FINAL INVESTIGATION REPORT ON ACCIDENT TO M/s AHMEDABAD AVIATION & AERONAUTICS LTD., CESSNA 172S AIRCRAFT, VT-ABK ON 24-11-2018 AT MEHSANA AIRFIELD, GUJRAT

GOVERNMENT OF INDIA
MINISTRY OF CIVIL AVIATION
AIRCRAFT ACCIDENT INVESTIGATION BUREAU

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of this investigation is prevention of accidents/ incidents and not to apportion blame or liability.

This report has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of engine. Consequently, the use of this report for any purpose other than for the prevention of such future accidents & incidents could lead to erroneous interpretations.

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1.	Aircraft	Type	Cessna 172 S
		Nationality	Indian
		Registration	VT-ABK
2.	Owner and Operator		Ahmedabad Aviation & Aeronautics Ltd.
3.	Pilot – in –Command		Student Pilot License holder
	Extent of injuries		Nil
4.	Date & Time of Accident		24.11.2018; 0855 UTC.
5.	Place of Accident		Mehsana Airfield, Mehsana, Gujarat
6.	Co-ordinates of Accident Site		Lat: 23° 36' 03.89 " N Long: 072° 22' 26.08" E
7.	Last point of Departure		Mehsana Airfield, Mehsana, Gujarat
8.	Intended landing place		Mehsana Airfield, Mehsana, Gujarat
9.	No. of Passengers on board		NIL
10.	Type of Operation		Training flight
11.	Phase of Operation		Landing
12.	Type of Accident		Hard Landing & subsequent runway overshoot.

(All the timings in the report are in UTC)

SYNOPSIS

On 24th Nov 2018, Cessna 172S aircraft VT-ABK belonging to M/s Ahmedabad Aviation & Aeronautics Ltd. was involved in an accident at Mehsana Airport while operating a training flight. The aircraft was under the command of a student pilot holding a valid student pilot license and who was detailed for solo "circuit and landing" at Mehsana Airfield.

The Trainee Pilot took–off for a "circuit and landing" exercise from runway 05 and completed one sortie uneventfully. Thereafter, the student pilot decided to go for one more "circuit and landing" exercise, and accordingly take-off clearance was given. The aircraft took-off from runway 05 and while climbing at around 800 feet AMSL (Above Mean Sea Level), the student pilot felt power loss and immediately informed on RT about the same. After confirming with student pilot on RT, the CFI on ground, instructed the student pilot to take 180 degree left turn and land back on runway 23. Accordingly, the student pilot took 180 degree turn and started approaching runway 23 for landing. The aircraft was high on approach and made a delayed touchdown between runway intersection B and threshold of runway 05. The aircraft made a hard landing resulting in aircraft bouncing twice before overshooting the runway 05 end. The aircraft continued to travel on unpaved surface and came to halt just before the airport boundary wall over the open sewage line. The student pilot was rescued from the aircraft by the organization's personnel. There was no injury to trainee pilot and there was no fire. Aircraft received substantial damages.

Director General, AAIB appointed Sh. K Ramachandran, Assistant Director as Investigator – In – Charge & Sh. Dinesh Kumar, Air Safety Officer as Investigator to investigate into the probable cause(s) of the accident vide order No. INV.-11011/12/2018-AAIB dated 27th Nov 2018 under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017.

1. FACTUAL INFORMATION

1.1 History of Flight

As per the procedure being followed in the organization, previous to the day of flying training exercise, the Chief Flying Instructor (CFI) of the organization used to inform the student pilots about the flying programme for the next day. The student pilots report in the morning for flying training exercise and wait for their turn based on the availability of aircraft and number of students.

On the day of accident, the student pilot reported for flying training exercise in the morning as per the programme. He did his Pre-Flight Breath Analyzer Test and was waiting for his turn. The student pilot was detailed for solo "circuit and landing" exercise by the CFI. As per the procedure, the CFI accepted the aircraft after carrying out visual inspection and after finding no abnormality, handed over the aircraft to the student pilot. As per the routine, the student pilot himself carried out pre-flight inspection and found no abnormality in the aircraft. The circuit pattern used on the day of accident was left hand circuit pattern from runway 05. The student pilot accepted the aircraft and started for his first circuit landing exercise. At 0830 UTC, the aircraft was cleared for take-off from runway 05 by the tower. The weather at the time of take-off was visibility 5000 meters with winds 090/04 Kts. The student pilot took-off and completed one circuit and landed on runway 05 at around 0845 UTC. There was no abnormality observed on the aircraft by the student pilot. This was the first flight of the day on this aircraft. The flight was uneventful. After landing, the student pilot decided to carry out one more circuit & landing exercise and accordingly backtracked the aircraft. The tower cleared the aircraft for take-off runway 05 for the same circuit & landing pattern.

The aircraft took-off from runway 05 at around 0850 UTC. When the aircraft was in the upwind leg and at about 800 feet AMSL, when commencing the climbing left turn for the crosswind leg, the student pilot felt that the aircraft is not climbing. The student pilot stated that, he also observed reduction in RPM from 1900 to 1500. On observing this, he immediately reported "Power loss" on RT.

The CFI stated that, he was monitoring the aircraft from ground along with ground in-charge and observed sudden sink in aircraft which was followed by "Power loss" call by the student pilot. Once CFI heard "power loss" call on RT, he immediately took over the RT set from the ground in-charge and started guiding the student pilot. CFI confirmed with student pilot about the power loss and after getting the confirmation, asked student pilot to try to come back to the airfield by taking 180^{o} left turn and to apply flaps 30^{o} for landing. Accordingly, the student pilot took 180^{o} left turn to land back on runway 23. The student pilot stated that, once he saw the runway, he was totally focusing on the runway for landing and did not try to look inside the aircraft for gauges. The aircraft was high on approach and was about 400 feet AGL (Above Ground Level) while over threshold of runway 23 with higher gliding speed than normal, as observed by the CFI. The aircraft made a delayed touchdown after runway intersection B & close to threshold of runway 05. The touchdown was hard resulting in aircraft bouncing twice. The student pilot also stated that, although he had applied brakes, but he did not remember at what time after touchdown. As there was not sufficient runway left, the aircraft exited the runway 05 end and continued travelling on unpaved surface for about 134 meters before coming to final halt close to the airport boundary wall. The final resting position of the aircraft was over an open sewage line adjacent to the airport boundary wall. The student pilot then switched all electricals and masters OFF. Emergency siren was also pressed by the personnel manning the tower. On observing the aircraft bouncing and subsequently after few seconds sand dusts emanating, the CFI along with ground in-charge took the emergency vehicle and reached the accident site. They rescued the student pilot from the aircraft and then taken to CFI cabin for medical examination. The student pilot did not receive any injury. The aircraft was retrieved from the accident site on 26.11.2018 and brought to organization hangar for further examination. The aircraft received substantial damages during the accident. There was no fire.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	NIL	NIL	NIL
Serious	NIL	NIL	NIL
~~Minor~~/None	01	NIL	NIL

1.3 Damage to Aircraft

The aircraft was substantially damaged during the accident. Following are the main damages observed on the aircraft:-

1. The propeller was found intact. However, one propeller blade was found bent backwards from 7-8 inch from root section upto tip.

Image 1. Propeller blade found bent backwards

2. Top and Bottom engine cowling was found damaged.
3. Induction Air Filter was found damaged.

Image 2. Air Filter Found damaged

4. Dents were found at many wing stations along the leading edge of both the wings.

Image 3. Damages on Left Wing leading edge (Outboard)

Image 4. Damages on Left Wing leading edge (Inboard)

Image 5. Damages on Right Wing leading edge

5. Skin at forward fuselage bulk head station above the upper hinge position of LH & RH door was found bent due to heavy impact.

Image 6. Skin found bent above the upper hinge RH door

Image 7. Skin found bent above the upper hinge LH door

6. Dent found at Fuselage Station (FS) No. 142 and between FS No. 124 & 178 on RH side.

Image 8. Dents in fuselage RH side

7. Dent found at FS No. 142 on LH lower surface.

Image 9. Dent in Fuselage LH lower surface

8. Cut mark on LH main wheel tire.

Image 10. Cut Mark on LH tyre

9. Dents found in LH main wheel strut fairing.

Image 11. Dents in LH main wheel strut fairing

10. L.H. side VHF antenna mounted on upper surface of LH wing found broken.

Image 12. Broken LH VHF Antenna

11. Air Intake was found broken.

Image 13 ***Image 14***

Damaged Air Intake

12. Engine mount found broken at upper RH side mount to engine attachment.

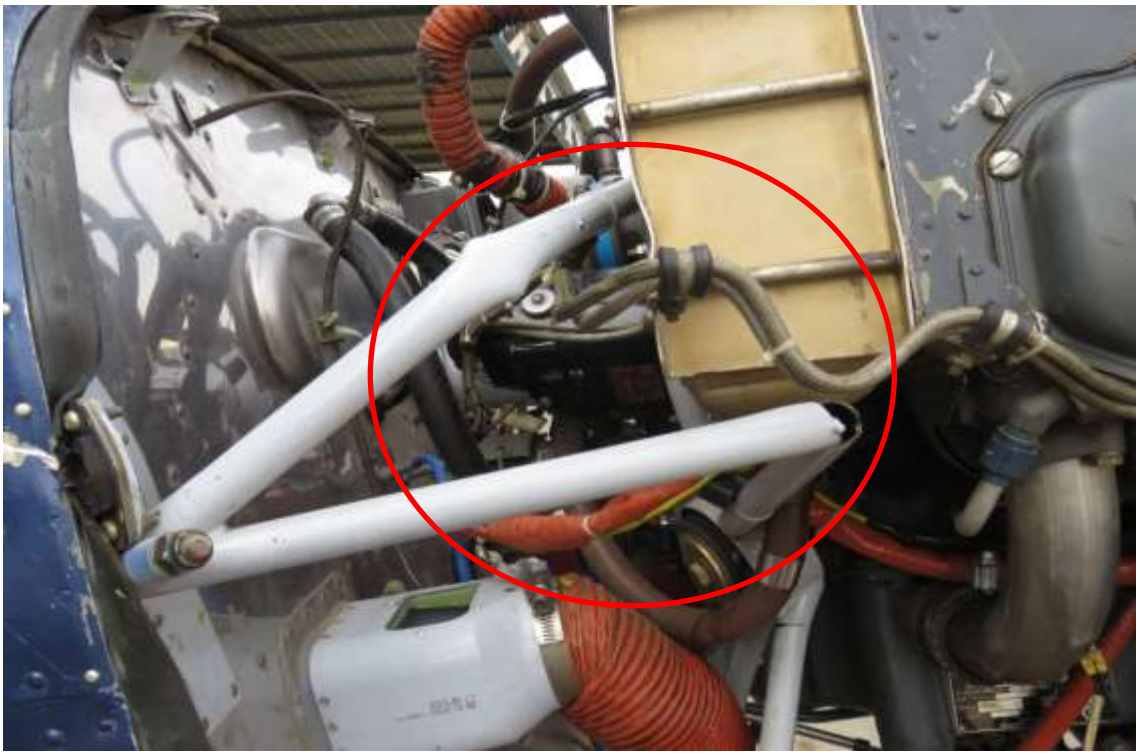


Image 15. Broken Engine Mount

13. RH side steering rod eye end found broken from nose bearing.

Image 16. Broken RH side steering rod eye end

14. Nose wheel found bent backward along with lower firewall.

Image 17. Nose Wheel bent backwards

15. Upper firewall found damage above battery cradle.

Image 18. Damage to upper firewall

16. Dent found on LH wing strut near lower fairing attachment.

Image 19. Dent on LH wing strut

1.4 Other Damages

- The aircraft ran over one of the runway 05 end lights which was found broken.

Image 20. Broken runway end light

- Branches of some shrubs and bushes on the unpaved surface were found cut/broken by propeller & wings.

Image 21. Branches of shrubs & bushes found cut/broken

1.5 Personnel Information:

1.5.1 Student Pilot

AGE	:	24 years
License	:	Student Pilot License (SPL)
Date of Issue	:	27th Nov 2012
Valid up to	:	11th Feb 2019
Category	:	Aeroplane (Single Engine)
Date of Class II Med. Exam.	:	12th Feb 2018
Class II Medical Valid up to	:	12th Feb 2020
Date of issue of FRTO License	:	02nd Jan 2013
FRTO License Valid up to	:	01st Jan 2023
Total flying experience	:	75 Hours 10 Mins
Total solo flying experience	:	23 Hours 05 Mins
Total flying experience during last 1 year	:	32 Hours 10 Mins

Total flying experience during last 6 Months : 22 Hours 10 Mins
Total flying experience during last 30 days : 25 Hours 10 Mins
Total flying experience during last 07 Days : 05 Hours 20 Mins
Total flying experience during last 24 Hours : 02 Hours 15 Mins
Total number of landings in last 10 days : 29 landing

The student pilot joined the flying training organization in August 2012 and was issued SPL on 27th Nov 2012, which initially was valid upto 26th Nov 2017. However, his flying training started only in November 2016 due to want of the scholarship which he received in November 2016. The SPL was further extended upto 11th Feb 2019. The student pilot was released for solo flying on 07th June 2017 after obtaining dual instruction flight experience of about 52 hours. He was released for solo flight after satisfactorily obtaining simulated engine failure exercise with the instructor. All his flying has been carried out on Cessna 172S aircraft.

1.5.2 Chief Flying Instructor

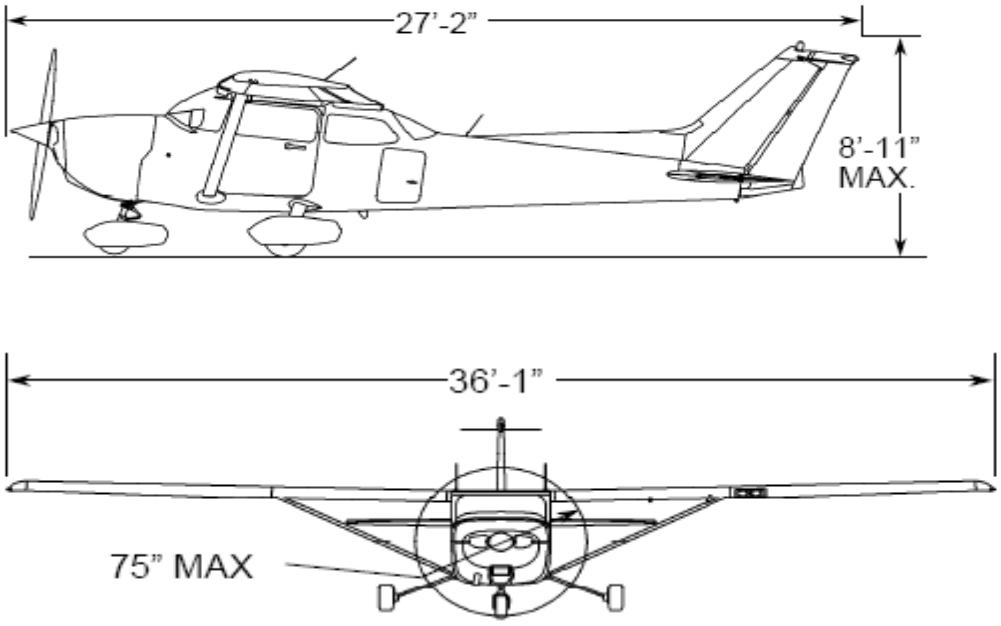
The Chief Flying Instructor (CFI) had joined the flying training organization in July 2018. The CFI has total flying experience of around 2800 hours (on Cessna 152 & Cessna 172) with 2400 hours as Pilot-In-Command (PIC) as on date of accident. The CFI holds Flight Instructors Rating (FIR) which was issued by DGCA on 10th May 2012 and valid upto 09th May 2019. As per the records, the CFI was qualified & certified to impart flying training instructions as per the existing regulations.

1.6 Aircraft Information

1.6.1 General Description

Cessna 172S is a four-place, high wing monoplane of all metal semi-monocoque construction, single engine and is designed for general utility and training purposes. The aircraft is equipped with fixed tricycle type landing gear with

tubular spring steel main landing gear struts. The Nose Landing Gear is steerable and equipped with an Air/Hydraulic fluid shock strut. The aircraft is powered by a horizontally opposed, direct drive, four-cylinder, overhead valve, air-cooled, fuel injected engine with wet sump lubrication system. The Engine is an AVCO-Lycoming Model IO-360 L2A with a horse Power rating of 160 BHP at 2700 RPM. The aircraft is equipped with a two bladed, fixed pitch metal Maculey Propeller, Model 1A170E/JHA7660. The aircraft is certified for single pilot operation. Cabin doors are installed on each side of the airplane. The seating arrangement consists of two vertically adjusting crew seats for the pilot and co-pilot/front seat passenger, and a single bench seat with adjustable back for rear seat passengers.



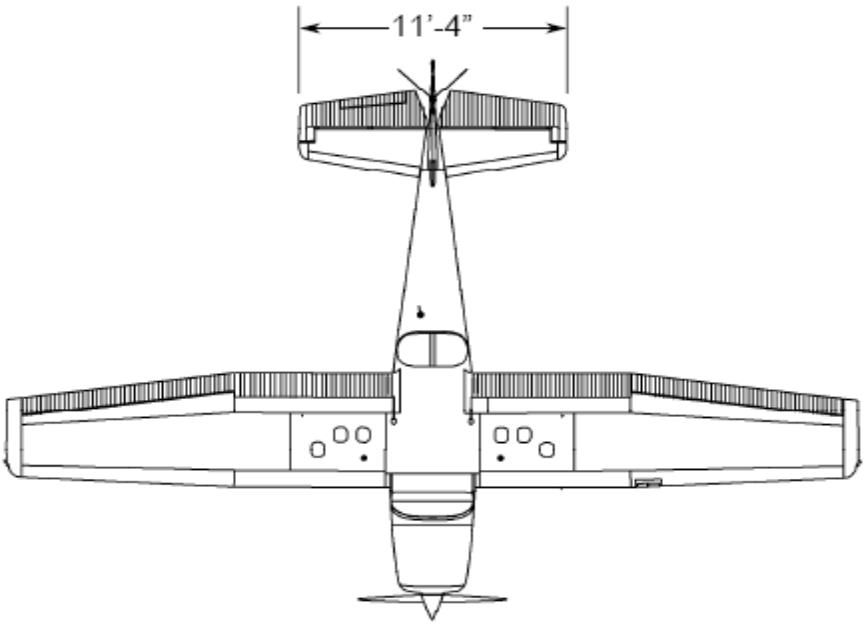


Image 22. Cessna 172S aircraft Dimensions

The airplane's flight control system consists of aileron, rudder and elevator control surfaces. The control surfaces are manually operated through series of sprockets, chains, pulleys, cables, bell cranks, and pushrods. The ailerons receive input from the pilot or copilot control wheel. The elevators are operated by power transmitted through forward and aft movement of the control yoke. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The elevator trim tab on the right elevator is controlled by a trim wheel in the pedestal. The wing flap control system has an electric motor and transmission assembly, drive pulleys, push-pull rods, cables, and a follow-up control.

Brake System

The airplane has a single-disc, hydraulically actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. Brake lines, hoses, floating cylinder brake assemblies are located at each main landing gear wheel. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (co-pilot's) set of rudder pedals, which are interconnected. This

motion is mechanically transmitted to the respective brake master cylinder, and through fluid-carrying lines out to the brake assembly, where fluid pressure acts to exert friction (through brake pads) against brake discs.

1.6.2 Accident Aircraft Information

Aircraft Model	: Cessna 172 S
Aircraft S. No.	: 8652
Year of Manufacturer	: 2000
Certificate of Registration (C of R) No.	: 3436
Certificate of Airworthiness (C of A) No.	: 2845
C of A Validity	: Valid at the time of accident
Airworthiness Review Certificate (ARC) issued on	: 05th April 2018
ARC valid up to	: 04th April 2019
Engine Type	: Lycoming – IO360 – L2A
Engine Sl. No.	: L – 34646 – 51E
Propeller Type	: 1A170E/JHA 7660
Propeller Sl. No.	: TJ107
Aircraft Empty Weight	: 768.05 Kgs
Maximum Take-Off weight	: 1156.68 Kgs
Date of Aircraft weighment	: 12th December 2005
Total Aircraft Hours	: 12998:15 hours
Engine Hours Since New	: 3025:25 hours
Engine Hours (Since Overhaul)	: 1028:25 hours

The Aircraft is registered in "Normal" category & Sub Division - "Passenger Aircraft".

Radio Certificate to Release to Service (C. R. S.) was issued on 15th March 2018 and was valid up to 14th March 2019. The C of A remains valid subject to validity of Airworthiness Review Certificate.

The Aircraft was holding a valid Aero Mobile License No. A-291/013 at the time of accident. The Aero Mobile license was initially issued on 18th January 2007 and renewed on 14th November 2017.

The aircraft was initially operated under Non-Scheduled Air Operator Permit (NSOP) No. 01/1995 which was issued on 08.04.2009 and re-issued on 08.05.2015 and with validity upto 30.10.2015. The aircraft was also utilized for chartered flying in addition to flying training purpose. However, the NSOP of the aircraft was not renewed by DGCA due to non-compliance of CAP 3100 (Civil Aviation Publication). Since the expiry of NSOP, the aircraft was operated for flying training purpose only under Flying Training Organisation Approval No. 1/2016 issued on 08th January 2016 and valid upto 11th August 2020.

The aircraft was last weighed on 12th December 2005 at Embry Riddle, Canada and the weight schedule was re-computed on 27th January 2017, duly approved by the office of Director of Airworthiness, DGCA, Mumbai. As per the approved weight schedule the Empty Weight of the aircraft is 768.05 Kgs and Maximum Take-Off Weight (MTOW) of the aircraft is 1156.68 Kgs. Maximum usable fuel quantity is 144.43 Kgs. Maximum payload with fuel tanks full is 159.20 Kgs. Empty weight CG is 100.46 centimetres aft of datum (Front face of firewall). As the MTOW of the aircraft is below 2000 Kgs, there is no requirement as per Civil Aviation Requirement (CAR Section 2, Series 'X', Part II, para 4) for re-weighing of the aircraft on periodic basis.

Aircraft had logged 12998:15 hours till the date of accident. Last scheduled inspection carried out on the aircraft was inspection operation 13 & 03 at 12972:00 airframe hours on 27th October 2018. The aircraft had logged 26:15 hrs since last scheduled inspection. Pre-flight inspection was carried out by the CFI before the first flight on the day of accident. Prior to the accident flight, the aircraft had flown for 00:15 hrs. with 01 landing on the day of accident.

As on date of accident, the aircraft engine had logged 1028:30 Hrs. since overhaul. Last scheduled inspection carried out on the engine was inspection operation 13 & 03 at 1002:15 engine Hours (since overhaul) on 27th October 2018.

The propeller installed on the aircraft had logged 1024:05 hrs. since overhaul & 11298: 20 Hrs since new, as on date of accident.

All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of event.

Scrutiny of the Flight Report Book (FRB) revealed that, there was no snag pending on the aircraft prior to the accident flight. The last snag recorded in the FRB was on 25th September 2018 and the snag was "Oil Pressure Reading Not Registered". The rectification action carried out was "Ground Pin Wire on the transducer repaired".

Load and trim sheet of accident flight was prepared and center of gravity was found within limit.

After the accident ELT was found activated and was later switched off by the engineering personnel of the operator.

1.6.3 Emergency Procedure Checklists

As per the approved Pilot Operating Handbook (POH) of Cessna 172S aircraft following emergency checklists are to be followed in case of engine failures:-

<u>Engine Failure Immediately after take-off</u>

- **Airspeed - 70 KIAS (Knots Indicated Air Speed) (flaps UP).**
  65 KIAS (flaps DOWN).
- Mixture – IDLE CUT OFF.
- Fuel Shutoff Valve – OFF (Pull Full Out).
- Ignition Switch – OFF

- Wing Flaps – As required.
- Master Switch – OFF.
- Cabin Door – Unlatch
- Land – Straight Ahead.

Emergency Landing without Engine Power

- Passengers Seat Backs – Most Upright Position.
- Seats and Seat Belts - Secure
- **Airspeed - 70 KIAS (Knots Indicated Air Speed) (flaps UP).**
  65 KIAS (flaps DOWN).
- Mixture – IDLE CUT OFF.
- Fuel Shutoff Valve – OFF (Pull Full Out).
- Ignition Switch – OFF
- Wing Flaps – As required (30^{o} recommended).
- Master Switch – OFF (when landing is assured).
- Doors – Unlatch prior to touchdown.
- Touchdown – Slightly tail low.
- Brakes – Apply heavily.

In Amplified Emergency Procedures (Engine Failures) of POH, it is mentioned that, prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after take-off. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown. After an engine failure in flight, the most important course of action is to continue flying the airplane. Best glide speed as shown in figure below should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the

checklist. If the engine cannot be restarted, a forced landing without power must be completed.

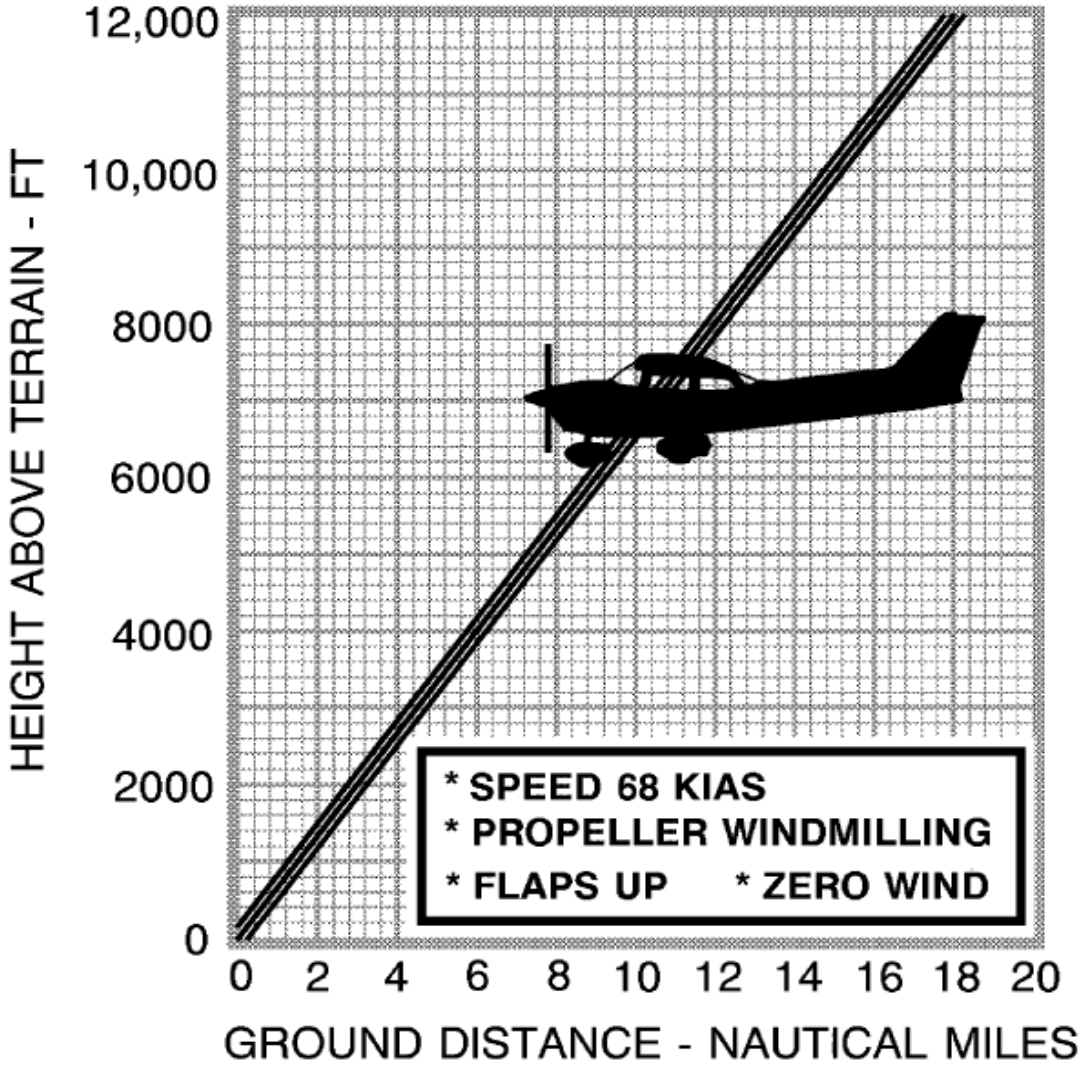


Image 23. Maximum Glide (Distance) Chart

1.7 Meteorological Information

There is no Indian Metrological Department (IMD) or Metrological (MET) office situated at Mehsana Airfield. Nearest MET office is at Ahmedabad which is at a distance of 35 Nm from Mehsana Airport. The weather is generally taken from IMD for Ahmedabad and local weather like visibility etc. are taken from website. The weather obtained is logged in a register kept in the CFI room

which is being updated periodically by the student pilots. There is a wind sock installed at the airfield near runway 23 threshold for information about winds.

At the time of accident, the weather reported was visibility 5000 meters, winds 090^{o}/04 Kts. with No Significant Change in weather.

1.8 Aids to Navigation

There is no Navigational aid available at Mehsana airfield other than runway end lights and markings. The aircraft is fitted with GPS, ADF (Automatic Direction Finder), VHF COM/NAV, Transponder, VOR/LOC Indicator and Glide Slope Indicator.

1.9 Communication

The Mehsana Airfield is an uncontrolled airfield. However, at Mehsana airfield, the operator had set up its own arrangements (a temporary tower) for maintaining flight co-ordination in air.

As per the Training & Procedure Manual of the operator, it comprises of following air to ground communication facilities: -

- Ground to air transceiver VHF channel on frequency 122.625 MHz.
- 2VHF hand held transceivers.
- Flag signal for flight training operations.
  - Red flag from the ATC indicates:
    - When aircraft is on ground - Hold position
    - When aircraft is in air- Runway is unavailable for landing.
  - Green flag from ATC indicates:
    - When aircraft is on ground – Clear for Take-Off/ Taxi.
    - When aircraft is in air – Clear to land.

The tower is generally manned by an operator personal having valid RTR license and was given responsibility to communicate with the aircraft from tower on RT. However, during the time of the accident, the tower was manned by two trainees.

Based on the statements of CFI, student pilot & other organizational personnel monitoring RT, following conversations were made between CFI & Student pilot after the student pilot on RT reported "Power Loss": -

- CFI on ground took over the RT and asked student pilot "Confirm Power loss".
- The student pilot confirmed Power loss.
- The CFI instructed student pilot to take 180^{o} left turn to come back and apply flaps 30 for landing.
- The CFI thereafter asked student pilot to confirm whether he will be able to land for which the student pilot said he will be able to land.

There was always two-way communication between the student pilot and the tower/CFI.

Image 24. Temporary Tower manned by Organizational personal

1.10 Aerodrome Information

The Mehsana airfield is owned & maintained by the State Government of Gujarat and was given on lease to the flying training organization for flying training operations.

The mean sea level of Mehsana airfield is 83 meters. There is one runway available at Mehsana with following specifications: -

- Runway orientation : 05/23
- Length : 1196 meters
- Width : 30 meters

Both Runway directions are used depending upon the wind direction. There is a 10.4 meters wide parallel taxiway having three intersections with runway namely A, B & C.

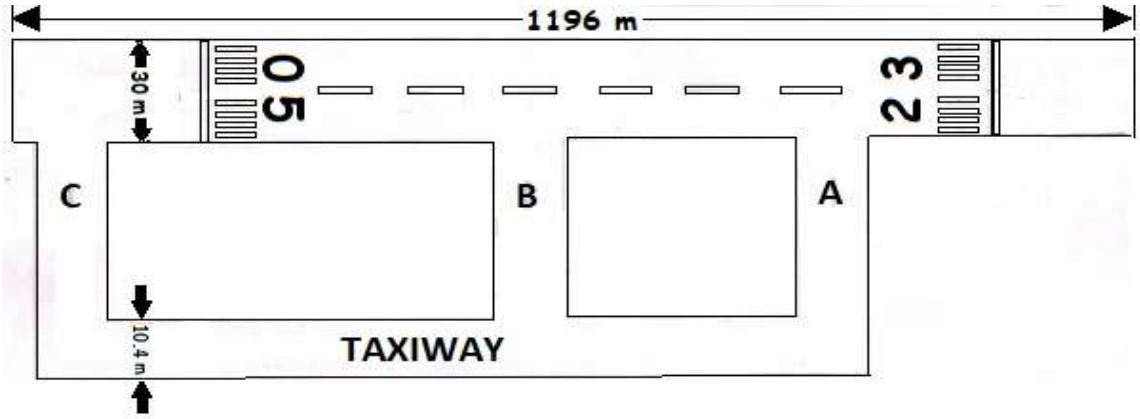


Image 25. Mehsana Runway & Taxiway layout.

Following runway markings are available at Mehsana airfield:

- Runway displaced threshold marking
- Runway threshold
- Runway orientation number
- Runway centerline
- Runway edge line

The Mehsana airfield is an uncontrolled airfield. However, the flying training organization had set up its own arrangements (a temporary tower) for maintaining flight co-ordination in air. There are no navigational aids available on the airfield. There is one Windsock (with traffic pattern indicator) installed near runway 23 threshold. The emergency services i.e. the fire fighting vehicle and the medical emergency is manned by the organization's personnel. After

the accident, the CFI along with the Ground In-Charge & other personal of the organization took the emergency vehicle and reached near the accident site.

Image 26. Wind Sock with Traffic Pattern Indicator

1.11 Flight Recorders

Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR) were neither fitted nor required on this aircraft as per Civil Aviation Requirements.

1.12 Wreckage & Impact Information

The aircraft was high on approach and made a delayed touchdown close to the runway 05 threshold. The exact touch down point could not be established as there was no prominent tyre marks of the aircraft found on the runway. Moreover, there were lot of tyre marks observed on the runway which probably were of other vehicles which went to the accident site after the accident. Based on the statements of the eyewitnesses and the student pilot, the touchdown point was identified to be after runway intersection B and close to runway 05 threshold. However, tyre marks of the aircraft were observed just before the runway 05 end.

Image 27. Aircraft Tyre marks close to runway 05 end

The landing was hard which resulted in aircraft bouncing twice before exiting the runway 05 end. While exiting the runway, the left wheel of the aircraft ran over one of the runway end lights which was evident from the cut marks found on the LH tyre of the aircraft and damaged it (Refer Image 11). The damaged part of the light was found on the unpaved surface at around 36 meters from the runway 05 end.

Image 28. **LH wheel of aircraft ran over runway end light**

Image 29. Broken part of runway end light found on unpaved surface

The aircraft continued to travel on the unpaved surface after exiting the runway, running over the bushes and the wings impacting the shrubs on the way. This was evident from the damages observed on the leading edge of the wings (Image 4 to 6). Some branches of shrubs and bushes were found cut probably by the propeller blades and wings.

Image 30. Shrubs & Bushes cut by aircraft

The aircraft travelled for about 134 meters on the unpaved surface before coming to final halt just before the airport boundary wall. The aircraft was found lying over an open sewage drainage line (adjacent to the airport boundary wall). The nose section of the aircraft was resting on ground on the other side of the drainage line (close to the boundary wall). The fuselage mid-section along with cabin was hanging over drainage line and the main wheels in the sewage.

Image 31 & 32. Final resting position of the aircraft

There was a small bump just before the drainage line, which probably arrested the speed of the aircraft. As the nose wheel of the aircraft ran over the bump, the nose section of the aircraft went up (pitched up) and due to its weight, it hit the ground on the other side of the sewage line with heavy impact. Due to the impact, the nose wheel along with lower firewall of the aircraft was found bent backwards (Image 18). The engine cowling along with the engine mountings were damaged. One of the propeller blade was found bent backwards due to impact with ground (Image 2).

Image 33. Aircraft ran over the bump before coming to final halt

All the switches/CB's in the cockpit were found in OFF position. The ELT started transmitting signals after the impact, which was later switched off by the engineering personnel. The wing training edge flaps were found deflected in flaps 20 (20^{o}) position. The rudder was found deflected towards the port side which was in line with the position of rudder pedals in cockpit, as left rudder pedal was found pushed in.

Image 34. All the switches in cockpit were in OFF/Pushed IN position.

Image 35. Trailing Edge Flaps at 20° Position

Image 36. Rudder pedal Position in cockpit (Left pedal pushed in)

Image 37. Rudder found deflected towards port side

Traces of oil were observed on the external part of engine near the oil sump area. The oil may have leaked from the sump due to heavy impact of the nose section with ground.

There was no evidence of disintegration of any part of the aircraft in flight and the wreckage of aircraft was confined around its final rest position.

1.13 Medical & Pathological Information

The student pilot had undergone pre-flight Breath Analyzer (BA) test before the first flight and also post-flight, after the accident. Both the test results were negative i.e. the student pilot was not under the influence of alcohol.

The student pilot did not receive any injury during the accident.

1.14 Fire

There was no pre or post impact fire.

1.15 Survival Aspects

The accident was survivable. The student pilot was rescued from the aircraft by the organizational personnel who reached the site immediately after the accident.

1.16 Test and Research

1.16.1 Engine Strip Examination

The engine was removed from the aircraft and quarantined after the accident for detailed examination. The engine was strip examined at DGCA approved engine overhaul facility in the presence of the investigating team.

The relevant extract and findings made during the tear down inspection are as follows:

General external condition

The external condition of the engine was satisfactory. No abnormalities / damages were observed. The propeller shaft was free to rotate when hand cranked.

External condition of all the accessories were found satisfactory.

Magneto

Both the Magnetos were rig tested and no abnormality was observed, the performance was found satisfactory. The timings of the magnetos were also checked and found satisfactory.

Spark Plugs

All the 08 Spark Plugs were checked for any carbon deposit and No such deposits were observed. The condition of the all the spark plugs were found satisfactory. All the plugs were subjected to rig test and found satisfactory.

Oil Filter

Oil filter was checked for any deposit like metal particles etc. There were no abnormalities observed. The filter was also cut open but no particles seen.

Fuel Injector

The external condition of the Fuel Injector was satisfactory. The performance of the fuel injector was tested on rig and no abnormalities were observed.

Fuel Flow Divider

The external condition of the Fuel Flow Divider was satisfactory. The performance of the fuel flow divider was tested on rig and no abnormalities were observed.

The fuel lines from flow divider to cylinders were free from any obstruction.

Vacuum Pump

Vacuum pump was physically checked and found satisfactory.

Engine Disassembly

The Engine was stripped progressively and each part was checked for any abnormality. Following are the observations made:

Cylinder Assembly No. 01 to 04

- There were no signs of Piston seizure in all the 04 cylinders.
- The Pistons could be removed from cylinders in a normal way.
- The intake and exhaust valves were found normal and no sticking was observed in all the cylinder.

- Traces of oil were observed in cylinder # 2 & # 4 which were fresh and may be due to the engine impacting with ground.
- The condition of the piston heads & the bore was found satisfactory in all the cylinders.
- The condition of the piston rings was found satisfactory on all the pistons.

Interior of crank case

- The condition of internal parts were found satisfactory. No abnormalities noticed on the crank shaft. All the metal bearings were in position & in good condition. The journal diameters of crank shaft were in good condition.
- There was no sign of oil starvation noticed in the engine, i.e. all the moving parts were well lubricated.
- The cam shaft was found in good condition.
- Sufficient amount of oil was present in oil sump and the condition of oil sump was found satisfactory.
- The condition of gears were found satisfactory.

The Photographs of Engine Strip examination is enclosed as annexure to this report.

1.16.2 Fuel & Engine Oil Testing

- A sample of fuel from the fuel tank was collected and subjected to full specification test at the Fuel lab in the Directorate General of Civil Aviation (DGCA). As per the test report received, there was no abnormality in the sample and it passed the entire specification test.
- A sample of Engine Oil was drained from the aircraft and was subjected to specification test at Fuel lab in the Directorate General of Civil Aviation (DGCA). As per the test report received, there was no abnormality in the sample.

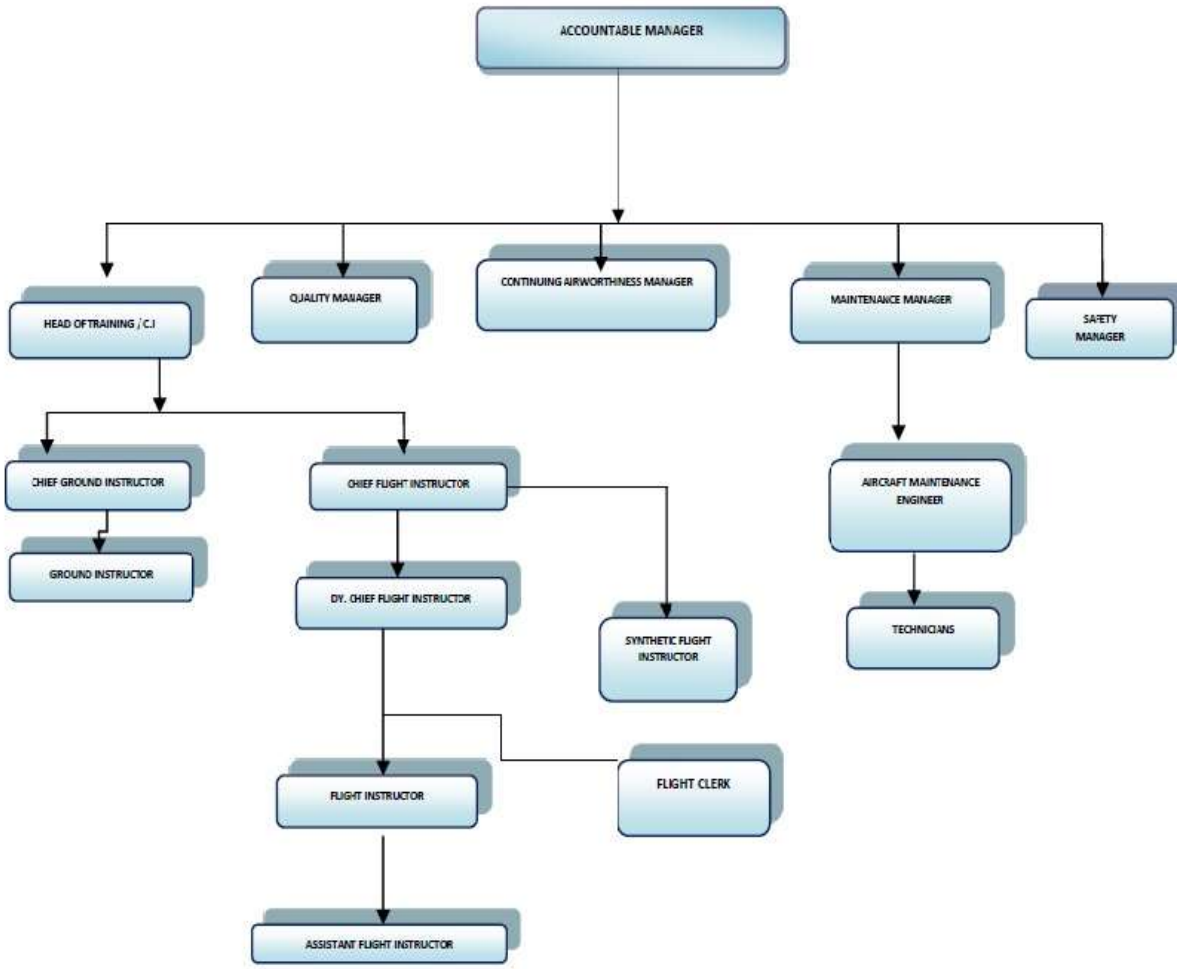
1.16.3 Brake Test

After the aircraft wreckage was shifted from the accident site, "insitu" functioning of brakes were checked and found satisfactory. Both the tyres were found in good condition and there was no flat spot on the tyres.

1.17 Organizational & Management Information

1.17.1 M/s Ahmedabad Aviation & Aeronautics Ltd. is a Flying Training Organization (FTO) which have their base at Ahmedabad & sub-base at Mehsana, Gujarat. The approval of Flying Training Organization (FTO) was issued by DGCA on 08th January 2016 and is valid upto 11th August 2020. As per the Certificate of Approval of FTO, the organization has approval for conducting flying training courses for

- Student Pilot License (SPL)
- Private Pilot License (PPL)
- Commercial Pilot License (CPL)
- Instrument Rating (IR)
- Assistant Flight Instructor (AFI)/Flight Instructor (FI) Rating
- Extension of aircraft rating single engine.



Organization Chart

On the day of accident, the flying training academy had one (01) CFI and one (01) API for imparting training to the student pilots. The academy had a fleet of 04 aircraft out of which there were 02 Cessna 172S, 01 Cessna 172R and 01 Cessna 152 aircraft. The FTO has their in-house maintenance setup as per CAR 145 which is approved by DGCA and was valid upto 31st December 2020.

Scrutiny of records available in the FTO and statements of other individuals of the organization revealed that there have been many instances in the past few years, where the flying training in the organization has been halted due to unavailability of the CFI and other administrative issues.

1.17.2 Training and Procedure Manual of the Organization

The Training & Procedures Manual (TPM) of the organization was approved by DGCA on 02.05.2016.

Para 8.3 of the TPM which gives the Emergency Procedures to be followed for flying training purpose, states that

"*Emergency procedures from the approved Airplane Flight Manual / Pilot Operating Handbook shall be practiced along with trainee pilots at regular intervals. Any additional emergency situation encountered during the course shall be entered in the Flying order, procedures made, and practiced*."

As per the Emergency Procedures Checklists given in the approved POH (Refer Para 1.6.3 of report), in case of an engine failure, the pilot should plan to land the aircraft straight ahead with only small changes in direction to avoid obstructions. Also, it was mentioned that altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway.

There are no forced landing fields identified around the Mehsana airfield while undergoing circuit landing exercise. Hence, the only option available in case of emergency is to return to the airfield itself. Although, the CFI stated that, verbal instructions are being given to all the student pilots to return to the airfield in case of any emergency. However, there are no procedures developed

& laid down in the TPM, covering the practical aspects & constraints around the airfield to precisely follow the emergency procedures as per the POH.

In addition to the TPM of the involved organization, the TPM of other Flying Training Organizations were also scrutinized by the investigation team. It was observed that, emergency procedures laid down in all these TPMs were in similar lines as that of the involved organization i.e. adapting emergency procedures prescribed in POH only, without considering the local aspects & constraints. Also, there was no mention of any identified forced landing fields, which is necessary as there may be instances where it will not be possible to land back on the airfield.

1.18 Additional Information

1.18.1 Climbing Turn & Sideslip

There are two ways to establish a climbing turn. It can be done by establishing a straight climb and then turn, or enter the climb and turn simultaneously. Climbing turns allow better visual scanning, and it is easier for other pilots to see a turning aircraft.

In the performance of climbing turns, the following factors are of prime importance.

- With a constant power setting, the same pitch attitude and airspeed cannot be maintained in a bank as in a straight climb, due to the increase in the total lift required.
- The degree of bank should not be too steep. A steep bank significantly decreases the rate of climb. The bank should always remain constant.
- It is necessary to maintain a constant airspeed and constant rate of turn in both right and left turns. The coordination of all flight controls is a primary factor.
- At a constant power setting, the airplane will climb at a slightly shallower climb angle because some of the lift is being used to turn the airplane.

- Attention should be diverted from fixation on the airplane's nose and divided equally among inside and outside references.

All the factors that affect the airplane during level (constant altitude) turns will affect it during climbing turns or any other training maneuver. Moreover, because of the low airspeed, aileron drag (adverse yaw) will have a more prominent effect than it did in straight-and-level flight and more rudder pressure will have to be blended with aileron pressure to keep the airplane in coordinated flight during changes in bank angle. Additional elevator back pressure and trim will also have to be used to compensate for centrifugal force, for the loss of vertical lift, and to keep pitch attitude constant.

In any turn, the loss of vertical lift and increased induced drag, due to increased angle of attack, becomes greater as the angle of bank is increased. So shallow turns should be used to maintain an efficient rate of climb.

If a medium or steep banked turn is used, climb performance will be degraded.

Common errors in the performance of climbing turns are:

- Inadequate or inappropriate rudder pressure during climbing turns.
- Allowing the airplane to yaw in straight climbs, usually due to inadequate right rudder pressure.
- Failure to initiate a climbing turn properly with use of rudder and elevators, resulting in little turn, but rather a climb with one wing low.
- Improper coordination resulting in a slip which counteracts the effect of the climb, resulting in little or no altitude gain.
- Inability to keep pitch and bank attitude constant during climbing turns.
- Attempting to exceed the airplane's climb capability.

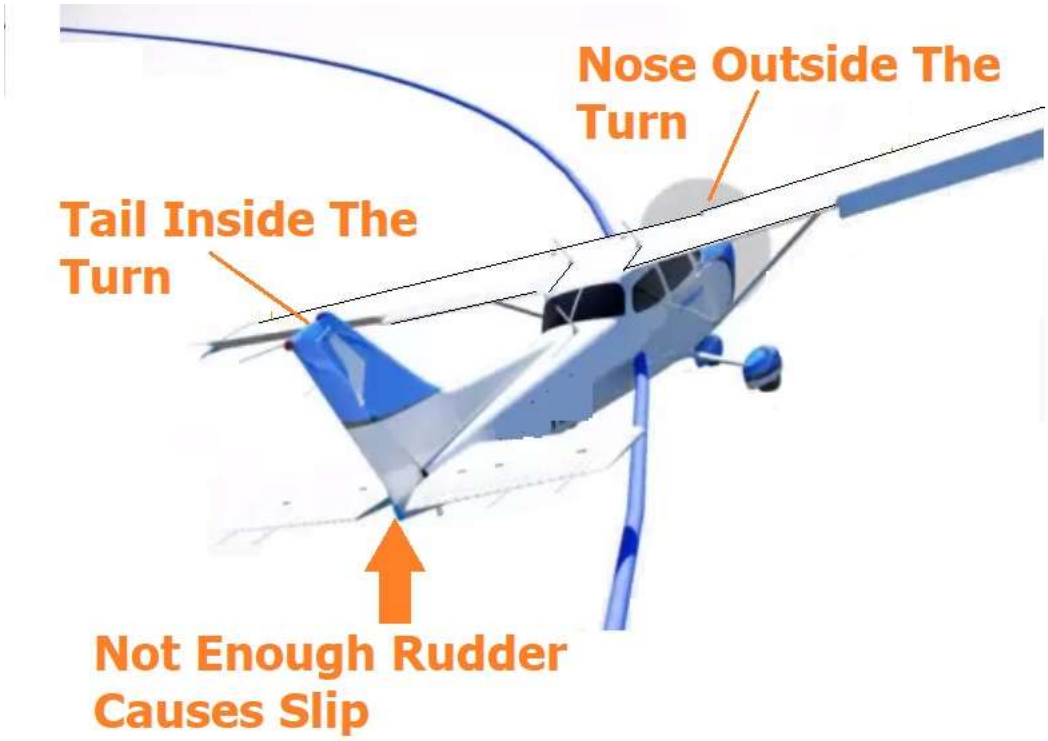
Sideslip

A slip is an aerodynamic state where an aircraft is moving somewhat sideways as well as forward relative to the oncoming airflow or relative wind i.e. the

nose will be pointing in the opposite direction to the bank of the wing(s). The aircraft is not in coordinated flight and therefore is flying inefficiently.

In this condition the nose of the airplane is outside of the turn while the tail of the aircraft is inside the turn. In this situation the angle of bank is too great for the rate of the turn.

Flying in a slip is aerodynamically inefficient, since the lift-to-drag ratio is reduced. More drag is at play consuming energy but not producing lift. Inexperienced or inattentive pilots will often enter slips unintentionally during turns by failing to coordinate the aircraft with the rudder. It could be corrected either by reducing the bank angle or by applying rudder to the direction of the turn.

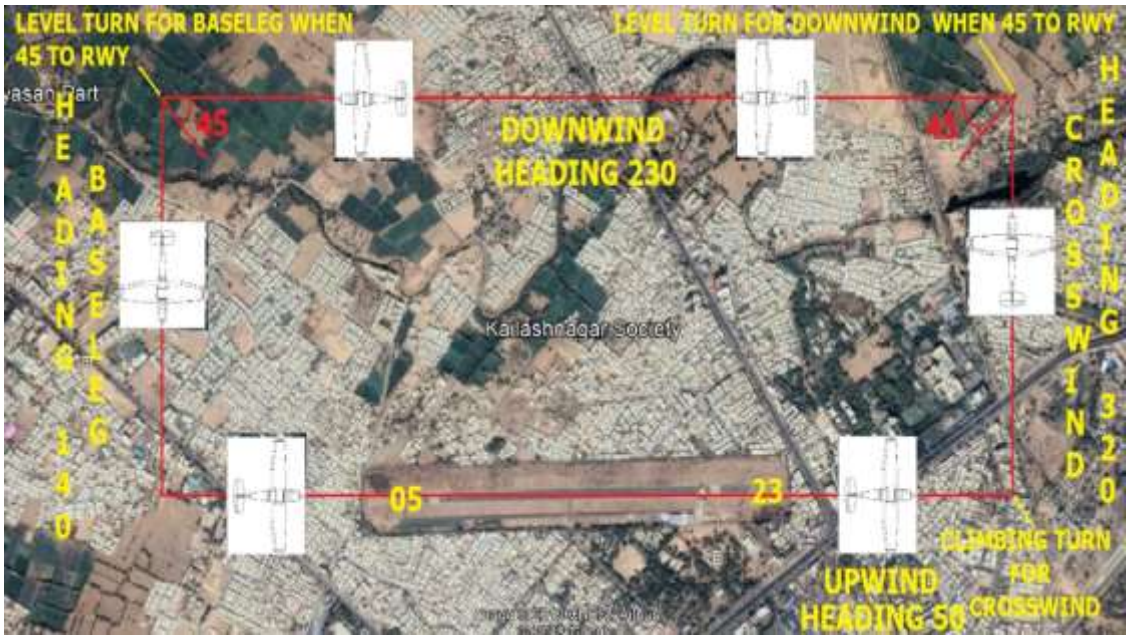


Sideslip During Climbing Turn

1.18.2 Procedure followed for Circuit & Landing pattern in Mehsana

As per the Training and Procedure Manual (TPM) of the FTO, the specified procedure for traffic pattern followed for flight training exercise are right-hand pattern for runway 23 and left-hand pattern for runway 05.

Traffic pattern flying is restricted to north of the airfield due to town settlement and obstacles. Joining the traffic pattern from sector or cross-country flight is as per the instructions of controller manning the tower at Mehsana.



Circuit & Landing Pattern for Runway 05

<u>Procedure for Runway 05</u>

<u>Upwind</u>

- Apply brakes to stop rotation of wheels after take-off.
- Maintain speed 70 – 75 Knots with full power.
- Retract flaps at 500 feet.
- At 800 to 900 feet make a climbing left turn for crosswind leg heading 320.

<u>Crosswind</u>

- Level out at 1300 feet.

- Maintain speed of 90-95 knots.
- Power at 2100 RPM
- Make a level left turn for downwind when 45^{o} to runway.

Downwind

- Report (on RT) when on downwind leg.
- Maintain heading 230 with speed 90 – 95 knots.
- At abeam threshold of runway, maintain power 1700 RPM.
- Fly straight & level with flaps at 10^{o}.
- Turn for base leg when 45^{o} to runway heading 140.

Base leg

- Maintain heading 140.
- Power at 1600 RPM with speed 70 – 75 knots.
- Flaps at 20^{o}.
- Turn for top of finals at 1000 feet.
- Report when turning for top of finals.

Approach and landing

- Establishing on finals aiming point centerline.
- Power at 1500 RPM with speed 65 knots.
- Flaps at 30^{o}.
- After crossing the runway threshold, look at the end of the runway, accordingly flare the aircraft by raising the attitude smoothly and fly parallel to runway.
- Let the aircraft land on its own.

In the present case, on the day of accident, the same circuit landing pattern was carried out by the student pilot.

1.19 Useful and Effective Techniques

NIL

2. ANALYSIS:

2.1 Serviceability of aircraft

2.1.1 The Aircraft had a valid C of R, C of A and the ARC on the day of accident. The Aircraft was holding a valid Aero Mobile License at the time of accident.

The aircraft was initially operated under Non-Scheduled Air Operator Permit and was utilized for chartered flying as well as to impart flying training. However, the NSOP of the aircraft was not renewed by DGCA due to non-compliance of CAP 3100. After the expiry of NSOP, the aircraft was operated for flying training purpose only under Flying Training Organization Approval which was valid on the day of accident.

Aircraft had logged 12998:15 hours till the date of accident. Last scheduled inspection carried out on the aircraft was inspection operation 13 & 03 at 12972:00 airframe hours on 27th October 2018 after which the aircraft had logged 26:15 hrs as on date of accident.

As per procedure, Pre-flight inspection was carried out by the CFI and also by the student pilot before the first flight on the day of accident. No abnormality was observed by both of them. Prior to the accident flight, the aircraft had flown for 00:15 hrs. with 01 landing on the day of accident.

The aircraft was maintained as per Continuous Maintenance Program approved by DAW. No inspection/Maintenance action was due on the aircraft & its engine as on date of accident.

All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of event.

Scrutiny of the Flight Release Book (FRB) revealed that, there was no snag pending on the aircraft prior to the accident flight. As per the FRB, the last snag recorded in the FRB was "Oil Pressure Reading Not Registered" on 25th September 2018 and was rectified by the AME.

Load and trim sheet of accident flight was prepared and center of gravity was found within limit.

2.1.2 Engine Strip Examination

The student pilot had reported power loss while carrying out his second circuit landing exercise of the day and returned to the airfield after making 180^{o} turn from the upwind leg during which the aircraft met with an accident.

In order to find out the exact cause of power loss, the engine was removed from the aircraft and quarantined for further detailed investigation after the accident. The engine was strip examined at a DGCA approved overhaul facility.

The external condition of the engine was satisfactory with no abnormalities or damages observed. The propeller shaft was rotating freely when hand cranked. External condition of all the accessories were found satisfactory.

The performance of the external components like Magnetos, Spark Plugs, Oil Filter, Fuel Injector/Fuel Flow Divider etc. were checked and no abnormality was observed.

The Engine was stripped progressively and each part was checked for any abnormality/damages. All the four cylinders were found to be normal with no signs of any seizure. However, traces of fresh oil were observed in cylinder # 2 & # 4 probably due to the engine's impact with the ground. The condition of the piston heads, the bore & piston rings were found satisfactory in all the cylinders/pistons.

The condition of all internal parts like Crank shaft, metal bearings, cam shaft, gears etc. were checked and no abnormality was observed.

There was no sign of oil starvation noticed in the engine, i.e. all the moving parts were well lubricated. Also, sufficient amount of oil was present in the oil sump thereby indicating that whatever external oil leak was observed, it was consequential to the impact.

With the above observations made after the strip examination of the engine, it is inferred that there was no evidence of any abnormalities in the engine which could have led to loss of power.

2.2 Weather

The weather reported at the time of accident was visibility 5000 meters and winds 090^{o}/04 Knots, with no significant change in weather. Hence, the weather was fine and well above the required minima for conducting flying training operations under VFR.

2.3 Operational Aspect

2.3.1 Student Pilot

The student pilot joined the flying training organization in August 2012, however, his flying training started only in November 2016, as he had to wait for the scholarship which he obtained only in November 2016. The student pilot has total flying experience of about 75 hours and all of his flying has been done on Cessna 172S aircraft. He was released for his solo flight after obtaining dual instruction flight experience of about 52 hours. He was released for solo flight after satisfactorily obtaining engine failure simulation exercise performed by the instructor. He has acquired a total solo flying experience of about 23 hours. Majority of his flying has been carried out in Mehsana airfield. Total of 29 landings were carried out by the student pilot in Mehsana airfield during the last 10 days. The student pilot was certified and qualified for the flight in accordance with existing regulations.

2.3.2 Pilot Handling of aircraft

On the day of accident, the student pilot had already carried out an uneventful circuit & landing exercise. Thereafter, he decided to go for another circuit landing exercise for same circuit landing pattern from runway 05. Accordingly, he backtracked the aircraft and after obtaining clearance from tower, took-off from runway 05. While climbing, at around 800 feet AMSL in the upwind leg started turning left for cross wind leg. While initiating the climbing turn, he probably banked the aircraft abruptly resulting in sudden change in angle of bank. This sudden increase in left bank angle resulted in aircraft sideslip to right, thereby, counteracting the effect of the climb, resulting in no altitude gain. The student pilot did feel that the aircraft is not climbing, but due to lack of situational awareness, he did not realize the actual phenomenon behind it. Subsequent to this, he also observed drop in RPM (within acceptable limits) to understand that, it was a situation of power loss. He immediately reported power loss on RT. Thereafter, CFI on ground asked student pilot to confirm power loss and after getting confirmation asked him to come back to the airfield by taking 180^{o} left turn and apply flap 30 for landing. The student pilot accordingly took 180^{o} left turn to land back on the airfield. Once the student pilot with his understanding thought that, it was a situation of power loss, he was in panic (fear) state of mind. He was just looking outside at the airfield and did not adhere to the standard procedures to land the aircraft safely resulting in improper handling of controls. The aircraft was high on approach and was about 400 feet AGL when over the runway 23 threshold with higher gliding speed than normal. This resulted in aircraft consuming most part of the runway length before making a delayed touchdown, close to the runway 05 threshold. The touchdown was hard resulting in aircraft bouncing twice. The student pilot did not apply brakes immediately after touchdown which was evident from the fact that, there were no prominent tyre marks found on the runway. As there was not sufficient runway left for

the aircraft to stop, it overshot the runway and entered the unpaved surface.

2.3.3 Chief Flight Instructor

The Chief Flight Instructor of the Organization was qualified and certified to hold the position as per the existing regulations.

The CFI was observing the aircraft from ground, when the student pilot took-off for his second circuit landing exercise. The CFI observed sudden sink in aircraft nose when it commenced the climbing left turn, after which the student pilot reported power loss. The aircraft at that time was around 550 feet AGL. Hence, there was sufficient time for CFI to co-ordinate with student pilot to assess the situation and ask the student pilot to act accordingly. However, in the absence of any identified forced landing fields other than the airfield, the CFI took immediate decision to ask the student pilot to make 180^{o} turn and land back on the airfield. CFI did confirm with student pilot, weather he will be able to land, for which the student pilot said he will. However, the CFI who was continuously monitoring the aircraft could have re-confirmed with student pilot, whether he is following proper procedures to land the aircraft, as he himself observed that, the aircraft was high on approach with higher gliding speed. Proper guidance from CFI in this situation could have helped the student pilot to follow the proper procedures for landing the aircraft on runway safely which may have averted the accident.

2.4 Organizational Aspect

2.4.1 Scrutiny of records available in the FTO and statements of personnel of the organization revealed that there have been many instances in the past where the flying training in the organization has been halted due to non-availability of the CFI and other administrative issues.

Regular closure of the flying training organization may lead to many student pilots not able to complete their respective flying training requirements in time to obtain Commercial Pilot license (CPL). Moreover, regular breaks in the flying training, reduces the adaptability of the student pilots to the standard operating procedures and also reduces their ability to have situational awareness, and react properly to a particular emergency situation.

2.4.2 As discussed in para 1.17.2 of the report, the emergency procedure laid down in the TPM of the organization states that the emergency procedures as prescribed in the POH shall be followed for flying training purposes. However, as per the Emergency Procedures Checklists given in the approved POH (Refer Para 1.6.3 of the report), in case of an engine failure, the pilot should plan to land the aircraft straight ahead with only small changes in direction to avoid obstructions. Also, it was mentioned that altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway.

As there are no forced landing fields identified around the Mehsana airfield, hence, the only option available in case of emergency is to return to the airfield itself. Moreover, if the emergency situation arises after take-off in the same heading, as in this case, it is practically very difficult to take 180^{o} turn to land back to the airfield safely. This is even more difficult for a student pilot to execute a 180^{o} turn and land back as these exercises are never practiced during the flying training. Although, the CFI stated that, verbal instructions are being given to all the student pilots to return to the airfield in case of any emergency. However, there are no procedures developed & laid down in the TPM of the organization, keeping in view the various practical aspects in and around the airfield to execute these procedures, in addition to the laid down emergency procedures in the POH.

Also, there are no forced landing fields identified nearby the airfield and laid down in the TPM of the organization. Identification of forced landing fields around & nearby the airfield will help the pilots to approach the same in case it is difficult for them to return to the airfield.

As discussed earlier, in addition to the TPM of the involved organization, the TPM of other Flying Training Organizations were also scrutinized by the investigation team and it was observed that, they also adopted the emergency procedures prescribed in POH only, without considering the local aspects & constraints which needs additional practical procedures. Also, there was no mention of any identified forced landing fields, as in this case.

2.5 Circumstances Leading to Accident

After take-off from runway 05 and at around 800 feet AMSL in upwind leg, the student pilot initiated climbing left turn for cross wind leg. While initiating the climbing left turn, he banked the aircraft abruptly, resulting in sudden change in angle of bank. This resulted in aircraft side-slipping to right, thereby, counteracting the effect of the climb with no altitude gain. Due to lack of situational awareness, the student pilot did not realize that the aircraft is not climbing because of sideslip. Instead he coupled this phenomenon with drop in RPM (within acceptable limits) to understand that, it was a situation of power loss. He immediately reported power loss on RT. As there was no forced landing field identified nearby the airfield, the student pilot took 180^{o} left turn to land back on the airfield, as advised by the CFI. In a panic (fear) state of mind, he did not adhere to the standard procedures for landing which resulted in improper handling of controls. The aircraft was high on approach with higher gliding speed than normal. The CFI, who was observing the aircraft from ground did not adequately co-ordinate with student pilot to re-confirm his actions & correct it. High on approach & higher gliding speed resulted in aircraft consuming most part of the runway length before making a delayed touchdown, close

to the threshold of runway 05. The touchdown was hard resulting in aircraft bouncing twice. The student pilot did not apply brakes immediately after touchdown and as there was not sufficient runway left for the aircraft to stop, it overshot the runway and resulted into the accident.

3. CONCLUSION:

3.1 Findings :

1. The aircraft was having valid C of R, C of A & ARC on the day of accident.
2. The aircraft and its engine were being maintained as per continuous maintenance programme approved by DGCA. No inspection/Maintenance action was due on the aircraft & its engine as on date of accident.
3. All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of event.
4. Scrutiny of the Flight Release Book (FRB) revealed that, there was no snag pending on the aircraft prior to the accident flight.
5. Load and trim sheet of accident flight was prepared and center of gravity was found within limit.
6. The student pilot was having a valid student pilot license and was certified & qualified to operate the flight.
7. The student pilot joined the flying training organization in August 2012 but his flying training started only in November 2016.
8. The student pilot has total flying experience of about 75 hours and all of his flying has been done on Cessna 172S aircraft.
9. Student pilot was released for his solo flight after obtaining dual instruction flight experience of about 52 hours and after satisfactorily obtaining engine failure simulation exercise performed by the instructor.
10. He has total solo flying experience of about 23 hours. Majority of his flying has been carried out in Mehsana airfield. Total of 29 landings were carried out by the student pilot in Mehsana airfield during the last 10 days.

11. On the day of accident, the flying training academy had one (01) CFI and one (01) API for imparting training to the student pilots.
12. There have been many instances in the past few years, where the flying training in the organization has been halted due to unavailability of the CFI and other administrative issues.
13. The emergency procedure laid down in the approved TPM only adopts the emergency procedures as prescribed in the POH. There are no detailed procedures developed and laid down in the TPM, keeping in view the various practical aspects in and around the airfield to execute these procedures. This same issue was observed when the TPM of some other FTOs was scrutinized by the investigating team.
14. There are no forced landing fields identified nearby the airfield and laid down in the TPM of the organization.
15. On the day of accident, pre-flight inspection was carried out by the CFI and also by the student pilot before the first flight. No abnormality was observed by both of them.
16. Prior to the accident flight student pilot carried out one circuit landing exercise from runway 05 which was uneventful.
17. The accident happened in second circuit landing exercise for same circuit pattern from runway 05.
18. The weather was fine at the time of accident and well above the required minima for conducting flying training operations under VFR.
19. While initiating the climbing left turn, there was sudden change in bank angle resulting in aircraft side-slipping to right, thereby, counteracting the effect of the climb with no altitude gain.
20. Lack of situational awareness prompted student pilot to understand that, it was a situation of power loss. He immediately reported power loss on RT.
21. As there was no forced landing field identified nearby the airfield, the student pilot took 180^{o} left turn to land back on the airfield, as advised by the CFI.

22. In a panic state of mind, he did not adhere to the standard procedures for landing, resulting in improper handling of controls.
23. The aircraft was high on approach with higher gliding speed than normal.
24. The CFI, observing the aircraft from ground did not give adequate guidance to correct the student pilot.
25. The aircraft consumed most part of the runway length before making a delayed touchdown, close to the threshold of runway 05.
26. The touchdown was hard resulting in aircraft bouncing twice.
27. The student pilot did not apply brakes immediately after touchdown and as there was not sufficient runway left for the aircraft to stop, it overshot the runway and resulted into the accident.
28. There was no fire.
29. The student pilot did not receive any injury.
30. The aircraft received substantial damages during the accident.

3.2 Probable Cause of the Accident

Improper handling of controls during approach, resulted in delayed touchdown of aircraft and non-application of brakes immediately after touchdown resulted in aircraft overshooting the runway.

Contributory Factors

- Lack of situational awareness and under state of panic (fear), the student pilot did not adhere to the SOPs resulting in improper handling of controls.
- Lack of guidance & co-ordination by the CFI with student pilot.

4. Safety Recommendations

4.1 It is recommended that DGCA may issue instructions to all the Flying Training Organizations to develop detailed procedures keeping in view the local practical aspects & constrains to execute the emergency procedures laid down in the POH and same may be incorporated in their Training & Procedure Manual.

K. Ramachandran

(K. Ramachandran)
Investigator- In-Charge

(Dinesh Kumar)
Investigator

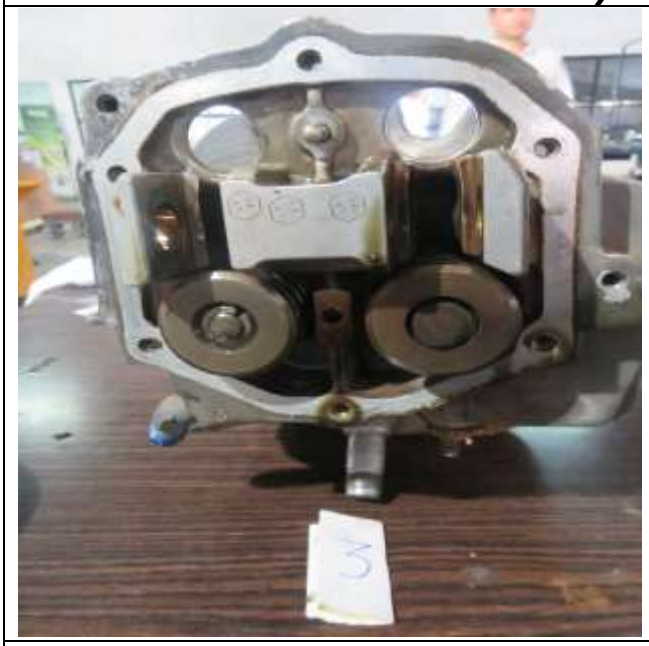
Date: 31st May 2019
Place: New Delhi

Annexure

PHOTOGRAPHS TAKEN DURING ENGINE STRIP EXAMINATION

	
Spark Plugs	***Oil Filter***

	
Head Side	***Cylinder Bore***
Cylinder # 1	

	
Head Side	***Cylinder Bore***
Cylinder # 2	
	
Head Side	***Cylinder Bore***
Cylinder # 3	

	
Head Side	***Cylinder Bore***
Cylinder # 4	

	
Crank Shaft	***Cam Shaft***

Oil Sump