AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9907		
Aircraft registration	**ZS-OET**	**Date of accident**	26 August 2020		**Time of accident**	1630Z	
Type of aircraft	Cessna 172F (Aeroplane)		**Type of operation**		Training (Part 141)		
Pilot-in-command licence type	Commercial Pilot		**Age**	26	**Licence valid**	Yes	
Pilot-in-command flying experience	Total flying hours		1 220.0		Hours on type	150.3	
Last point of departure	Springs Aerodrome (FASI), Gauteng Province						
Next point of intended landing	Springs Aerodrome (FASI), Gauteng Province						
Aircraft damage	Destroyed						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Springs Aerodrome (GPS position: 26°15'15.68" South 028°23'42.58" East), elevation 5 363 feet							
Meteorological information	Surface wind: 320°/3kts, temperature; 22°C, dew point; -2°C, CAVOK						
Number of people on-board	2 + 0	**No. of people injured**	1	**No. of people killed**	1		
Synopsis							

On Wednesday evening, 26 August 2020 at 1540Z, a Cessna 172F aircraft with registration ZS-OET took off from Springs Aerodrome (FASI) on a night training flight at the same aerodrome. The flight instructor and the private pilot, who was the pilot flying (PF), were on-board the aircraft. The flight was conducted in Visual Meteorological Conditions (VMC) at night under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

Three close circuit television (CCTV) cameras at FASI which are facing the runway (in a westerly direction) show the aircraft flying low on a left downwind for Runway 03 with the intention to perform a glide approach as the PF is under instruction for her night rating; the aircraft is then seen turning left towards the runway at base leg and, as the aircraft continues with the turn, the left wing impacts a tree, which is approximately 70 feet (ft) in height. Following impact with the tree, the PF loses control of the aircraft and rotates 360° to the left before impacting terrain in an upright position.
The aircraft was destroyed during the accident sequence; the flight instructor was seriously injured, and the PF was fatally injured.

It was established that the night training flight was not conducted according to the stipulated circuit height of 1 000 feet (ft) as prescribed in the Aviation Training Organisation (ATO) training manual. It was also established that there was nothing wrong with the aircraft or engine systems, and all damage was attributed to the accident sequence.

Probable Cause

The left wing of the aircraft impacted a tree while turning left base for Runway 03 and the pilot (PF) lost control of the aircraft.

Contributing Factors:

(1) The crew deviated from the ATO training procedures by not flying at the circuit height stipulated in their training manual.

(2) Inadequate in-flight supervision by the instructor during the night circuit training flight.

SRP date	12 October 2021	Release date	13 October 2021

DESCRIPTION OF ACCIDENT

Reference number	**:** CA18/2/3/9907
Name of owner	**:** Mach 1 Aviation Academy (Pty) Ltd
Name of the operator	**:** Mach 1 Aviation Academy (Part 141)
Manufacturer	**:** Cessna Aircraft Company
Model	**:** 172F
Nationality	**:** South African
Registration markings	**:** ZS-OET
Place	**:** Springs Aerodrome (FASI)
Date	**:** 26 August 2020
Time	**:** 1630Z

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 apportion blame or liability.***

Investigation Process:

The AIID of the South African Civil Aviation Authority (SACAA) was informed about an aircraft accident involving a Cessna 172F, which occurred during a training flight at Springs Aerodrome on the evening of 26 August 2020.

The AIID appointed an investigator-in-charge (IIC) with a co-investigator that conducted an on-site investigation. The AIID had sent a notification to the State of Manufacture and Design, which is the United States of America, and have appointed a non-travelling Accredited Representative.

Notes:
1. Whenever the following words are mentioned in this report, they shall mean the following:

- *Accident – this investigated accident*
- *Aircraft – the Cessna 172F involved in this accident*
- *Investigation – the investigation into the circumstances of this accident*
- *Pilot – the pilot involved in this accident*
- *Report – this accident report*

2. Photographs and figures used in this report are taken from different sources and may be adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report are limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:

Abbreviation	Description
AGL	Above Ground Level
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AIID	Accident and Incident Investigations Division
ATO	Aviation Training Organisation
ARFF	Aerodrome Rescue and Fire-Fighting
CAR	Civil Aviation Regulations
CAVOK	Ceiling and Visibility OK (for VFR flight)
CCTV	Close Circuit Television
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CPL	Commercial Pilot Licence
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
°C	Degrees Celsius
FAGM	Rand Aerodrome
FASI	Springs Aerodrome
FDR	Flight Data Recorder
ft	feet
GPS	Global Positioning System
HGV	Heidelberg Golf Victor (beacon)
hPa	Hectopascal
km	kilometre(s)
kt	knot(s)
IIC	Investigator-in-charge
m	Metre(s)
METAR	Meteorological Routine Aerodrome Report
MHz	Megahertz
MPI	Mandatory Periodic Inspection
NOSIG	No Significant Change
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot-in-Command
POH	Pilot's Operating Handbook
PPL	Private Pilot Licence
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TBO	Time Between Overhaul
VMC	Visual Meteorological Conditions
VHF	Very High Frequency (30 to 300 MHz)
VFR	Visual Flight Rules
Vso	Stall speed or minimum flight speed in landing configuration
Z	Zulu (Term for Universal Coordinated Time - Zero hours Greenwich)

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On Wednesday, 26 August 2020 at approximately 1540Z, a Cessna 172F with registration ZS-OET took off from Springs Aerodrome (FASI) on a night training flight. On-board the aircraft were a flight instructor, who was seated on the right front seat; and a private pilot, who was the pilot flying (PF) and seated on the front left seat. The night training flight was part of the PF's night rating. The crew used Runway 03 as the prevailing surface wind was from the north-west at 3 knots (kts).

1.1.2 According to the accident flight instructor who was interviewed on 27 November 2020, he was not scheduled to fly that evening; he was requested to take over training due to the scheduled flight instructor falling ill. The aircraft took off from FASI, headed towards the Hotel Golf Victor (HGV) beacon, according to a statement that was obtained from a witness flight instructor who was flying an aircraft with registration ZS-ISI. The witness flight instructor stated that they completed two circuits and, on their third circuit, that is when the accident occurred.

1.1.3 According to the witness flight instructor, he was also engaged in a training flight at FASI at the time; he stated that fine weather conditions prevailed with some clouds and no visible moon. He further stated that after he and his student had performed a full stop landing, he broadcasted on the aerodrome frequency that he was backtracking on the runway; and he exited to the taxiway. Once he had vacated the runway, he brought the aircraft to a stop on the taxiway and watched the ZS-OET aircraft perform the glide approach for Runway 03. The witness flight instructor recalled seeing the aircraft low on the glide approach; at that time, it was behind a tree as the landing light was on. He then saw the aircraft impacting the tree and crashed within the aerodrome perimeter. The witness flight instructor immediately taxied his aircraft to the aviation training organisation (ATO) apron, shut down the aircraft engine and informed the emergency services and the flight school management about the accident. He further stated that at no stage during the flight did any of the two pilots on-board ZS-OET broadcast a distress or Mayday call. The runway lights were serviceable and were switched on at the time of the accident.

1.1.4 Another aircraft (ZS-PED) from the same ATO (as the accident aircraft) got airborne from Runway 03 on a training flight and was routing towards the HGV beacon when they heard over the radio that there was an accident at FASI. The flight instructor of ZS-PED stated that later during their flight, she was contacted by the ATO and was

instructed to divert to Rand Aerodrome (FAGM) for a full stop landing as there was an accident at FASI. After landing at FAGM, the instructor and her student were collected by a driver and were driven back to FASI.

1.1.5 The accident aircraft was captured on three close circuit television (CCTV) cameras which were positioned at different locations at the aerodrome. The cameras were facing west towards the runway. One of these cameras is positioned outside the ATO's hangar. The footage on this CCTV is not very clear as the camera had already readapted its intensity from daylight, which is in colour, to night mode, which only provides a black and white image. *In the footage, the aircraft is visible on the left downwind for Runway 03 and is seen making a descent on the downwind leg. However, this camera did not capture the aircraft's impact with the tree.* In Figure 1, the aircraft is seen on the left downwind for Runway 03, shortly before the accident occurred. This photograph (below) was taken from the 'still' video footage of the ATO CCTV camera.

Figure 1: The aircraft on the left downwind for Runway 03. (Source: ATO video camera)

1.1.6 There were two other cameras located at different locations at the aerodrome that also captured the accident. *From the footage of these cameras, the aircraft is visible on a left downwind for Runway 03, flying lower than the circuit height. The aircraft then turns left base and, shortly thereafter, the left wing impacts a large tree. Following impact, the aircraft is seen completing a full barrel roll (rotating 360° to the left) while still in the air. The right wing of the aircraft is the first structural part to impact the ground, where after, the aircraft comes to rest in an upright position on its belly, with the left wing severely damaged but remaining attached to the airframe until ground impact.*

1.1.7 The PF was fatally injured during the accident sequence and the flight instructor was seriously injured and was taken to hospital by ambulance after being attended to by emergency medical personnel on site. The flight instructor was interviewed on Friday, 27 November 2020. He stated that he joined the ATO in February 2017 as a flight instructor. He could not recall much about the accident itself but mentioned in an interview that he was not scheduled to fly that evening and he was requested by a colleague to stand in for him as he had fallen ill and was not able to fly. He did not conduct a theoretical briefing prior to the flight; however, this was done by another flight instructor and he only stood in for the training flight part. The flight instructor also mentioned that when flying the circuit, the aircraft should be at 1 000ft above ground level (AGL) on the downwind leg. He further stated that the accident occurred during the third circuit he flew with the private pilot (PF).

1.1.8 The accident occurred at FASI during night time at a Global Positioning System (GPS) determined to be: 26°15'15.68" South 028°23'42.58" East, at an elevation of 5 363 feet (ft).

Figure 2: Overlay indicating the location of the accident site (yellow pin shows the location where ZS-OET came to rest). (Source: Google Earth)

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	1	-	-	1	-
Serious	1	-	-	1	-
Minor	-	-	-	-	-
None	-	-	-	-	-
Total	**2**	**-**	**-**	**2**	**-**

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed during the accident sequence.

Figure 3: The aircraft as it came to rest in an upright position on its belly.

1.4 Other Damage

1.4.1 Apart from the tree, no other damage was caused.

Figure 4: The tree with which the aircraft's left wing collided.

1.5 Personnel Information

1.5.1 Pilot-in-command (PIC) / Flight Instructor

Nationality	South African	Gender	Male	Age	26
Licence Number	0272453853	Licence Type	Commercial Pilot		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Instructor Grade II				
Medical Expiry Date	31 October 2020 (Class 1)				
Restrictions	None				
Previous Accident	None				

1.5.1.1 The instructor was issued a Class 1 aviation medical certificate on 1 October 2019 with an expiry date of 31 October 2020.

Flying Experience:

Total Hours	1 220.0
Total Past 90 Days	77.2
Total on Type Past 90 Days	25.2
Total on Type	150.3

The last entry in the flight instructor logbook was dated 31 July 2020. The hours entered in the table above were obtained from his logbook, and his flying hours for August 2020 were obtained from the ATO. The flying hours include the accident flight of approximately 50 minutes (0.8 hours).

1.5.2 Pilot Flying (Private Pilot)

Nationality	South African	Gender	Female	Age	19
Licence Number	0275010093	Licence Type	Private Pilot		
Licence Valid	Yes	Type endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 January 2024 (Class 2)				
Restrictions	None				
Previous Accidents	None				

1.5.2.1 The PF (private pilot) was issued a Class 2 aviation medical certificate on 18 January 2019 with an expiry date of 31 January 2024.

Flying Experience:

Total Hours	81.9
Total Past 90 Days	2.5
Total on Type Past 90 Days	2.5
Total on Type	2.5

According to the pilot flying logbook, she started training on 15 February 2019 and concluded her training on 30 November 2019 when she successfully passed her private pilot flight test. She was then issued a Private Pilot Licence (PPL) by the South African Civil Aviation Authority (SACAA). According to her pilot logbook, she flew on 14 January 2020. Between 14 January 2020 and 4 February 2020 she conducted seven flights and had accumulated 18.4 flying hours. The flight on 4 February 2020 was the last recorded flight entered in her pilot logbook.

According to available evidence obtained from the ATO on 20 August 2020, the pilot conducted her type conversion to the Cessna 172 type aircraft and flew 1.7 hours. The accident flight occurred six days after her type conversion, and it was her second flight on the aircraft type.

1.6 Aircraft Information

Airframe:

Type	Cessna 172F	
Serial Number	172-53141	
Manufacturer	Cessna Aircraft Company	
Year of Manufacture	1965	
Total Airframe Hours (at time of accident)	10 552.6	
Last Scheduled Inspection (hours & date)	10 461.6	14 August 2020
Hours Since Last Inspection	91.8	
C of A (issue date)	18 May 1998	
C of A (expiry date)	31 May 2021	
C of R (issue date) (Present owner)	20 November 2019	
Operating Categories	Standard	

1.6.1 Approximately 80 litres of fuel were drained from both wing tanks on site by a service provider that specialises in environmental (spill) management.

Engine:

Type	Lycoming O-320-E2A
Serial Number	L-15265-27A
Hours Since New	Unknown (as per logbook entry)
Hours Since Overhaul	992.6

Propeller:

Type	McCauley IC160/DTM7553
Serial Number	ABA 44506A
Hours Since New	Unknown (as per logbook entry)
Hours Since Overhaul	688.6

1.7 Meteorological Information

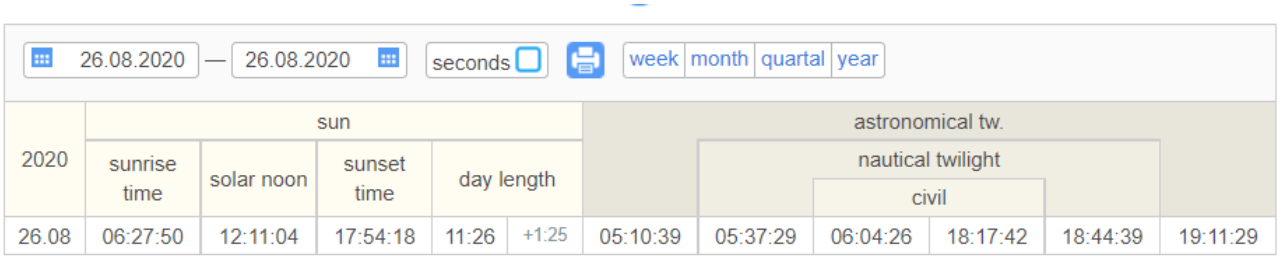
1.7.1 The weather information on the table (below) was obtained from the Meteorological Routine Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), METAR (Packtime: 1630Z) for FAOR: 261630Z 32003KT

300V020 CAVOK 22/M02 Q1022 NOSIG=.

Wind Direction	320°	Wind Speed	3kt	Visibility	9999m
Temperature	22°C	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	-2°C	QNH	1022 hPa		

1.7.2 Sunrise and sunset times on 26 August 2020 for Johannesburg were as follows:

Source: https://sunsetsunrisetime.com/sun/johannesburg_(south_africa)



2020	sun					astronomical tw.					
	sunrise time	solar noon	sunset time	day length			nautical twilight				
								civil			
26.08	06:27:50	12:11:04	17:54:18	11:26	+1:25	05:10:39	05:37:29	06:04:26	18:17:42	18:44:39	19:11:29

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA). There was no record indicating that the navigation system was unserviceable prior to or during the flight.

1.9 Communication

1.9.1 The aircraft was equipped with standard communication equipment as approved by the Regulator.

1.9.2 The designated aerodrome very high frequency (VHF) for FASI was 122.40 megahertz (MHz) and was operational.

1.9.3 There were two other aircraft in the circuit (ZS-ISI and ZS-PED) on the evening of the accident day that were also engaged in night flight training. The crew of the other two aircraft heard the crew of ZS-OET speaking over the radio during their flight, but no distress call or Mayday was broadcast prior to the accident occurrence.

1.10 Aerodrome Information

Aerodrome Location	Springs Aerodrome (FASI)	
Aerodrome Co-ordinates	26°15’00.93” South 028°24’15.45” East	
Aerodrome Elevation	5 340 feet AMSL	
Runway Designations	03/21	14/32
Runway Dimensions	1 600 x 18 m	554 x 20 m (Grass)
Runway Used	03	
Runway Surface	Asphalt	
Approach Facilities	Runway lights	
Aerodrome Status	Licensed	

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 regulation to be installed on this aircraft type.

1.11.2 A Garmin GPSmap 296, Serial No. 10703018 was recovered at the accident site. The unit was taken to an approved avionics maintenance facility to assist with the download of any possible data relating to the accident flight. However, no data could be retrieved from the unit pertaining to the accident flight.

1.12 Wreckage and Impact Information

1.12.1 The left wing of the aircraft impacted a tree that was located 32 metres (m) outside FASI’s perimeter fence (see Figure 5) during a glide approach for Runway 03 at night time. The aircraft appeared to be in a left bank attitude of approximately 30° when the left wing impacted the tree. The pilot lost control and the aircraft impacted terrain in a north-westerly direction and within the aerodrome’s perimeter. The aircraft came to rest in an upright position, parallel to Runway 03. Although the left wing remained partially attached to the fuselage, it was severely deformed, and the leading edge displayed evidence of impact with the tree as it was flattened. Control continuity was established and all flight controls were accounted for, with minor damage visible to the empennage, including the rudder, horizontal stabilisers and elevators. No pre-existing failure could be found.

1.12.2 From the CCTV footage, the aircraft is seen impacting the tree, thereafter, the aircraft completes a barrel roll (rotates 360° to the left) before impacting terrain in a slight right-wing low attitude. The quality of the video footage was not of high resolution and no screenshots were possible as the aircraft turned left towards the aerodrome (where the cameras were installed) with the landing light on, which distorted the footage. The footage from all the cameras was in black and white.

Figure 6: The tree that the aircraft collided with was 32m outside the aerodrome perimeter fence.

Figure 7: The aircraft impacted terrain 14m inside the aerodrome perimeter.

Figure 8: A view of the left-side of the wreckage.

Figure 9: The wreckage location in relation to the tree the aircraft impacted.

Figure 10: A view of the wreckage and the tree (on the left) the aircraft collided with (taken from the runway side).

Figure 11: Tree branches on the horizontal stabiliser from the tree with which the aircraft collided.

1.13 Medical and Pathological Information

1.13.1 According to the Medico-Legal post-mortem report, the PF's cause of death was due to multiple injuries.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival aspects

1.15.1 The accident was considered non-survivable as the cockpit/cabin area was severely damaged during the impact sequence, resulting in the PF being fatally injured and the flight instructor sustaining serious injuries.

1.15.2 The accident occurred on a licensed aerodrome (unmanned), however, there was no aerodrome rescue and fire-fighting (ARFF) personnel stationed at the aerodrome. Emergency services from the local metro responded to the accident scene as well as the police service personnel.

Figure 12: Emergency personnel who responded to the accident scene.

1.16 Tests and Research

1.16.1 None.

1.17 Organisational and Management Information

1.17.1 This was a training flight which was conducted under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2 The Aviation Training Organisation (ATO) was issued an ATO approval certificate on 29 March 2017 with an expiry date of 18 March 2022.

1.17.3 The last Mandatory Periodic Inspection (MPI) that was carried out on the aircraft prior to the accident flight was certified on 14 August 2020 at 10 460.8 airframe hours. The Aircraft Maintenance Organisation (AMO) was issued an AMO approval certificate by the SACAA on 21 February 2020 with an expiry date of 28 February 2021.

1.18 Additional Information

1.18.1 The 180° Power-off Approach

Source:
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/media/10_afh_ch8.pdf

This approach is executed by gliding with the power off from a given point on the downwind to a pre-selected landing area (see Figure 13). It is an extension of the principles, involved in the 90° power-off approach. Its objective is to further develop judgment in estimating distances and glide ratios in that the aircraft is flown without power from a higher altitude and through a 90° to reach the base-leg at a proper altitude for executing the 90° approach.

The 180° power-off approach requires more planning and judgment than the 90° power-off approach. In the execution of the 180° power-off approaches, the aircraft is on a downwind heading parallel to the landing runway. The altitude from which this type of approach is started varies with the type of aircraft but usually should not exceed 1 000 feet above the ground except for large aircraft.

When opposite the desired landing spot, the throttle is reduced to idle and altitude is maintained while the aircraft is decelerated to the manufacturer's recommended glide speed or 1.4 stall speed (Vso) when abeam the desired landing spot, at the downwind key position (see Figure 13).

The turn from the downwind leg to the base leg is a uniform turn with a medium or slightly steeper bank. The degree of bank and amount of this initial turn depend upon the glide angle of the airplane and the velocity of the wind. Again, the base leg

is positioned as needed for the altitude or wind condition. Position the base leg to conserve or dissipate altitude so as to reach the desired landing spot.

The turn onto the base leg is made at an altitude high enough and close enough to permit the airplane to glide to what would normally be the base key position in a 90° power-off approach.

Although the key position is important, it must not be overemphasised nor considered as a fixed point on the ground. Many inexperienced pilots may gain a conception of it as a particular landmark, such as a tree, crossroad, or other visual reference, to be reached at a certain altitude. This misconception leaves the pilot at a total loss any time such objects are not present. Both altitude and geographical location should be varied as much as is practical to eliminate any such misconceptions. After reaching the base key position, the approach and landing are the same as in the 90° power-off approach.

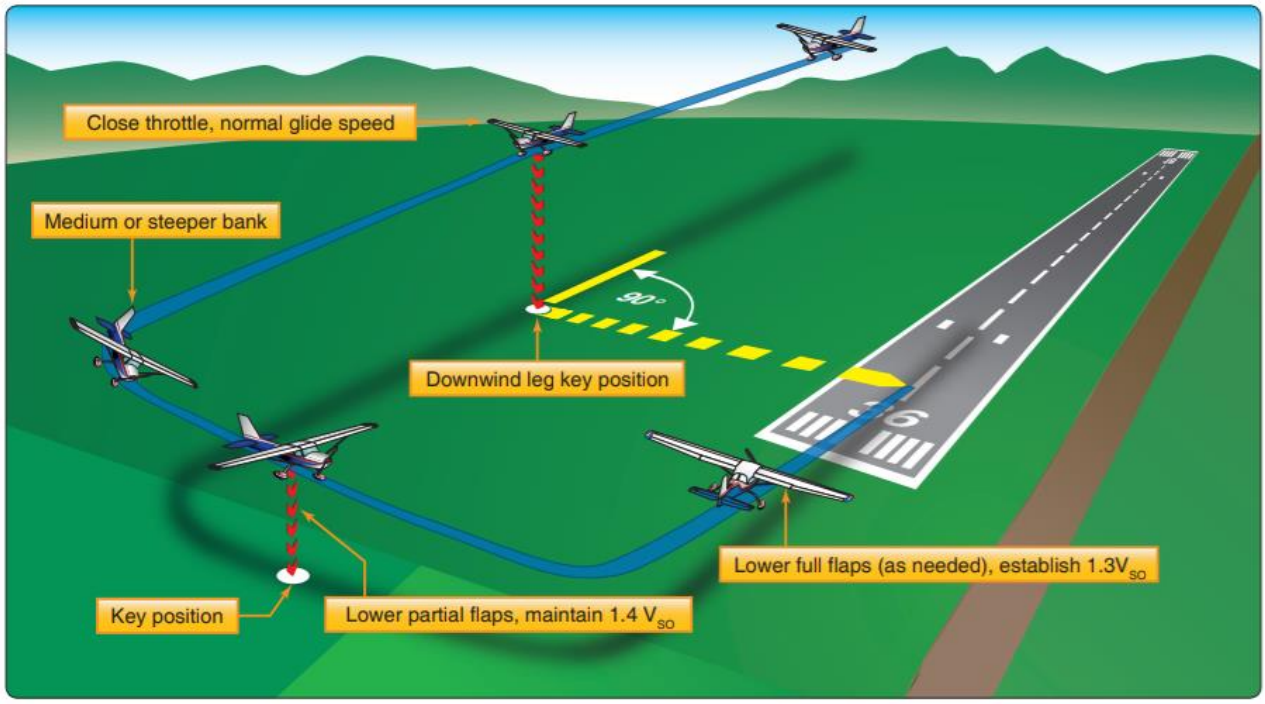


Figure 13: The 180° power-off approach.

1.18.2 Exercise 16, Forced Landing

Source: The ATO's Flight Instructors Training Procedures

Definition: A forced landing is a landing not contemplated before take-off and one in which no power is available to select a landing path.

During training, once established in final approach knowing you will make the field, initiate a go-around at a safe height, recommended not below 200ft AGL.

Important:

(i) If you sit on the left-hand seat, select a field on your left. (This is preferable but not always possible or practical. Must be able to fly left and right-hand circuits.

(ii) ALWAYS keep the field in sight throughout the descent.

(iii) Fly best glide speed gives the greatest gliding distance.

(iv) Make Mayday call as high as possible (very high frequency [VHF] is line of sight).

(v) Don't "stretch" the glide – you can stall the aircraft.

(vi) In a square or rectangular field, the greatest distance is diagonally across.

A detailed layout of how the exercise should be flown is attached to this report as Appendix A. At Point 6 Upwind Key Point the aircraft must be at 2 000ft AGL. On the downwind leg, the aircraft can descent by a 1 000ft, and at Point 8 Base Leg Key Point the aircraft should be at a 1 000ft AGL.

1.18.3 Minimum Operating Height at Night

Source: ATO – Training and Procedures Manual, Pg. 43

A height of less than 1 500 ft (or 2000 ft the terrain or obstacle is higher than 5000 ft amsl) above the highest obstacle within radius of 5 Nautical Miles of Aero plane.

Standard Operating Heights

During routine transit flying, pilots shall maintain a height from which it is possible to make a safe autorotation landing in the event of engine failure. This will obviously be higher downwind than into the wind. The nature of terrain and cloud base are factors which must be taken into consideration. Unless restricted for any reason, pilots should regard 500 feet AGL as minimum standard operating height.

1.18.4 Environmental Spill Response

Following the accident, the ATO commissioned the services of an environmental spill recovery company. Four members of the service provider responded to the scene. A site assessment and site set-up were conducted, where after, plastic sheeting was placed on the ground beneath the wings of the aircraft to prevent ground contamination during the pumping process. The company personnel placed 2 x 210L close top drums on top of the plastic sheeting and pumped out fuel from the two fuel tanks of the aircraft into the 210L drums until the fuel tanks were empty.

Figure 14: Spill response company members draining fuel from the right-wing tank into a 210L drum.

1.19 Useful or Effective Investigation Techniques

1.19.1 No new methods were used.

2. ANALYSIS

2.1 General

From the evidence available, the following analysis was made with respect to this accident. These shall not be read as apportioning blame or liability to any organisation or individual.

2.2 Crew

Both pilots were properly licensed and were authorised to conduct the training flight. They were both in good health and were in possession of valid aviation medical certificates.

From the PF logbook, it was noted that she had not flown for more than six months, with her last flight undertaken on 4 February 2020 and her first flight, thereafter, on 20 August 2020. This was attributed to the SARS Cov-2 (COVID 19) virus protocol being implemented. The accident flight was her first flight towards obtaining her night rating and her second flight on the Cessna 172 type aircraft following her type conversion flight on 20 August 2020, which was conducted through the same ATO.

The flight instructor was not scheduled to fly on the evening but agreed to stand at short notice for a colleague who had taken ill. According to the ATO, the flight instructor was well rested prior to the flight.

Both pilots were acquainted with the aerodrome and the hazards surrounding it. The accident occurred during the third circuit when the crew deviated from the procedures. According to available information, sunset time for Johannesburg on the day of the accident was at 15:54:18Z, which was approximately 35 minutes before the accident occurred. The first two circuits were flown during twilight conditions, which allowed the crew to identify the obstacles that were close to the aerodrome, such as the tree they collided with when it was dark.

2.3 Aircraft

The aircraft was maintained according to the required maintenance schedule and was serviceable prior to the flight. During on-site wreckage examination, all flight control surfaces were accounted for and it was found that the aircraft integrity was not compromised during the flight, which might have contributed to the aircraft impacting the tree. The left wing was severely damaged following impact but remained attached to the airframe until ground impact.

2.4 Environment

Fine weather conditions prevailed on the evening of the day of the accident and it was found that the weather did not contribute to the accident. The flight instructor and the PF were well acquainted with the aerodrome and the surrounding area.

2.5 Conclusion

The crew deviated from the ATO training procedures for this exercise by flying low-level circuit at night, instead of being at 1 000ft AGL before commencing the base leg turn. The landing light, which was positioned on the left wing was switched on and it could not be determined why neither of the crew members saw the tree prior to impact as there was no evidence from the video footage that the crew attempted to take any evasive manoeuvre or action prior to impact with it.

Was this accident preventable? Yes it was, if the crew had adhered to the training procedures by flying at the prescribed heights within the circuit.

3. CONCLUSION

3.1 General

From the evidence available, the following findings, causes and contributing factors were made with respect to this Accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this Investigation, the following sections are included in the conclusions heading:

- **Findings —** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes —** are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors —** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2 Findings

Crew

3.2.1 The flight instructor was issued a Commercial Pilot Licence (CPL) on 10 September 2012. He held the necessary ratings to operate the aircraft and had flown a total of 1 220.0 hours. He did his last flight test on 15 September 2019 and was reissued the licence with an expiry date of 31 October 2020.

3.2.2 The flight instructor who was scheduled to fly on the evening of the accident night fell ill at short notice and the accident flight instructor was requested to stand in for him. He only conducted the “training flying” part, the theoretical briefing prior to the flight was conducted by another flight instructor.

3.2.3 The flight instructor had flown a total of 77.2 hours in the 90 days preceding the accident flight, of which 25.2 hours were on the Cessna 172.

3.2.4 The flight instructor was issued a Class 1 aviation medical certificate on 1 October 2019 with an expiry date of 31 October 2020, without any restrictions.

3.2.5 The PF was initially issued a Private Pilot Licence (PPL) on 10 January 2020. She had flown a total of 81.9 hours of which 2.5 hours were on the Cessna 172 type aircraft, which comprised her type conversion flight onto the aircraft type.

3.2.6 The PF was issued a Class 2 aviation medical certificate on 18 January 2019 with an expiry date of 31 January 2024, without any restrictions.

Aviation Training Organisation (ATO)

3.2.7 This was a training flight conducted under the provisions of Part 141 of the Civil Aviation Regulations 2011 as amended. The ATO was issued an ATO certificate on 29 March 2017 with an expiry date of 18 March 2022.

3.2.8 The ATO had a flight instructor’s training procedure document which provides guidance on how the exercise should be conducted, however, the crew deviated from it by not adhering to the recommended heights at the upwind and base leg positions, respectively.

3.2.9 Page 34 of the Training and Procedures Manual (TPM) states that the minimum operating height at night that pilots should regard is 500ft AGL as the minimum standard operating height.

Aircraft

3.2.10 The aircraft was issued a Certificate of Airworthiness on 31 May 1998 with an expiry date of 13 August 2021.

3.2.11 The aircraft was issued a Certificate of Release to Service on 14 August 2020 with an expiry date of 13 August 2021 or at 10 560.8 airframe hours, whichever comes first.

3.2.12 The aircraft was issued a Certificate of Registration on 20 November 2019.

3.2.13 The last scheduled MPI that was carried out on the aircraft prior to the accident flight was certified on 14 August 2020 at 10 460.8 airframe hours. The aircraft had accumulated an additional 91.8 airframe hours since its last inspection.

3.2.14 The flight was conducted under Visual Flight Rules (VFR) by night.

3.2.15 No evidence of pre-existing failures could be found on the aircraft during the on-site investigation and all damage was attributed to the crash which destroyed the aircraft.

3.2.16 The GPS unit that was recovered on-site did not contain any data relating to the accident flight.

Injuries

3.2.17 The flight instructor was seriously injured and was attended to by emergency personnel at the scene and, later, admitted to hospital by ambulance.

3.2.18 The PF, who was seated on the left front seat, was fatally injured during the accident sequence.

Aerodrome

3.2.19 The accident occurred on a licensed aerodrome (non-towered).

3.2.20 The accident aircraft was captured on three CCTV cameras that were positioned at several locations at the aerodrome facing the runway. In the footage, the aircraft is seen on the left downwind for Runway 03 and makes a descent, thereafter, the left wing impacts the tree and the pilot loses control; where after, the aircraft rolls 360° before it crashes.

3.2.21 One of the witnesses who was flying another aircraft reported that once he had vacated the runway, he brought his aircraft to a stop on the taxiway and watched the ZS-OET aircraft perform the glide approach for Runway 03. He recalled seeing the aircraft being low on glide approach and was behind the tree as the landing light was on. He then saw the aircraft impact the tree and crashed within the aerodrome's perimeter. The witness further indicated that at no stage during the flight did the pilots of the ZS-OET aircraft broadcast any distress or Mayday call.

Environment

3.2.22 Fine weather conditions prevailed at the time of the accident and had no bearing on the accident.

3.2.23 Sunset time for Johannesburg on the day of the accident was 15:54:18Z, which was 35 minutes before the accident occurred.

3.3 Probable Cause

3.3.1 The left wing of the aircraft impacted a tree while turning left base for Runway 03; thereafter, the pilot lost control of the aircraft.

3.4 Contributory Factors

3.4.1 The crew deviated from the ATO training procedures by not flying at the circuit heights as stipulated in the ATO training manual.

3.4.2 The instructor's failure to prepare for the flight by not conducting a briefing of the flight himself.

3.4.3 Inadequate supervision/intervention by the flight instructor during the training flight.

4. SAFETY RECOMMENDATIONS

4.1 General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report; the AIID expects that all safety issues identified by the Investigation are addressed by the receiving States and organisations.

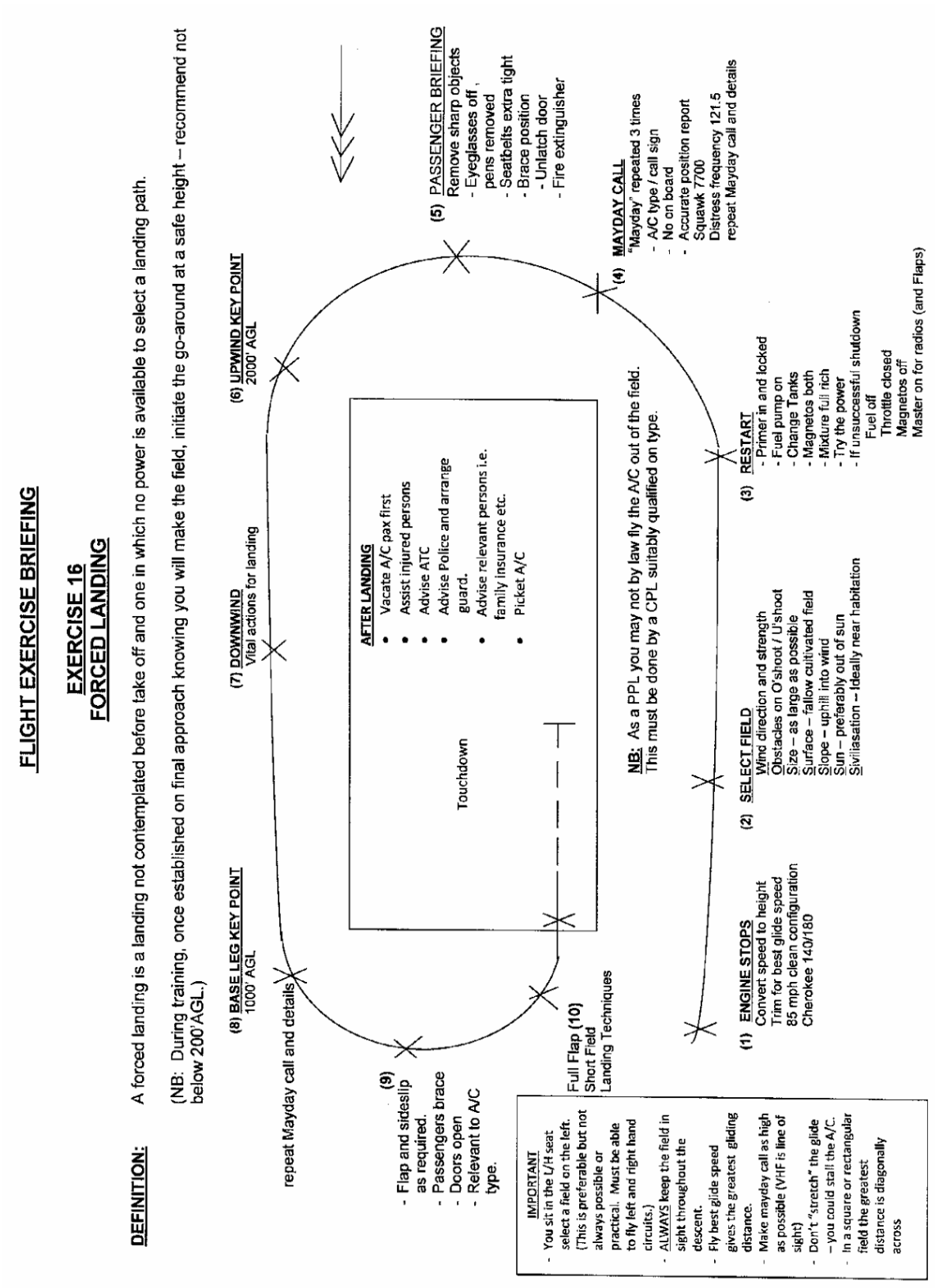
4.2 Safety message:

Operators and pilots are reminded of the dangers associated with night flying and specifically night training flights. It is of paramount importance that all training flights be conducted in compliance with the approved training procedures, especially when it comes to the minimum heights at or near aerodromes.

5. APPENDICES

5.1 Appendix A (Flight Instructors Training Procedures – Exercise 16, Forced Landing)

This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa


FLIGHT EXERCISE BRIEFING
EXERCISE 16
FORCED LANDING
DEFINITION: A forced landing is a landing not contemplated before take off and one in which no power is available to select a landing path.
(NB: During training, once established on final approach knowing you will make the field, initiate the go-around at a safe height – recommend not below 200'AGL.)
(8) BASE LEG KEY POINT 1000' AGL
(7) DOWNWIND Vital actions for landing
(6) UPWIND KEY POINT 2000' AGL
(5) PASSENGER BRIEFING Remove sharp objects
- Eyeglasses off, pens removed
- Seatbelts extra tight
- Brace position
- Unlatch door
- Fire extinguisher
(4) MAYDAY CALL
"Mayday" repeated 3 times
- A/C type / call sign
- No on board
- Accurate position report
Squawk 7700
Distress frequency 121.5
repeat Mayday call and details
AFTER LANDING
• Vacate A/C pax first
• Assist injured persons
• Advise ATC
• Advise Police and arrange guard.
• Advise relevant persons i.e. family insurance etc.
• Picket A/C
Touchdown
repeat Mayday call and details
(9)
- Flap and sideslip as required.
- Passengers brace
- Doors open
- Relevant to A/C type.
Full Flap (10)
Short Field
Landing Techniques
NB: As a PPL you may not by law fly the A/C out of the field. This must be done by a CPL suitably qualified on type.
(3) RESTART
- Primer in and locked
- Fuel pump on
- Change Tanks
- Magnetos both
- Mixture full rich
- Try the power
- If unsuccessful shutdown
Fuel off
Throttle closed
Magnetos off
Master on for radios (and Flaps)
(2) SELECT FIELD
Wind direction and strength
Obstacles on O'shoot / U'shoot
Size – as large as possible
Surface – fallow cultivated field
Slope – uphill into wind
Sun – preferably out of sun
Civilisation – ideally near habitation
(1) ENGINE STOPS
Convert speed to height
Trim for best glide speed
85 mph clean configuration
Cherokee 140/180
IMPORTANT
- You sit in the L/H seat: select a field on the left. (This is preferable but not always possible or practical. Must be able to fly left and right hand circuits.)
- ALWAYS keep the field in sight throughout the descent.
- Fly best glide speed gives the greatest gliding distance.
- Make mayday call as high as possible (VHF is line of sight)
- Don't "stretch" the glide – you could stall the A/C.
- In a square or rectangular field the greatest distance is diagonally across