AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9834		
Aircraft Registration	ZS-EXI	**Date of Accident**	11 November 2019		**Time of Accident**	0500Z	
Type of Aircraft	Piper PA 28-140		**Type of Operation**		Training (Part 141)		
Flight Instructor Licence Type	Commercial Pilot Licence		**Age**	32	**Licence Valid**	Yes	
Flight Instructor Flying Experience	**Total Flying Hours**	351.4			**Hours on Type**	52.6	
Last Point of Departure	Springs Aerodrome (FASI), Gauteng Province						
Next Point of Intended Landing	Springs Aerodrome (FASI), Gauteng Province						

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

Olympia Road, Springs (GPS co-ordinates: 26°15'21.33" South 028°23'43.26" East) at elevation of 5377 ft AMSL

Meteorological Information	Wind: 040° at 09kt, Temperature: 24°C, Dew Point: 11°C, Clouds: Few at 4000ft, Visibility: 9999m, QNH: 1020hPa				
Number of People on Board	2+0	**No. of People Injured**	2	**No. of People Killed**	0

Synopsis

On 11 November 2019, at approximately 0500Z, a flight instructor and a student pilot on-board a Piper PA 28-140 with registration mark ZS-EXI took off from Springs Aerodrome on a training flight. The purpose of the flight was to conduct circuits with emergency exercises.

During a glide approach while turning from base-leg, with the aircraft configured as follows: flaps in the retracted position, fuel mixture selected to full rich, and the carburettor heat selector set to "on" position, the student pilot had increased the bank angle to the left to align the aircraft with the runway centreline. This resulted in the aircraft being in a left-wing low attitude. At about 300 feet, the student pilot froze on the control column and lost control of the aircraft. This made it difficult for the flight instructor to take control of the aircraft. By the time the flight instructor took control of the aircraft and applied full power to recover and go-around, the engine did not produce enough power to execute this manoeuvre. The aircraft impacted a lamp post on Olympia Road in the residential area of Dal Fouche, Springs, and crashed. It came to rest approximately 325 metres from the threshold of Runway (RWY) 03.

The aircraft was substantially damaged during the accident sequence. Both occupants sustained injuries and were attended to at the scene by paramedics, where after, they were transported to a nearby hospital by ambulance to received medical attention.

Probable Cause/s

The student pilot froze on the controls while on glide approach, turning from base-leg to final to line up with the runway centreline. This resulted in the aircraft losing altitude before the instructor could gain control of it. After recovery, the instructor initiated the go-around, however, due to the aircraft's altitude and configuration, the engine could not produce enough power for a successful go-around. As a result, the aircraft impacted a lamp post on Olympia Road in the residential area of Dal Fouche, Springs, and crashed.

Contributing Factor:

Incorrect aircraft configuration and handling.

Poor technique during a glide approach.

SRP Date	19 January 2021	Publication Date	4 February 2021

Abbreviation	Description
°	Degrees
°C	Degrees Celsius
A/C	Aircraft
AMSL	Above mean sea level
ATO	Aviation Training Organisation
CAR	Civil Aviation Regulations 2011
CFI	Chief Flight Instructor
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CPL	Commercial Pilot Licence
FAOR	O.R. Tambo International Aerodrome
FASI	Springs Aerodrome
FI	Flight Instructor
ft	Foot/feet
Gal/USG	Gallons / US Gallons
GPS	Global Positioning System
kgs	Kilograms
Km	Kilometres
Kt	Knots
L	Litres
lbs	Pounds
L/H	Left hand
m	Metre(s)
OpSpec	Operations Specifications
POH	Pilot's Operating Handbook
POPS	Prospective Aviation Training Organisation Pre-Assessment Statement
PPL	Private Pilot Licence
QNH	Query: Nautical Height
R/H	Right hand
RWY	Runway
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
SP	Student Pilot
SPL	Student Pilot Licence
VFR	Visual Flying Rules
VHF	Very High Frequency
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

Description of Accident

Reference Number	**:** CA18/2/9834
Name of owner/operator	**:** Mach 1 Aviation Training School
Manufacturer	**:** Piper Aircraft Corporation
Model	**:** PA 28-140 (Cherokee 140)
Nationality	**:** South African
Registration Marks	**:** ZS-EXI
Place	**:** Olympia Road, Dal Fouche, Springs
Date	**:** 11 November 2019
Time	**:** 0500Z

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 (CAR) 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****.*

Investigations process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 11 November 2019 at about 0500Z. A team of investigators dispatched to the accident site at Springs on 11 November 2019. The investigators co-ordinated with all authorities on site by initiating the accident investigation process according to CAR Part 12 and investigation procedures. The AIID of the South African Civil Aviation Authority (SACAA) is leading the investigation as the Republic of South Africa is the State of Occurrence.

Note:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   - *Accident – this investigated accident*
   - *Aircraft – the PA-28-140 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. *Photos and figures used in this report were 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 were limited to cropping, magnification, file compression, or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.*

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On 11 November 2019, a flight instructor and a student pilot on-board a Piper PA 28-140 with registration mark ZS-EXI took off from Springs Aerodrome (FASI) on a training flight. The purpose of the flight was to conduct circuits with emergencies.

1.1.2. The instructor reported that the first two circuits were uneventful, however, during the third circuit, the instructor put the engine on idle when the aircraft was on base leg. During the glide approach while turning from base-leg, with the aircraft configured as follows: flaps in the retracted position, fuel mixture selected to full rich, and the carburettor heat selector set to "on" position; the student pilot had increased the bank angle to the left to align the aircraft with the runway centreline. This resulted in the aircraft being in a left-wing low attitude. At about 300 feet (ft) above ground level (AGL), the student pilot froze on the control column and, thus, lost control of the aircraft. This made it difficult for the flight instructor to take control of the aircraft.

1.1.3. By the time the flight instructor took control of the aircraft and applied full power to recover and go-around, the engine did not produce enough power to execute this manoeuvre. As a result, the aircraft impacted a lamp post on Olympia Road in the residential area of Dal Fouche, Springs, and crashed. It came to rest approximately 325 metres (m) from the threshold of Runway (RWY) 03.

1.1.4. The aircraft was substantially damaged during the accident sequence. The instructor sustained minor injuries and the student pilot sustained serious injuries. They were both attended to at the scene by paramedics, where after, they were transported to a nearby hospital by ambulance to received medical attention.

1.1.5. The flight was conducted under Visual Flying Rules (VFR) by day. The aircraft crashed approximately 325m from the threshold of RWY 03 at FASI at the following Global Positioning System (GPS) co-ordinates: 26°15'2133" South 028°23'4326" East at an elevation of 5377 feet (ft) above mean sea level (AMSL).

Figure 1: The aerial view of the accident site's proximity to the threshold of Runway 03 at FASI. (Source: Google Earth Map)

1.2. Injuries to Persons

Injuries	Crew	Passengers	Total in the aircraft	Other
Fatal	-	-	-	-
Serious	1	-	1	-
Minor	1	-	1	-
None	-	-	-	-
TOTAL	2	-	2	-

1.2.1. Both occupants sustained injuries during the accident and were attended to at the scene by paramedics, where after, they were transported to a nearby hospital by ambulance to receive medical attention.

1.3. Damage to Aircraft

1.3.1. The aircraft was substantially damaged.

Figure 2: Aircraft damage following the accident sequence.

1.4. Other Damage

1.4.1. The aircraft impacted and damaged two lamp poles and an electric earthing wire during the accident sequence.

1.5. Personnel Information

1.5.1. **Flight Instructor Information**

Nationality	South African	Gender	Female	Age	32
Licence Number	0272473125	Licence Type	Commercial Pilot (Aeroplane)		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night, Instrument, Instructor Grade 3				
Medical Class & Expiry Date	Class 1, 28 February 2020				
Restrictions	None				

Flight Instructor Flying Hours

Total Hours	351.4
Total Past 90 Days	51
Total on Type Past 90 Days	51
Total on Type	52.6

Flight Instructor Experience

1.5.1.1. The flight instructor (FI) had flight experience on single-engine piston aircraft of 319 hours, of which 31.6 hours were flight instructor patter training and 12.2 hours were instructional flights as flight instructor.

1.5.1.2. The FI underwent a skills test for Commercial Pilot Licence (CPL) Aeroplane (A) on 5 December 2015 using a Piper PA 34-200 aircraft.

1.5.1.3. From the date of first issue of the CPL (A) on 17 December 2015 until the date of issue of the Grade 3 instructor rating on 5 October 2019, the FI undertook 19 flights on the Piper PA 28-140 aircraft, from which 10 flights were patter training.

1.5.1.4. The FI's Grade 3 rating was first issued on 5 October 2019 with an expiry date of 31 October 2020. The FI's rating test was completed in line with the provisions of Subpart 61.12.1 of the Civil Aviation Regulations (CAR) 2011.

1.5.2. **Student Pilot Information**

Nationality	Tanzanian	Gender	Male	Age	19
Licence Number	0275500234	Licence Type	Student Pilot Licence (Aeroplane)		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Class & Expiry Date	Class 2; 17 July 2024				
Restrictions	None				

Student Pilot Flying Hours

Total Hours	14.5
Total Past 90 Days	14.5
Total on Type Past 90 Days	8.84
Total on Type	8.84

Student Pilot Experience

1.5.2.1. The student pilot was enrolled for a Private Pilot Licence (PPL) training at a flying school at Springs Aerodrome on 27 August 2019. The portfolio contained the training programme sheets which were used to record the type of lessons completed and provided space for comments by the instructor regarding the student (see Appendix A for recorded details of comments made by instructors in the student pilot's PPL portfolio following each training flight). The training programme was adapted from the South African Flight Instructor's Manual of Training Procedures.

1.5.2.2. From 2 to 8 October (six days), the student pilot flew with one instructor on a C172 aircraft. From 14 October 2019 until the date of the accident on 11 November 2019, a 28-day period, the student pilot flew with another FI operating a PA 28-140.

1.5.2.3. According to the logbook, the student pilot had a 10-hour dual check on 24 October 2019 with the chief flight instructor (CFI). On the same day, the CFI completed and signed the student pilot's logbooks endorsement sheet for the 10-hour dual check, as well as certified the student pilot to have completed spinning on the PA 28 aircraft. When the accident occurred, the student pilot had performed a total of 15 training flights, of which five flights amounting to 5.66 hours were on the Cessna 172, and 10 flights amounting to 8.84 hours were on the PA 28-140 aircraft.

1.5.2.4. The student pilot was class/type rated on the C172, P28A and TC06. On the day of the accident, the instructor and the student pilot were carrying out practical air exercise Lesson 14. The purpose of the training flight was on "take-off, circuit, approach and landing with emergencies" on the PA 28-140 aircraft. During the training flight, the pair had carried out two uneventful touch-and-go exercises. The accident occurred during the third flight on final approach.

1.5.2.5. According to the crew, the practical air exercise Lesson 14 of the training programme was carried out in line with the proposed version of the South African Flight Instructor's Manual of Training Procedures, Exercise 12E
&13E Circuit Emergencies – Engine failure after take-off. [Source: http://www.caa.co.za/Flight%20Instructor%20Guides/South%20African%20Flight%20Instructors%20Training%20Procedures%20(proposed%20version).pdf, pg. 108]

1.5.2.6. According to the South African Flight Instructor's Manual of Training Procedures, "*instructors must not attempt exercises 12 and 13 until they are satisfied that the student can fly a proper circuit as required for exercise 4 to 10*". [Source: http://www.caa.co.za/Flight%20Instructor%20Guides/South%20African%20Flight%20Instructors%20Training%20Procedures%20(proposed%20version).pdf, pg. 98]

1.6. Aircraft Information

1.6.1. The Piper PA-28-140 (Cherokee 140) is a four-seat fixed tricycle gear, general aviation aircraft, originally designed for flight training, touring and personal use. The aircraft is of an unpressurised, sheet metal construction, a single-engine piston-powered aircraft with low-mounted wings and a horizontal tail design. The aircraft has a single door on the right side, which is accessed by stepping on the wing.

1.6.2. The aircraft is equipped with a float carburettor heat control which provides maximum carburettor heat when pulled to its full aft position. The aircraft's heater muff, attached to the exhaust system, provides cabin heat and carburettor de-icing.

Airframe

Type	Piper PA-28-140	
Serial Number	28-22462	
Manufacturer	Piper Aircraft Corporation	
Year of Manufacture	1975	
Airframe Hours (At time of Accident)	8522.95	
Last MPI (Hours & Date)	8442.54	11 October 2019
Next Scheduled Inspection (Hours & Date)	8542.94	10 October 2020
Hours Since Last Mandatory Periodic Inspection	80.41	
C of A (Original Date of Issue & Expiry Date)	28 April 1969	30 April 2020
C of R (Issue Date) (Present owner)	22 November 2018	
Operating Categories	Standard Part 135	
Previous Occurrences (Number and Year)	Yes. 1 accident in 2008.	

1.6.3. According to the operator's fuel log records, ZS-EXI was last refuelled with 54.9 litres of AVGAS 100 LL on 8 November 2019, three days before the accident flight. However, according to the flight folio and defect report, the last fuel uplift on the day of the accident was 75.1 litres. The fuel consumption calculations showed that the aircraft had enough fuel for the flight.

1.6.4. The aircraft was issued a Certificate of Release to Service (CRS) on 11 October 2019 which would have lapsed at 8542.19 airframe hours (4707.94 Tacho hours) or on 10 October 2020, whichever occurs first.

Engine

Type	Lycoming O-320-D2A	
Serial Number	L-17810-27A	
Installation (Date & Hours Since New)	05 December 2006	4372.02
Hours since New (At time of Accident)	8522.95 Hours	
Last Overhaul (Date & Hours)	25 April 2019	8264.52
Number of Overhauls	2 times	
Hours Since Overhaul (At time of Accident)	258.43	

1.6.5. The engine logbook, engine removal and installation records information were as follows:

1.6.5.1. According to the Cherokee-140 Owners Handbook the approved engine type/model installed on the Piper PA28-140 is a Lycoming O-320-E2A engine. However, according to the engine logbook, a Lycoming O-320-D2A engine was installed on ZS-EXI.

According to the 2008 accident report (CA18/2/3/8598) on ZS-EXI, records found on the aircraft file revealed that the engine was "converted" from O-320-E2A (150 horsepower) to O-320-D2A (160 horsepower) motor with the aim of increasing the engine horsepower and to have a better climb performance at high altitude.

1.6.5.2. The engine was overhauled two times prior to the accident. The engine was installed after being repaired at 4372.02 hours on 5 December 2006. On 6 May 2009, the engine had accumulated 1893.20 hours before it was overhauled at 6265.22 hours since installation on ZS-EXI.

1.6.5.3. The engine was overhaul again on 6 May 2019 at 8264.52 hours, after 1999.30 hours since its previous overhaul at 6265.22 hours. From the last overhaul at 8264.52 hours, up to the date of the accident at 8522.95 hours, the engine had accumulated 258.43 hours.

1.6.6. There were no defects with the carburettor and engine recorded in the flight folio and defect logs prior to the accident.

Propeller

Type	SENSENICH 74 DM6-0-58	
Pitch	Fixed pitch	
Serial Number	A 61807	
Installation (Date & Hours Since New)	13 October 2008	0.00
Hours since New (At time of Accident)	3311.95	
Last Overhaul (Date & Hours)	07 October 2015	2100.00
Number of Overhauls	1 time. Next TBO not yet reached.	
Hours Since Overhaul (At time of Accident)	1211.95	

1.6.7. The manufacturer's recommended time between overhaul for Sensenich fixed-pitch aluminium propellers is 2000 total flight hours for normal and utility operations. According to the propeller logbook, the recorded overhaul was carried out at 100 hours over the recommended time between overhaul.

1.7. Meteorological Information

1.7.1. The weather information on the table (below) was provided by the South African Weather Service (SAWS) recorded at O.R. Tambo International Aerodrome (FAOR) on 11 November 2019 at 0500Z:

Wind direction	010°	Wind speed	09kt	Visibility	+ 10km
Temperature	17°C	Cloud cover	Few (1-2 octas)	Cloud base	4000ft
Dew point	11°C	QNH	1020hPa		

Note: FAOR is located 11km from FASI.

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with a Garmin GPS 100. The unit was not removed from the aircraft to be downloaded as it was deemed not necessary for this investigation.

1.8.2. There were no recorded defects with the navigational equipment prior to the accident.

1.9. Communication

1.9.1. The accident took place at an unmanned private aerodrome; there are no communication facilities available at the aerodrome.

1.9.2. The aircraft was equipped with a very high frequency (VHF) transmitter communication system. No radio contact was established during the accident sequence and there were no defects reported with the communication equipment prior to the accident.

1.10. Aerodrome Information

Aerodrome Location	Springs, South Africa
Aerodrome Co-ordinates	South 26°14’57.40” East 028°23’51.03”
Aerodrome Elevation	5340ft AMSL
Runway Designations	03/21
Runway Dimensions (metres)	1600 x 18
Runway Used	03
Runway Surface	Asphalt
Approach Facilities	Nil
Aerodrome Status	Licensed

1.11. Flight Recorders

1.11.1. The aircraft was neither equipped with a flight data recorder or a cockpit voice recorder, nor was it required by regulation to be fitted to the aircraft type.

1.11.2. The aircraft was equipped with a Garmin GPS 100. The unit was not removed from the aircraft to be downloaded as it was deemed not necessary for this investigation.

1.12. Wreckage and Impact Information

1.12.1. The aircraft accident occurred in a residential area, approximately 325m to the south of the threshold of RWY 03.

1.12.2. The aircraft first collided with a lamp pole with its left-side elevator and skidded for about 70m on the road before striking the second lamp pole where it came to a halt on a grass patch with a nose-down attitude pitch angle of about 10°. Metallic strike marks showed that the aircraft struck the first lamp pole in a slightly left-wing low and nose-low attitude on a northerly heading.

Figure 3: Overall damage to the aircraft.

1.12.3. All the major components were found within the wreckage trail, and all damage occurred during the accident sequence. There were skid tracks on the asphalt found along the flight direction of the aircraft after first impact. The aircraft first impacted a 50ft high lamp pole with its left-side elevator. The right-side elevator had remained intact and was found in the down position.

Figure 4: Location of components found at the accident site.

1.12.4. The outboard half of the right-side wing had detached from the fuselage during the accident sequence, and the remaining part of the right-side wing had partially separated from the fuselage due to impact forces.

1.12.5. The fixed type tricycle landing gear system was destroyed, and all three assemblies had broken off from the fuselage.

Figure 5: The first lamp pole the aircraft collided with (bottom left), debris of the left-side elevator (top left), debris of the outboard right-side wing (top right), and the aircraft wreckage (bottom right).

1.12.6. The left-side wing was found intact and in good condition with only a few minor scratches. It had partially separated from the fuselage as a result of impact with a lamp pole, while the right-side wing was damaged during the accident. The rest of the wing was still in good condition with only a few scratches.

1.12.7. Both wing flaps were found in the retracted position (up position) and the turn co-ordinator was found in the straight and level position.

1.12.8. The aircraft's dual controls were both operational and continuity of the flight controls was determined (up to the fixation bolts). There was no evidence of a control restriction. Examination of the engine controls revealed that on impact, the throttle lever, primer and generator switch were in the "in" position which is consistent with take-off configuration.

1.12.9. The aircraft cockpit fuel gauges were found in the empty position; this may have been a result of impact forces during the accident sequence.

1.12.10. The carburettor heat selector was found in the "on" position; the fuel mixture was full rich (1 inch out) and the fuel pump was in the "on" position.

1.12.11. The battery master and ignition switches were "off". These were switched off by one of the eyewitnesses who had arrived at the accident site before emergency services.

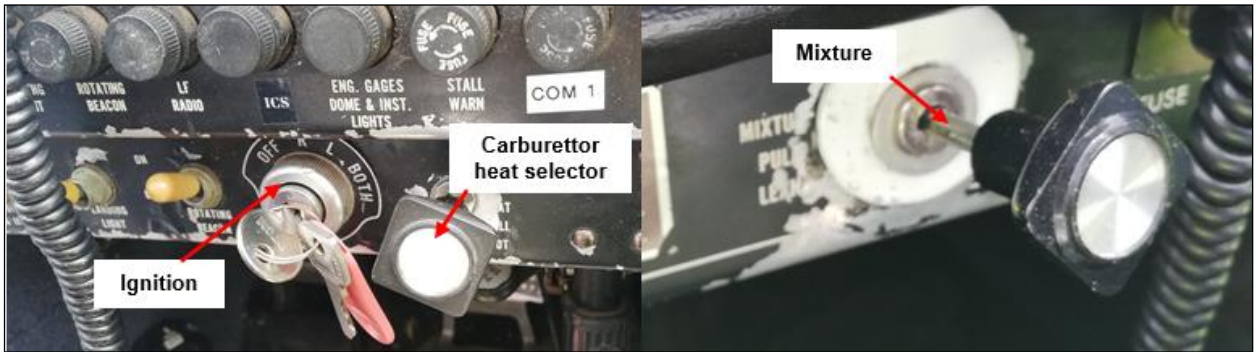

Figure 6: Images showing positions of the ignition and carburettor heat selector (left), and mixture selector (right).

1.12.12. The fuel selector valve was found dislodged; however, it was determined that the selector was set to the right tank. The amount of fuel remaining in the right-side fuel tank could not be determined as the tank was destroyed by impact forces.

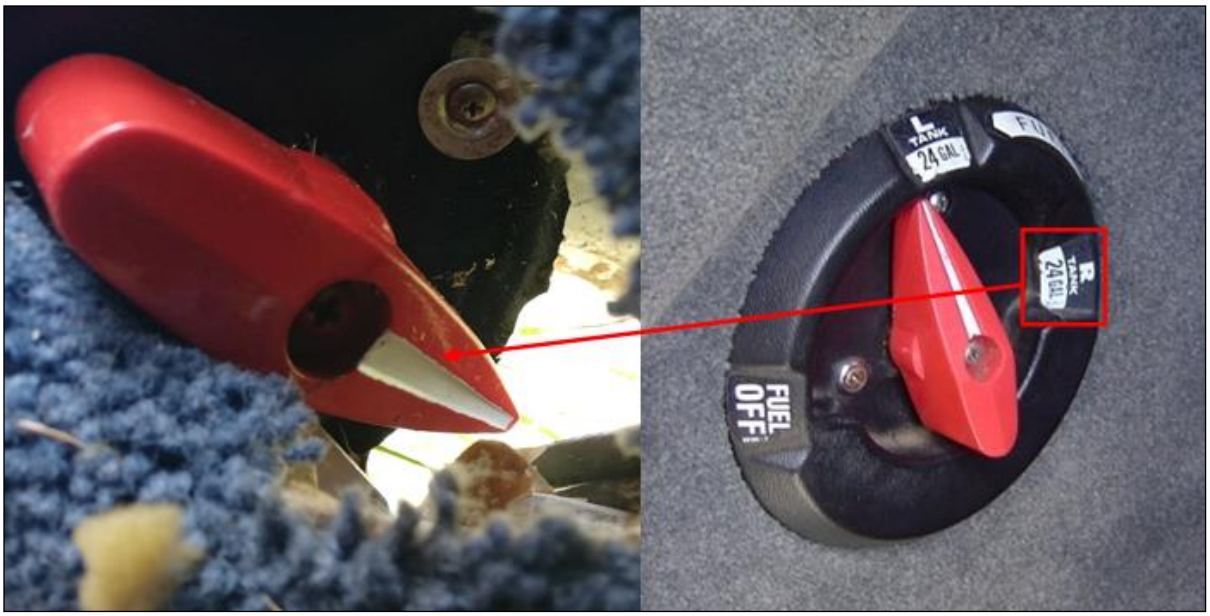

Figure 7: The accident aircraft's damaged/dislodged fuel selector valve (left); and an image of a similar aircraft's fuel selector valve (right). (Source: https://aviation.stackexchange.com/)

1.12.13. Damage observed on the propeller blades indicated that the engine was producing little or no power upon impact, this was consistent with the requirements of carrying out a glide approach landing. One of the propeller blades was bent slightly backwards while the other was slightly bent forward; both had minor scars on the leading edges. One of the blades that was found squeezed between the ground and the engine was more bent than the other (see Figure 8).

Figure 8: (Left) Propeller blade bent backwards. (Right) Propeller blade bent forwards.

1.12.14. The propeller was turned by hand to determine if the engine was functional; it turned freely, which indicated that the engine was still operational and was not damaged by impact forces.

1.13. Medical and Pathological Information

1.13.1. The student pilot sustained serious injuries to the face, while the flight instructor sustained minor injuries to the left knee.

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 survivable as the cockpit and cabin structure remained intact during the accident sequence. The aircraft crashed on a residential road near Springs Aerodrome. The crew was assisted out of the aircraft by nearby residents.

1.15.2. The student pilot, who was seated on the left side of the aircraft sustained serious injuries to the face and was transported by ambulance to a nearby hospital for medical attention. The flight instructor sustained minor injuries to the knees. Both occupants had made use of and were restrained by the aircraft's safety harnesses.

1.16. Tests and Research

1.16.1. None.

1.17. Organisational and Management Information

1.17.1. The operator was in possession of an Aviation Training Organisation (ATO) certificate, which was issued on 29 March 2017 by the SACAA with an expiry date of 18 March 2022. The aircraft was not authorised to operate under the ATO and was not included in the ATO's Operations Specifications (OpSpec) by the SACAA. The last ATO inspection was conducted on 19 March 2016.

According to SACAA procedures and checklists, the periodic inspection of the ATOs should be conducted on an annual basis. This means that at the time of the accident, the ATO had not been audited in more than three (3) years.

1.17.2. The aircraft maintenance organisation (AMO) which carried out the mandatory periodic inspection (MPI) prior to the accident flight was in possession of an AMO certificate which was issued by the SACAA on 31 March 2019 with an expiry date of 30 March 2020, following an AMO audit conducted on 10 January 2019.

According to the Operations Specifications, the AMO had the required ratings and had been authorised to carry out maintenance on the aircraft type.

1.17.3. **SACAA's Training Operations Approval According to the ATO File Information**

1.17.3.1. The ATO was initially issued a Training Approval Certificate on 18 March 2015 with an expiry date of 18 March 2016, a year period. The ATO's subsequent Training Approval Certificate was issued on 29 March 2017 with an expiry date of 18 March 2022.

1.17.3.2. According to the latest Training OpSpec for ATO-0372 issued on 7 May 2019, the ZS-EXI aircraft was not included in the list of aircraft approved by the SACAA's Personnel Licensing Department to be operated by ATO-0372 (see Appendix B).

1.18. Additional Information

1.18.1. ***180° Power-Off Approach – According to the Airplane Flying Handbook Chapter 8 of the FAA-H-8083-3B***

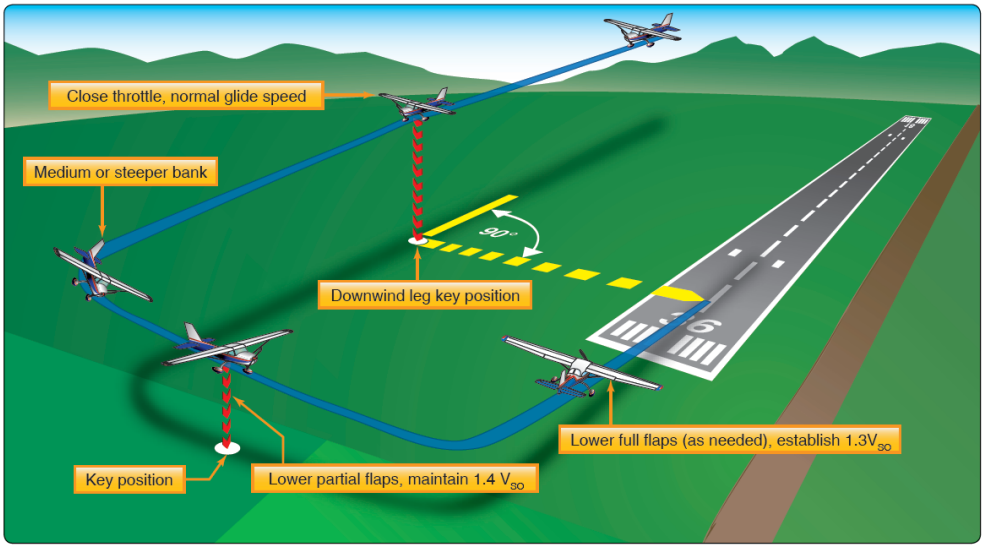

Figure 8-27. An illustration of a *180° power-off approach.*

The 180° power-off approach is executed by gliding with the power off from a given point on a downwind leg to a preselected landing spot. [Figure 8-27] It is an extension of the principles involved in the 90° power-off approach just described. The objective is to further develop judgment in estimating distances and glide ratios, in that the airplane is flown without power from a higher altitude and through a 90° turn to reach the base-leg position 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 180° power-off approaches, the airplane is flown on a downwind heading parallel to the landing runway. The altitude from which this type of approach is started varies with the type of airplane but should usually not exceed 1,000 feet above the ground, except with large airplanes. Greater accuracy in judgment and manoeuvring is required at higher altitudes.

When abreast of or opposite the desired landing spot, the throttle is closed, and altitude maintained while decelerating to the manufacturer's recommended glide speed or 1.4 VSO. The point at which the throttle is closed is the downwind key position.

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 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 or considered as a fixed point on the ground. Many inexperienced pilots may gain a conception of it as a 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.

Common errors in the performance of power-off accuracy approaches are:

- *Downwind leg is too far from the runway/landing area*
- *Overextension of downwind leg resulting from a tailwind*
- *Inadequate compensation for wind drift on base leg*
- *Attempting to "stretch" the glide during an undershoot*

1.18.2. ***90° Power-Off Approach – According to the Airplane Flying Handbook Chapter 8 of the FAA-H-8083-3B***

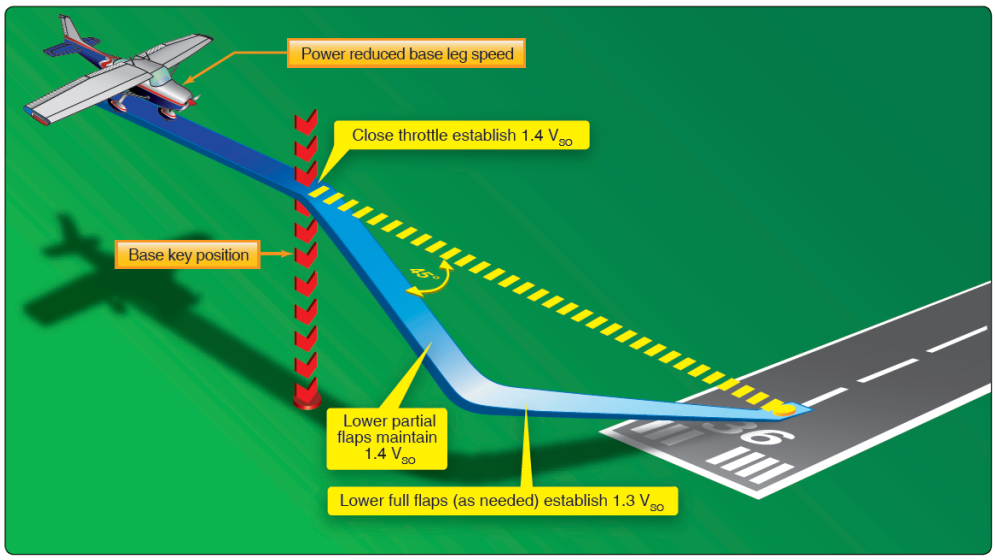

Figure 8-26. An illustration of a *90° power-off approach.*

The 90° power-off approach is made from a base leg and requires only a 90° turn onto the final approach. The approach path may be varied by positioning the base leg closer to or farther out from the approach end of the runway according to wind conditions. [Figure 8-25] The glide from the key position on the base leg through the 90° turn to the final approach is the final part of all accuracy landing manoeuvres.

The 90° power-off approach usually begins from a rectangular pattern at approximately 1,000 feet above the ground or at normal traffic pattern altitude. The airplane is flown on a downwind leg at the same distance from the landing surface as in a normal traffic pattern. The before landing checklist should be completed on the downwind leg, including extension of the landing gear if the airplane is equipped with retractable gear.

After a medium-banked turn onto the base leg is completed, the throttle is retarded slightly, and the airspeed allowed to decrease to the normal base-leg speed. [Figure 8-26] On the base leg, the airspeed, wind drift correction, and altitude are maintained while proceeding to the 45° key position. At this position, the intended landing spot appears to be on a 45° angle from the airplane's nose.

The pilot can determine the strength and direction of the wind from the amount of crab necessary to hold the desired ground track on the base leg. This helps in planning the turn onto the final approach and in lowering the correct number of flaps.

At the 45° key position, the throttle is closed completely, the propeller control (if equipped) advanced to the full increase revolution per minute (rpm) position, and altitude maintained until the airspeed decreases to the manufacturer's recommended glide speed. In the absence of a recommended speed, use 1.4 VSO. When this airspeed is attained, the nose is lowered to maintain the gliding speed and the controls trimmed. The base-to-final turn is planned and accomplished so that upon rolling out of the turn, the airplane is aligned with the runway centreline. When on final approach, the wing flaps are lowered and the pitch attitude adjusted as necessary to establish the proper descent angle and airspeed (1.3 VSO), then the controls trimmed. Slight adjustments in pitch attitude or flaps setting are used as necessary to control the glide angle and airspeed. However, never try to stretch the glide or retract the flaps to reach the desired landing spot. The final approach may be made with or without the use of slips.

After the final-approach glide has been established, full attention is then given to making a good, safe landing rather than concentrating on the selected landing spot. The base-leg position and the flap setting already determined the probability of landing on the spot. In any event, it is better to execute a good landing 200 feet from the spot than to make a poor landing precisely on the spot.

1.18.3. ***Go-Arounds (Rejected Landings) – According to the Airplane Flying Handbook Chapter 8 of the FAA-H-8083-3B***

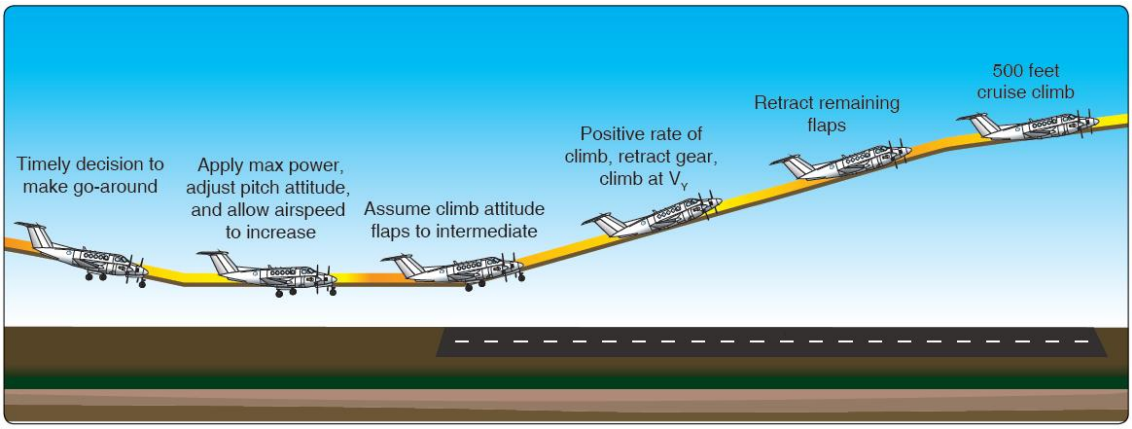

Figure 8-14. *Go-around procedure.*

Whenever landing conditions are not satisfactory, a go-around is warranted. There are many factors that can contribute to unsatisfactory landing conditions. Situations such as air traffic control (ATC) requirements, unexpected appearance of hazards on the runway, overtaking another airplane, wind shear, wake turbulence, mechanical failure, and/or an unstable approach are all examples of reasons to discontinue a landing approach and make another approach under more favourable conditions. The assumption that an aborted landing is invariably the consequence of a poor approach, which in turn is due to insufficient experience or skill, is a fallacy. The go-around is not strictly an emergency procedure. It is a normal manoeuvre that is also used in an emergency. Like any other normal manoeuvre, the go-around must be practised and perfected. The flight instructor needs to emphasise early on, and the pilot must be made to understand that the go-around manoeuvre is an alternative to any approach and/or landing.

Although the need to discontinue a landing may arise at any point in the landing process, the most critical go-around is one started when very close to the ground. The earlier a condition that warrants a go-around is recognised, the safer the go-around/rejected landing is. The go-around manoeuvre is not inherently dangerous. It becomes dangerous only when delayed unduly or executed improperly. Delay in initiating the go-around normally stems from two sources:

1. Landing expectancy or set—the anticipatory belief that conditions are not as threatening as they are and that the approach is surely terminated with a safe landing,

2. Pride—the mistaken belief that the act of going around is an admission of failure—failure to execute the approach properly. The improper execution of the go-around manoeuvre stems from a lack of familiarity with the three cardinal principles of the procedure: power, attitude, and configuration.

Power

Power is the pilot's first concern. The instant a pilot decides to go around, full or maximum allowable take-off power must be applied smoothly and without hesitation and held until flying speed and controllability are restored. Applying only partial power in a go-around is never appropriate. The pilot must be aware of the degree of inertia that must be overcome before an airplane that is settling towards the ground can regain enough airspeed to become fully controllable and capable of climbing or turning safely. The application of power is smooth, as well as positive. Abrupt movements of the throttle in some airplanes causes the engine to falter. Carburettor heat is turned off to obtain maximum power.

Attitude

Attitude is always critical when close to the ground, and when power is added, a deliberate effort on the part of the pilot is required to keep the nose from pitching up prematurely. The airplane executing a go-around must be maintained in an attitude that permits a build-up of airspeed well beyond the stall point before any effort is made to gain altitude or to execute a turn. Raising the nose too early could result in a stall from which the airplane could not be recovered if the go-around is performed at a low altitude.

A concern for quickly regaining altitude during a go-around produces a natural tendency to pull the nose up. A pilot executing a go-around must accept the fact that an airplane cannot climb until it can fly, and it cannot fly below stall speed. In some circumstances, it is desirable to lower the nose briefly to gain airspeed. As soon as the appropriate climb airspeed and pitch attitude are attained, "rough trim" the airplane to relieve any adverse

control pressures. More precise trim adjustments can be made when flight conditions have stabilised.

Configuration

After establishing the proper climb attitude and power settings, be concerned first with flaps and secondly with the landing gear (if retractable). When the decision is made to perform a go-around, take-off power is applied immediately, and the pitch attitude changed to slow or stop the descent. After the descent has been stopped, the landing flaps are partially retracted or placed in the take-off position as recommended by the manufacturer. Caution must be used in retracting the flaps. Depending on the airplane's altitude and airspeed, it is wise to retract the flaps intermittently in small increments to allow time for the airplane to accelerate progressively as they are being raised. A sudden and complete retraction of the flaps could cause a loss of lift resulting in the airplane settling into the ground. [Figure 8-14].

Unless otherwise specified in the AFM/POH, it is generally recommended that the flaps be retracted (at least partially) before retracting the landing gear for two reasons.

1.18.4. ***Ground Effect – According to the Airplane Flying Handbook Chapter 8 of the FAA-H-8083-3B***

Ground effect is a factor in every landing and every take-off in fixed-wing airplanes. Ground effect can also be an important factor in go-arounds. If the go-around is made close to the ground, the airplane may be in the ground effect area. Pilots are often lulled into a sense of false security by the apparent "cushion of air" under the wings that initially assists in the transition from an approach descent to a climb. This "cushion of air," however, is imaginary. The apparent increase in airplane performance is, in fact, due to a reduction in induced drag in the ground effect area. It is "borrowed" performance that must be repaid when the airplane climbs out of the ground effect area. The pilot must factor in ground effect when initiating a go-around close to the ground. An attempt to climb prematurely may result in the airplane not being able to climb or even maintain altitude at full power.

Common errors in the performance of go-arounds (rejected landings) are:

- *Failure to recognise a condition that warrants a rejected landing*
- *Indecision*
- *Delay in initiating a go-around*
- *Failure to apply maximum allowable power in a timely manner*
- *Abrupt power application*
- *Improper pitch attitude*
- *Failure to configure the airplane appropriately*
- *Attempting to climb out of ground effect prematurely*
- *Failure to adequately compensate for torque/P factor*
- *Loss of aircraft control*

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

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. Aircraft

2.2.1. The aircraft was registered for commercial operation, Standard Part 135. The ZS-EXI's latest Certificate of Airworthiness (C of A) indicated that it was originally issued on 28 April 1969 with an expiry date of 30 April 2020. Records indicate that the aircraft was being maintained in line with the approved procedures and regulations.

2.2.2. According to the aircraft's Certificate of Release to Service (CRS) issued on 11 October 2019 at 8442.54 (airframe total time) and 4607.94 (Tacho), the aircraft's next Mandatory Periodic Inspection (MPI) was due on 10 October 2020 or at 8442.19 (airframe total time) and 4607.94 (Tacho), whichever occurs first. At the time of the accident, the aircraft had accumulated 80.41 hours since its last inspection.

2.2.3. There was enough fuel available and there were no pre-existing mechanical faults with either the carburettor or the engine recorded in the flight folio and defect logs prior to the accident.

2.3. Wreckage and Impact Information

2.3.1. The wreckage was thoroughly examined, the flight controls were inspected, and no pre-impact anomaly was found.

2.3.2. The propeller was turned by hand and it rotated freely, which indicated that the engine did not fail prior to the accident. Due to this, an engine strip was not considered necessary for this investigation. The damage to the propeller indicated that the engine delivered low power or was shut off. This is consistent with the requirements of carrying out Exercise 12E & 13E – Take-off, Circuit, Approach and Landing with Emergencies.

2.3.3. It is probable that during the recovery phase when the instructor abruptly increased power while the mixture was at full rich and the carburettor heat in the "on" position, the engine suffered a power loss which resulted in the engine stoppage due to spark plug fouling as a result of less dense air in the carburettor. This was evident on the propeller blades which had no rotational signature marks on the tips (see Figure 8).

2.3.4. The configuration of the aircraft was consistent with the practising of emergency exercises where the student pilot and the flight instructor were conducting "powerless" landings with flaps retracted. However, the carburettor heat selector was left in the "on" position; this was because the final approach checklist was not carried out as a result of the student pilot freezing on the controls while lining up with the runway centreline, which required the flight instructor to recover the aircraft before continuing with normal flight procedures.

2.3.5. The accident was considered survivable as the cockpit and cabin structure remained intact after the accident; however, the aircraft was destroyed during the accident sequence. The flight instructor sustained minor injuries, and the student pilot sustained injuries on the face and was transported to a nearby hospital.

2.4. Crew Information

2.4.1. The flight instructor was initially issued a Commercial Pilot Licence (CPL) on 17 December 2015 and had undergone the last skills test on 25 November 2018 with an expiry date of 30 November 2019. The flight instructor was issued a Grade 3 instructor rating on 5 October 2019, with the next skills test due on or before 5 October 2020.

2.4.2. The flight instructor was issued a Class 1 aviation medical certificate on 7 February 2019 with an expiry date of 28 February 2020, with no restrictions.

2.4.3. The student pilot was initially issued a Student Pilot Licence (SPL) on 22 July 2019 which was the date of the skills test, with an expiry date of 21 July 2020. The student pilot was issued a Class 2 aviation medical certificate on 17 July 2019 with an expiry date of 17 July 2024, with no restrictions.

2.5. Student Pilot and Instructor Experience

<u>Student Pilot Experience</u>

2.5.1. The student pilot had performed a total of 15 training flights after enrolling for a Private Pilot Licence (PPL) at a flying school at Springs Aerodrome on 27 August 2019.

2.5.2. At the time of the accident, the student pilot had performed a total of 15 training flights, of which five flights amounting to 5.66 hours were on the Cessna 172, and 10 flights amounting to 8.84 hours were on the PA 28-140 aircraft, with a different flight instructor.

2.5.3. According to the student pilot's PPL portfolio, there was no familiarisation flight to transition the student pilot from the C172 to PA28 aircraft. Additionally, according to the comments recorded by the two flight instructors in Lesson 3 and Lessons 8 to 12, the student pilot's aircraft handling and look-out techniques when turning required improvement. It was also recorded that the student pilot tended to get confused and uncomfortable during base turns.

Flight Instructor Experience

2.5.4. The flight instructor (FI) had, overall, limited experience of instructional flights with flight experience on single engine piston aircraft of 319 hours, of which 31.6 hours were flight instructor patter training and 12.2 hours were instructional flights as flight instructor.

2.5.5. Since the first issue of the FI's CPL (A) on 17 December 2015 until the date of issue of the Grade 3 instructor rating on 5 October 2019, the FI's experience on the Piper PA 28-140 aircraft was limited to 19 flights, of which 10 flights were patter training.

2.5.6. After obtaining a Grade 3 instructor rating on 5 October 2019 up to the day of the accident flight on 11 November 2019 (36 days), the FI had flown 15 flights using the PA 28-140 aircraft, of which 14 flights were instructional flights as FI and one flight was for the proficiency test.

2.6. Operator

2.6.1. The operator was in possession of an Aviation Training Organisation (ATO) certificate No. CAA/0372, which was issued on 29 March 2017 by the SACAA with an expiry date of 18 March 2022. The aircraft was not authorised to operate under the ATO and is not included in the OpSpec by the SACAA.

2.6.2. According to the ATO's Training Operations Specifications, the ZS-EXI aircraft was not authorised to operate under the ATO and was not authorise in the OpSpec by the SACAA.

2.6.3. The last ATO inspection was conducted on 19 March 2016; this meant that at the time of the accident, the ATO had not been audited in more than three (3) years. There were no recorded findings and/or observations made against the AMO that could have had a direct cause and/or contributed to the accident.

2.6.4. The aircraft maintenance organisation (AMO) which carried out the Mandatory Periodic Inspection (MPI) prior to the accident flight was in possession of an AMO certificate number 0071 that was issued by the SACAA on 31 March 2019 with an expiry date of 30 March 2020.

The last AMO audit was conducted on 10 January 2019 and there were no recorded findings and/or observations made against the AMO that could have had a direct cause and/or contributed to the accident. The AMO had the required ratings and had been authorised to carry out maintenance on the aircraft type.

2.7. Training Flight Operations

2.7.1. According to the South African Flight Instructor's Manual of Training Procedures, *instructors must not attempt exercises 12 and 13 until they are satisfied that the student can fly a proper circuit as required for exercise 4 to 10*. The student was progressed to Exercises 12E and 13E – Emergencies despite the instructors' reports indicating that the student was prone to making common faults (see Appendix A). It could not be determined from the records of the training programme whether instructors de-briefed the student pilot after flights, or whether common faults identified by the instructors were discussed with the student pilot to assist in improving those aspects.

2.7.2. The student pilot's training should have been restarted from the "Straight & Level" – Lesson 3 training with the Piper PA 28-140 aircraft after a familiarisation flight had been made with this type of aircraft. The change of aircraft and instructor could have created a stressful environment for the student pilot and, ultimately, led to mistakes that resulted in the accident on 11 November 2019 while practising emergency landings for the first time.

Based on the flight instructor and student pilot statements of what occurred during the glide approach exercise carried out at the time of the occurrence, it was possible that the aircraft was likely going to undershoot the runway when the student pilot used excessive manoeuvring by banking sharply to align with Runway 21. As the glide approach landing was attempted with retracted flaps, this meant that the aircraft had a flatter descent angle. Because the student pilot froze on the controls at about 300ft, this further degraded the aircraft's performance which led to the flight instructor avoiding nearby houses in the flight path (attempting to "stretch" the glide during an undershoot).

2.7.3. According to section 1.1.3., it was reported that "by the time the flight instructor took over control of the aircraft and got it straight and level and applied full power with the intention of performing a go-around, the aircraft just kept sinking and the engine did not produce any power".

According to the Airplane Flying Handbook – Common errors in the performance of go-arounds (rejected landings) are:

- Failure to recognise a condition that warrants a rejected landing
- Indecision
- Delay in initiating a go-around
- Failure to apply maximum allowable power in a timely manner
- Abrupt power application
- Improper pitch attitude
- Failure to configure the airplane appropriately
- Attempting to climb out of ground effect prematurely
- Loss of aircraft control

2.7.4. The investigation determined that most of the common errors mentioned above that occur during power-off landing exercises were prevalent on the day of the accident. The errors that the crew made were – failure to apply maximum allowable power in a timely manner, abrupt power application and failure to configure the aircraft appropriately, which then resulted in the accident.

2.7.5. The aircraft accident was a result of the late recovery of the aircraft by the flight instructor after the student pilot froze at the controls at about 300ft on final approach. Because the aircraft was not correctly configured for a go-around, the engine could not produce enough power for a successful go-around to be executed as a result of power being applied abruptly.

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 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

3.2.1. Aircraft

3.2.1.1. The aircraft was certified, equipped and maintained in line with existing regulations and approved maintenance procedures.

3.2.1.2. The aircraft was issued a Certificate of Airworthiness (C of A) and was maintained in line with regulations.

3.2.1.3. The ZS-EXI aircraft was operated by the ATO without approval from the SACAA.

3.2.1.4. The aircraft was structurally intact prior to impact; there was no evidence of airframe failure, and all damage to the aircraft was attributed to the severe impact forces.

3.2.1.5. It is probable that during the recovery phase when the instructor abruptly increased power while the mixture was at full rich and carburettor heat in the “on” position, the engine suffered a power loss which resulted in engine stoppage due to spark plug fouling as result of less dense air in the carburettor.

3.2.1.6. The aircraft was substantially damaged, with the student pilot sustaining serious injuries and the flight instructor sustaining minor injuries during the accident sequence.

3.2.2. **Crew**

3.2.2.1. Both the flight instructor and student pilot were appropriately licensed and qualified for the flight IAW International Civil Aviation Organisation (ICAO) and the provisions of Part 61 of the Civil Aviation Regulations (CAR) 2011 as amended.

3.2.2.2. Both the flight instructor and student pilot were medically fit with valid medical certificates to operate the flight in line with the provisions of Part 67 of the CAR 2011 as amended.

3.2.3. **Training Flight Operations and Wreckage**

3.2.3.1. The flight was conducted under visual meteorological conditions (VMC) by day with fine weather conditions prevailing at the time of the accident. As a result, the weather did not contribute to the accident.

3.2.3.2. Although the flight was conducted in line with the requirements of carrying out Exercise 12E & 13E – Take-off, Circuit, Approach and Landing with Emergencies, lesson 13 was omitted. See Appendix A.

3.2.3.3. The flight controls were inspected, and no pre-impact anomaly was found.

3.2.3.4. The damage to the propeller indicated that the engine delivered low power or was shut off.

3.2.3.5. The engine was not damaged during the accident sequence, which was indicated by the freely rotating propeller.

3.2.3.6. The aircraft accident was a result of the late recovery of the aircraft by the flight instructor after the student pilot froze at the controls at about 300ft on final approach. Because the aircraft was not correctly configured for a go-around, the engine could not produce enough power for a successful go-around to be executed as a result of power being applied abruptly.

3.3. Probable Cause/s

3.3.1 The student pilot froze on the controls while on glide approach, turning from base-leg to final to line up with the runway centreline. This resulted in the aircraft losing altitude before the instructor could gain control of it. After recovery, the instructor initiated a go-around, however, due to the aircraft’s altitude and configuration, the engine could not produce enough power for a successful go-around. As a result, the aircraft impacted a lamp post on Olympia Road in the residential area of Dal Fouche, Springs, and crashed.

3.4. Contributory Factors:

3.4.1. Incorrect aircraft configuration and handling.

3.4.2. Poor technique during a glide approach.

3.4.3. The flight instructor had inadequate experience of instructional flights as an instructor. The flight instructor had obtained a Grade 3 instructor rating on 5 October 2019, 35 days prior to the accident flight.

3.4.4. The student pilot’s performance degradation due to stress as a result of training with different instructors and with different aircraft without conducting a familiarisation flight in the new aircraft. The student pilot’s progression to the next lesson despite flight instructors’ reports on the student pilot’s

aircraft handling and look-out deficiencies, and without improving the student pilot's shortfalls.

3.4.5. The student pilot's aptitude to control the aircraft and fly proper circuits was not yet completely satisfactory, although the student pilot had progressed through exercises despite faults identified by instructors, and without corrective action.

4. SAFETY RECOMMENDATION

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 Recommendation/s

4.2.1 It is recommended to the DCA that the Director reviews the current minimum experience required for one to become a flight instructor to determine if the minimum experience should be increased or made more stringent. The instructor in this occurrence had minimal experience on the aircraft type (as an instructor) and, moreover, he was training a student who already had challenges to fly the aircraft, according to the student's flying records.

5. APPENDICES

5.1. Appendix A: Instructors' comments made following each training flight in the student pilot's portfolio.
5.2. Appendix B: Training Operations Specifications for ATO
5.3. Appendix C: Pertinent Information from the Cherokee 140 Owner's Handbook (POH)
5.4. Appendix D: Pertinent Information from the Airplane Flying Handbook Chapter 8 of the FAA-H-8083-3B

This Report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

APPENDIX A

Instructors comments made following each training flight in the student pilot's portfolio

Date	Time lapsed	Aircraft Type	Instructor	Instructor comments following lesson (Practical Air Exercise)
28/08/2019	-	C 172	FI 1	**Lesson 1 – Intro Flight** – Student enjoyed short introduction flight! Was relaxed during the full flight.
02/10/2019	7 days	C 172	FI 2	**Lesson 2 – Familiarisation, Effect of Control, Taxiing** – Very good attitude towards learning and flying. Student is calm and comfortable in the aircraft. – Effects of controls were demonstrated, and the student carried on controlling the aircraft with anticipation and intent. – Spiral dive – Recovery demonstrated – Student recovered well.
03/10/2019	1 day	C 172	FI 2	**Lesson 3 – Straight & Level** – Get used to the concept of picking reference point. – Be gentle on the controls. – When you get confused hand over control to me while you gather your thoughts.
04/10/2019	1 day	C 172	FI 2	**Lesson 4 – Climbing & Descending** – Aircraft handling still to improve, remember that we do not want to overcontrol the aircraft, neither do we want to be lazy on the controls. – Be proactive on the controls without over-correcting
08/10/2019	4 days	C 172	FI 2	**Lesson 5 – Rate one & Medium Turns** – A/C handling – Generally good except for the slow response to fixing flight path deviations. – Do not forget to look out first before entering a turn and use co-ordinated controls to bank the aircraft.
14/10/2019	6 days	PA 28	FI 3	**Lesson 6 – Stalling & Slow Flight** – A/C handling was good, conditions were bumpy, remember it will require you to be more active on the rudders. – Keep flight coordinated aileron & rudder. – HASELL checks done well remember to always lookout before any manoeuvre.
16/10/2019	2 days	PA 28	FI 3	**Lesson 7 – Spin Avoidance** – A/C handling – scan need to be quicker, primarily eyes outside the cockpit, confirm instruments for performance. – Remember to ease out of dive, not apply too much back pressure.
17/10/2019	1 day	PA 28	FI 3	**Progress report** – A/C handling – when you set up the A/C always confirm you are getting the correct performance and make changes as necessary. – Always ensure we are flying wings level ball in the middle. – For all manoeuvres remember to lookout, lookout needs more work remember it's a safety measure. – Carb heat very important to be ON low RPM settings and OFF before full power for recovery.

24/10/2019	7 days	PA 28	CFI	**10 hours dual check** Following the flight, the CFI scored the student pilot as follows: – 2 out of 4; handling: for **taxi and power control** – 2 out of 4; airmanship, safety and command: for **lookout** **Score of 1. Score of 2. Score of 3. Score of 4.** On the same day the CFI completed and signed the student pilot's logbook endorsement sheet for the 10-hour dual check as well as certified the student pilot to have completed spinning on the P28A aircraft.
29/10/2019	5 days	PA 28	FI 3	**Lesson 8 – Take-off, Circuit, Approach & Landing** – Checks done well upwind, x-wind, downwind and base leg. – Finals don't forget the carb-heat very important for next take-off. – Lookout before all turns, very important for safety especially in a big circuit.
30/10/2019	1 day	PA 28	FI 3	**Lesson 9 – Take-off, Circuit, Approach & Landing** – Circuit checks – checks on downwind and base are good, circuit geometry - don't forget to look at runway for turning timing. – Lookout – very important to look out especially in the circuit as there will be another a/c ahead of you. – Turn onto final, keep track of runway so as not to overshoot and correct as soon as possible for smoother approach that's aligned with centreline. Don't forget your carb-heat on finals.
31/10/2019	1 day	PA 28	FI 3	**Lesson 10 – Take-off, Circuit, Approach & Landing** – Turn onto final corrected a lot better today, power management important you don't want to touchdown with too much power. – Remember at the slower speeds need to be more active on the rudders to keep aligned. – Student flew a full circuit with no input from instructor, pattern and radio work good.
04/11/2019	4 days	PA 28	FI 3	**Lesson 11 – Take-off, Circuit, Approach & Landing** – A/C handling – student handles a/c well, altitude maintained, remember to correct for flap on downwind. – Lookout – has improved immensely keep that lookout going always but don't forget to listen out also over radio to keep situational awareness. – Base leg – don't forget carb-heat ON, power 1800-2000 RPM hold altitude for speed after you take flap. – Approaches more stable all the way to round-out.
05/11/2019	1 day	PA 28	FI 3	**Lesson 12 – Take-off, Circuit, Approach & Landing** – A/C handling – when conditions are not favourable you need to be a lot more active on the rudders to maintain directional control. – Base turn – slow speed, need to be mindful of your bank angle in the turn. – Go around – if the approach is not stable then go around safety good decision on going around, when feeling unsafe.
				Lesson 13 – Take-off, Circuit, Approach & Landing – Lesson not conducted.
11/11/2019	6 days	PA 28	FI 3	**Lesson 14 – Take-off, Circuit, Approach & Landing with emergencies**
				Accident flight.

APPENDIX B
Training Operations Specifications for ATO

EMPIC ISSUE #1

TRAINING OPERATIONS SPECIFICATIONS

[redacted]

has obtained the privilege to provide and conduct the following training courses and to use the following resources:

Approved Course	Date of Approval	Approved Course	Date of Approval
PPL (A)	March 2015	Instrument Rating (A)	March 2015
CPL (A – Modular)	March 2015	Class Rating - SEA (L)	March 2015
ATPL (Modular - A)	March 2015	Class Rating - MEA (L)	March 2015
Night Rating (A)	March 2015	FSTD IOS (A)	March 2015
Flight Instructor (A)	March 2015	ELP	March 2015
Radio Telephony (Restricted)	March 2015	Radio Telephony (General)	March 2015
MCC	March 2015	Examination Centre	March 2015
Type Rating – Aeroplane certified for operation with one or more pilot.	March 2015	Type Rating - Turbojet and turbofan powered aeroplanes	March 2015

Area/s of Operations
Springs Airfield

Restrictions and/or Limitations
A320 FSTD IOS (A)
B738 FSTD IOS (A)

Aircraft					
Type	Registration	Certification	Type	Registration	Certification
PA-28	ZS-MDZ	Standard	C172	ZS-SMB	Standard
PA-28	ZS-BFC	Standard	C172	ZS-CWP	Standard
PA-28	ZS-EKI	Standard	C172	ZS-EPM	Standard
PA-28R	ZS-FOJ	Standard	PA-34	ZS-LZA	Standard
PA-28-180	ZS-CBU	Standard	PA-34	ZS-MMD	Standard
C172	ZS-PED	Standard	TC-06	ZU-SLZ	Standard
C172	ZS-MKZ	Standard	C208	ZS-CBU	Standard

Nominated Post Holders	
Accountable Manager	[redacted]
Head of Training	
Responsible Person (Aeroplane)	
Quality Manager	
Safety Officer	

Operations Specifications Approval

[redacted]

2019 -05- 07

Signature	Name in Block Letters	Effective Date:
SENIOR MANAGER: PERSONNEL LICENSING	[redacted]	[redacted]

ISSUING AUTHORITY: SOUTH AFRICAN CIVIL AVIATION AUTHORITY
E-mail: PEL.Training@caa.co.za

[redacted]

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APPENDIX C
Information from the Cherokee 140 Owner's Handbook (POH)

Take-off Procedure

TAKE-OFF

Just before take-off the following items should be checked:

1. Controls free
2. Flaps "UP"
3. Tab set
4. Mixture "RICH"
5. Carburetor heat "OFF"
6. Fuel on proper tank
7. Electric fuel pump "ON"
8. Engine gauges normal
9. Door latched
10. Altimeter set
11. Fasten belts/harness

The take-off technique is conventional for the Cherokee. The tab should be set slightly aft of neutral, with the exact setting determined by the loading of the aircraft. Allow the airplane to accelerate to 50 to 60 miles per hour, then ease back on the wheel enough to let the airplane fly itself off the ground. Premature raising of the nose, or raising it to an excessive angle, will result in a delayed take-off. After take-off let the aircraft accelerate to the desired climb speed by lowering the nose slightly.

Approach and Landing Procedures According to the Cherokee 140 Owner's Handbook (POH)

APPROACH AND LANDING

The airplane should be trimmed to an approach speed of about 85 miles per hour with flaps up. The flaps can be lowered at speeds up to 115 miles per hour, if desired, and if approach speed is reduced 3 miles per hour for each additional notch of flap. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with heat on is likely to cause detonation.

The amount of flap used during landings and the speed of the aircraft at contact with the runway should be varied according to the landing surface and existing conditions, both windwise and loadwise. It is generally good practice to contact the ground at the minimum possible safe speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired airspeed and approach flight path. Mixture should be full rich, fuel on the fullest tank, carburetor heat off, and electric fuel pump on. Reduce the speed during the flareout and contact the ground close to the stalling speed (55 to 65 MPH). After ground contact hold the nose wheel off as long as possible. As the airplane slows down, drop the nose and apply the brakes. There will be

Stall Characteristics According to the Cherokee 140 Owner's Handbook (POH)

STALLS

Stall characteristics of the Cherokee are conventional. Visual stall warning is provided by a red light located on the left side of the instrument panel which is turned on automatically between 5 and 10 miles per hour above stall speed. Gross weight stalling speed with power off and full flaps is 52 miles per hour at 1950 pounds and 54 miles per hour at 2150 pounds. With flaps up this speed is increased 9 miles per hour.

Intentional spins are prohibited in the normal category airplane. For approved maneuvers and entry speeds refer to the Flight Manual.

According to the Aircraft Icing Handbook, Version 1, “Unless stated to the contrary in the Pilot’s Operating Handbook or Flight Manual the HOT position should be selected on base leg as the power is reduced for the approach. On some engine installations, to ensure better engine response and to permit a go-around to be initiated without delay, carburettor heat should be selected to COLD at about 200/300ft on finals”.

According to the Aircraft Icing Handbook, Version 1, Go-Around or Touch and Go, “if the carburettor heat has not been selected to COLD on finals this should be done concurrently with the application of go-around power, or as shortly thereafter as is possible”.

Use of Flaps

The lift/drag factors are varied by the pilot to adjust the descent using landing flaps. [Figures 8-3 and 8-4] Flap extension during landings provides several advantages by:
- *Producing greater lift and permitting lower landing speed,*
- *Producing greater drag, permitting a steeper descent angle without airspeed increase, and*
- *Reducing the length of the landing roll.*

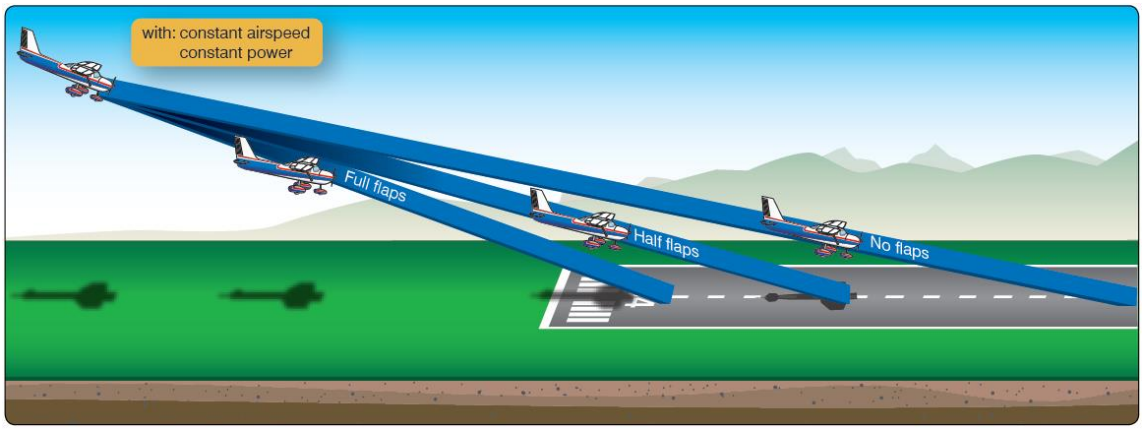

Figure 8-3. *Effect of flaps on the landing point.*

Flap extension has a definite effect on the airplane's pitch behaviour. The increased camber from flap deflection produces lift primarily on the rear portion of the wing. This produces a nose-down pitching moment; however, the change in tail loads from the downwash deflected by the flaps over the horizontal tail has a significant influence on the pitching moment. Consequently, pitch behaviour depends on the design features of the airplane.

Flap deflection of up to 15° primarily produces lift with minimal drag. The airplane tends to balloon up with initial flap deflection because of the lift increase. The nose-down pitching moment, however, tends to offset the balloon. Flap deflection beyond 15° produces a large increase in drag. Also, deflection beyond 15° produces a significant nose-up pitching moment in high-wing airplanes because the resulting downwash increases the airflow over the horizontal tail.

The time of flap extension and the degree of deflection are related. Large flap deflections at one single point in the landing pattern produce large lift changes that require significant pitch and power changes in order to maintain airspeed and descent angle. Consequently, there is an advantage to extending flaps in increments while in the landing pattern. Incremental deflection of flaps on downwind, base leg, and final approach allow smaller adjustments of pitch and power compared to extension of full flaps all at one time.

When the flaps are lowered, the airspeed decreases unless the power is increased, or the pitch attitude lowered. On final approach, the pilot must estimate where the airplane lands through judgment of the descent angle. If it appears that the airplane is going to overshoot the desired landing spot, more flaps are used, if not fully extended, or the power reduced further, and the pitch attitude lowered. This results in a steeper approach. If the desired landing spot is being undershot and a shallower approach is needed, both power and pitch attitude are increased to readjust the descent angle. Never retract the flaps to correct for undershooting since that suddenly decreases the lift and causes the airplane to sink rapidly.

The airplane must be re-trimmed on the final approach to compensate for the change in aerodynamic forces. With the reduced power and with a slower airspeed, the airflow produces less lift on the wings and less downward force on the horizontal stabilizer resulting in a significant nose-down tendency. The elevator must then be trimmed more nose-up.

The round out, touchdown, and landing roll are much easier to accomplish when they are preceded by a proper final approach consisting of precise control of airspeed, attitude, power, and drag resulting in a stabilized descent angle.

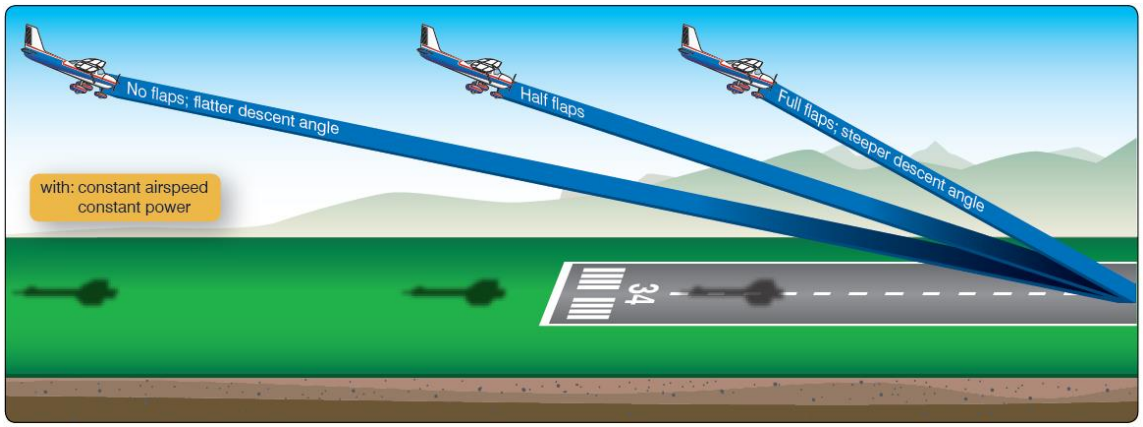

Figure 8-4. *Effect of flaps on the approach angle.*