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FINAL INVESTIGATION REPORT ON ACCIDENT TO CESSNA 172R AIRCRAFT VT-TEH OF M/s SHA-SHIB FLYING ACADEMY ON 14 FEB 2019 AT GUNA AIRFIELD, MADHYA PRADESH

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 the investigation of an accident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of the above said rules shall be separate from any judicial or administrative proceedings to apportion blame or liability.

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

GLOSSARY

AAIB	Aircraft Accident Investigation Bureau, India
ADC	Air Defence Clearance
AME	Aircraft Maintenance Engineer
AMM	Aircraft Maintenance Manual
API	Assistant Pilot Instructor
ARC	Airworthiness Review Certificate
ATD	Actual Time of Departure
ATC	Air Traffic Control
AUW	All Up Weight
BHP	Brake Horse Power
C of A	Certificate of Airworthiness
CAR	Civil Aviation Requirement
CFI	Chief Flying Instructor
CG	Centre of Gravity
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DGCA	Directorate General of Civil Aviation
ELT	Emergency Locator Beacon
FAA	Federal Aviation Administration
FAB	Flight Authorization Book
FRTOL	Flight Radio Telephone Operators License
FTO	Flying Training Organization
Gal/Hr	Gallons/ Hour
Hrs	Hours
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IST	Indian Standard Time
KIAS	Knots Indicated Air speed
Lat	Latitude
Long	Longitude
Ltr/Hr	Litre/Hour
METAR	Meteorological Terminal Aviation Routine
MTOW	Maximum Takeoff Weight
NM	Nautical Miles
NSOP	Non- Scheduled Operating Permit
PI	Pilot Instructor
PIC	Pilot in Command
POH	Pilot’s Operating Handbook
PSWS	Pilot Safety and Warning Supplement
RPM	Rotation Per Minute
RT	Radio- Telephony
RTR	Radio- Telephony Restricted
SOP	Standard Operating Procedure
SPL	Student Pilot Licence
TSN	Time Since New
VFR	Visuals Flight Rules
UTC	Coordinated Universal Time

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SYNOPSIS

Date and Time	:	14 Feb 2019 at 1415 IST
Aircraft	:	Cessna 172 R
Accident location	:	24°39'31"N 077°20'81"E
Aircraft owner	:	M/s Sha-Shib Flying Academy
Type of flight	:	Solo Training Flight
Phase	:	Landing
Last point of Departure	:	Guna (ICAO Code: VAGN)
Point of intended landing	:	Guna (ICAO Code: VAGN)
Persons on board	:	One (Student Pilot)

(All timings are in IST unless otherwise mentioned)

ABSTRACT

On 14.02.2019, Cessna 172 R aircraft VT-TEH of Sha-Shib Flying Academy while operating a training flight was involved in an accident at 1435 IST at Guna Airfield, Madhya Pradesh.

Student Pilot reported at base at 0900 Hrs IST and had undergone breath analyzer test, which was negative. Student Pilot did an instrument flying with Instructor at 0935 Hrs IST, on another aircraft.

Another sortie for the Student Pilot was planned by CFI for solo circuit and landing exercise. As per the statement of the Student Pilot, at 1400 Hrs CFI authorized the solo circuit and landing exercise on VT-TEH for him and he was briefed for the exercise. After carrying out preflight checks, he requested ATC for startup clearance. At 1415 Hrs IST, ATC cleared VT-TEH for taxy and line up for runway 14. Weather information was also passed to the Student pilot.

Aircraft got airborne at 1419 Hrs IST for circuit – landing Exercise and circuit was uneventful. While maintaining an altitude of 700 feet, VT-TEH reported downwind and finals for landing after obtaining ATC clearance.

As per the statement of the Student Pilot, when the aircraft was at 100 feet AGL (approx), it encountered a stall and aircraft hit the runway near threshold point resulting into bounced landing.

After the accident, ATC activated the siren and emergency services. Aircraft was substantially damaged, however, there were no injury to Student Pilot.

Occurrence was classified as Accident as per the Aircraft (Investigation of Accidents and Incidents) Rules, 2017. DG-AAIB issued AAIB Order-Accident vide file No. INV. 11011/02/2019-AAIB dated 15th Feb, 2019 appointing Mr. Anil Tewari, Director, AAIB as an Investigator-in-Charge, Mr. Dinesh Kumar, Air Safety Officer as Investigator and Mr. Amit Kumar, Safety Investigator Officer was nominated for OJT.

Probable Cause

Improper flare during landing phase resulting the aircraft into stall. Improper stall and bounce recovery technique to recover the aircraft resulted into the accident.

Hazard Identified During the Investigation

Improper flare and stall recovery technique.

Consequence

Bounced and hard landing.

1. FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

Cessna-172 aircraft VT-TEH belonging to M/s Sha-Shib Flying Academy was engaged in a solo training flight (Circuit and Landing Exercise) under the command of Student Pilot at Guna Airfield on 14 Feb 2019.

On 14 Feb 2019, Student Pilot reported to flying club at 0900 Hrs IST. He underwent Breath Analyzer Test at 0908 Hrs and the test results were negative. The Student Pilot was detailed for Instrument Flying with one of the AFI of the academy by CFI on some other aircraft on the day of incident. On fateful day, the PIC flew his first sortie (Instrument flying) with one of the AFI on other Aircraft, GUNA – GUNA, at 0935 Hrs and landed back safely at 1045 Hrs (IST).

At 1400 Hrs IST, the PIC was authorized for Solo circuit landing on aircraft VT-TEH by the CFI. The preflight briefing to PIC by CFI included weather, taxy – T/O pattern, circuit pattern, approach and landing. As per the company procedure, the PIC completed the preflight inspection on VT-TEH before the sortie.

The PIC obtained ATC clearance for startup and circuit landing for a duration of 30 minutes. The engine was started up and all parameters were in green zone. During taxy, he noticed that the winds were calm and visibility was above 5000 meters. Further, VT-TEH was flown by some other pilot for one Hrs in the forenoon of 14 Feb 2019 and nothing unusual was reported after the sortie.

After line up for take-off, the PIC obtained ATC clearance and took-off from runway 14. Post airborne, brakes were applied to stop main wheel rotation. At 200 ft AGL, flaps were retracted and at 400 ft the PIC initiated a climbing turn towards left on heading 050. He levelled out the aircraft on crosswind at 700 ft, turned for downwind and reported his position to the ATC. ATC instructed VT-TEH to report on the finals.

At the end of downwind, he reduced the RPM to 1600 and selected 10 degrees flap. The speed of the aircraft was 85 knots. When the aircraft was about 8 O'clock position to the runway, student pilot started turning for the base leg. After rolling out on heading 230, he further reduced the throttle to maintain 1500 RPM, selected flaps to 20 degree thereby reducing the speed of aircraft to 75 Knots and switched on the landing lights. When the runway was at 10 O’clock position, he started turning for finals for runway 14.

On finals, at 450 ft altitude and speed of 70 knots, he requested ATC for landing clearance. As per API who was manning Guna ATC, approach was visually normal and the winds were clam and favourable (with reference to windsock). After obtaining clearance from ATC for landing on runway 14, at 200ft he reduced the power and maintained airspeed of 65 knots. As per the statement of Student Pilot, during approach at short finals the aircraft got a sudden updraft and consequently gained height. At 100 feet AGL, he noticed the wind was variable due to which aircraft airspeed washed out and aircraft sunk and consequently hit the runway at threshold. Thereafter, aircraft bounced & drifted towards right. He then tried to compensate by giving correction to the left aileron but aircraft hit the runway nose first, and dragged to some distance due to propeller rotation. Finally, after second bounce VT-TEH finally stopped at edge of the runway.

Student Pilot switched off the engine and came out of the aircraft without any assistance.

Person manning ATC activated the siren, informed CFI and alerted the emergency services. CFI immediately rushed to the accident site. Student pilot was taken to the local medical care room for preliminary health checkup. Later, Bhopal ATC and Gwalior ATC were also informed about the accident.

There was no pre and post fire reported on the aircraft.

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

During crash site examination, damage assessment of aircraft was carried out and following damages were observed: -

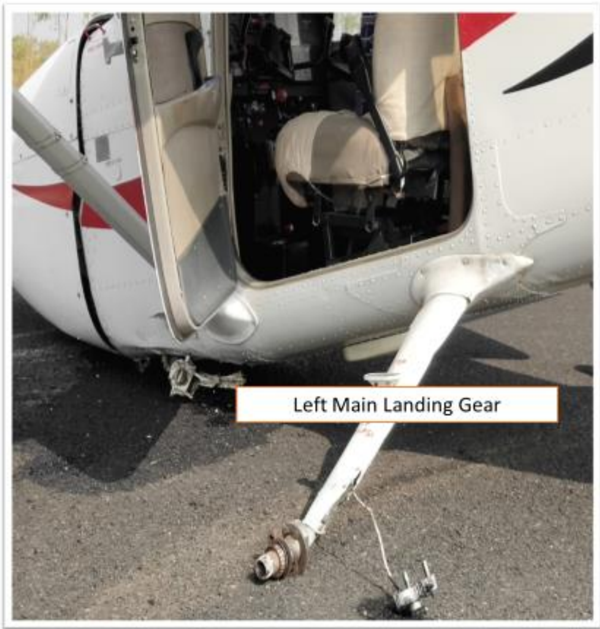
- Propeller – Tips of both propeller were bent in S-Shape, thereby indicating engine was on power.

- Top inner RH side Engine Cowl was found cracked 1 inch (approx).
- Bottom Engine Cowling was found damaged due to rubbing.
- Exhaust pipe was found bent.

- ***Nose wheel assembly*** was found damaged. Hydraulic oil leak was noticed which was due to broken pipelines.

Broken wheel

- ***RH Tyre*** : - Tyre was found deflated due to impact.
- ***LH Main Landing Gear*** – LH landing gear axle was found broken and wheel assembly detached from aircraft. Brake pipeline was found bent.



- ***LH Wing***: – LH wing spar from second station (viewed from tip) was found bent, which signifies that RH wing hit the runway during landing. LH wing tip was found detached from the wing. Aileron towards wing tip side was found bent.

- Fuel strainer drains point was found broken.
- Firewall was found broken at nose landing gear attachment point.
- Rubbing marks were found under cockpit Belly area.
- Firewall bulkhead was found damaged.
- Engine mounting bracket (LH side) was found bent.
- Nose Oleo shock Strut was found damaged.
- In main bulkhead (near door), hinge point was found broken.
- Induction air filters housing and ducts were found broken.

1.4 OTHER DAMAGES

Nil

1.5 PERSONNEL INFORMATION

1.5.1 Student Pilot

Pilot	:	SPL Holder
Age	:	21 Years
Licence	:	Valid SPL
Date of Issue	:	20/11/2017

Valid up to	:	19/11/2022
Category	:	Aero plane
Class	:	Single Engine Land
Endorsements as PIC	:	C-172 R
Date of Med. Exam.	:	09/03/2017
Med. Exam valid up to	:	08/03/2019
FRTO License.	:	Valid
Date of issue	:	14/03/2018
Valid up to	:	13/03/2028
Total flying experience	:	86:45 Hrs.
Experience on type	:	C-172 (86:45Hrs)
Experience as PIC on type	:	C-172 (42:55Hrs)
Last flown on type	:	C-172
Total flying experience during last 180 days	:	47:50 Hrs
Total flying experience during last 90 days	:	47:50 Hrs.
Total flying experience during last 30 days	:	18:55 Hrs
Total flying experience during last 07 Days	:	07:45 Hrs.
Total flying experience during last 48 Hours	:	03:00 Hrs.
Total flying experience during last 24 Hours	:	02:10 Hrs.

1.6 AIRCRAFT INFORMATION

1.6.1 General Description

The CESSNA 172R aircraft is a four-seater, fixed tricycle landing gear, general aviation airplane, used for flight training. Cessna 172R aircraft is powered with one Avco Lycoming, 4 cylinder, IO-360-L2A normally-aspirated, direct drive, air cooled, horizontally opposed, injector equipped engines using 100 LL (low lead) fuel. The engine has a Horsepower rating of 160 BHP with engine speed of 2400 RPM. The aircraft is fitted with fixed pitch McCauley Propeller of model No.1C235/LFA7570 having two blades. The aircraft is certified for a single pilot operation. There are two doors. The aircraft is fitted with Integral Fuel Tanks having a total fuel capacity of 56 U. S. gallon and usable fuel is 53 U. S. gallon. (1 U. S. gallon = 3.78541 Liters).

The airframe is of mainly metal construction being primarily of 2024-T42 aluminum alloy with riveted skin. Components such as wingtips and fairings are made from glass-reinforced plastic. The fuselage is a semi-monocoque with vertical bulkheads and frames joined by longerons running across the length of the fuselage.

Dual controls are available as optional equipment on the Cessna 172R and almost all 172R have this option installed. However, during the accident flight the dual controls were not removed from the aircraft.

The Cessna 172 is equipped with differential ailerons that move through 21 degrees upwards and 16 degrees downwards. It has single slotted flaps which are electrically operated and deploy to a maximum of 30 degrees. The rudder can move 18º44" (Measured perpendicular to hinge line) to either side and is fitted with a ground-adjustable tab. The elevators move up through 29 degrees and down through 24 degrees. An adjustable trim tab is installed on the right elevator and is controlled by a small wheel in the center of the control console. The trim tab moves 23 degrees up and 20 degrees down relative to the elevator chord line.

The Cessna 172R is equipped with fixed tricycle landing gear. The main gear has tubular steel legs surrounded by a full-length fairing with a step for access to the cabin. The main gear has a 65 Inches wheelbase. The nose wheel is attached to the nose oleo shock strut. The nose oleo strut dampens and absorbs normal landing loads. The nose wheel is steerable through 10 degrees either side of neutral and can castor under differential braking up to 30 degrees. It is connected to the rudder pedals through a spring linkage.

The braking system consists of single disc brake assemblies fitted to the main gear and operated by a hydraulic system. Brakes are operated by pushing on the top portion of the rudder pedals. During taxy, it is possible to use differential braking and this allows very tight turns to be made.

Cessna 172 is also fitted with a parking brake system. It is applied by pressing both brakes and then pulling the "Park Brake" lever aft and turn 90º anticlockwise to the pilot’s left. The toe brakes are then released but pressure is maintained in the system thereby leaving both brakes engaged.

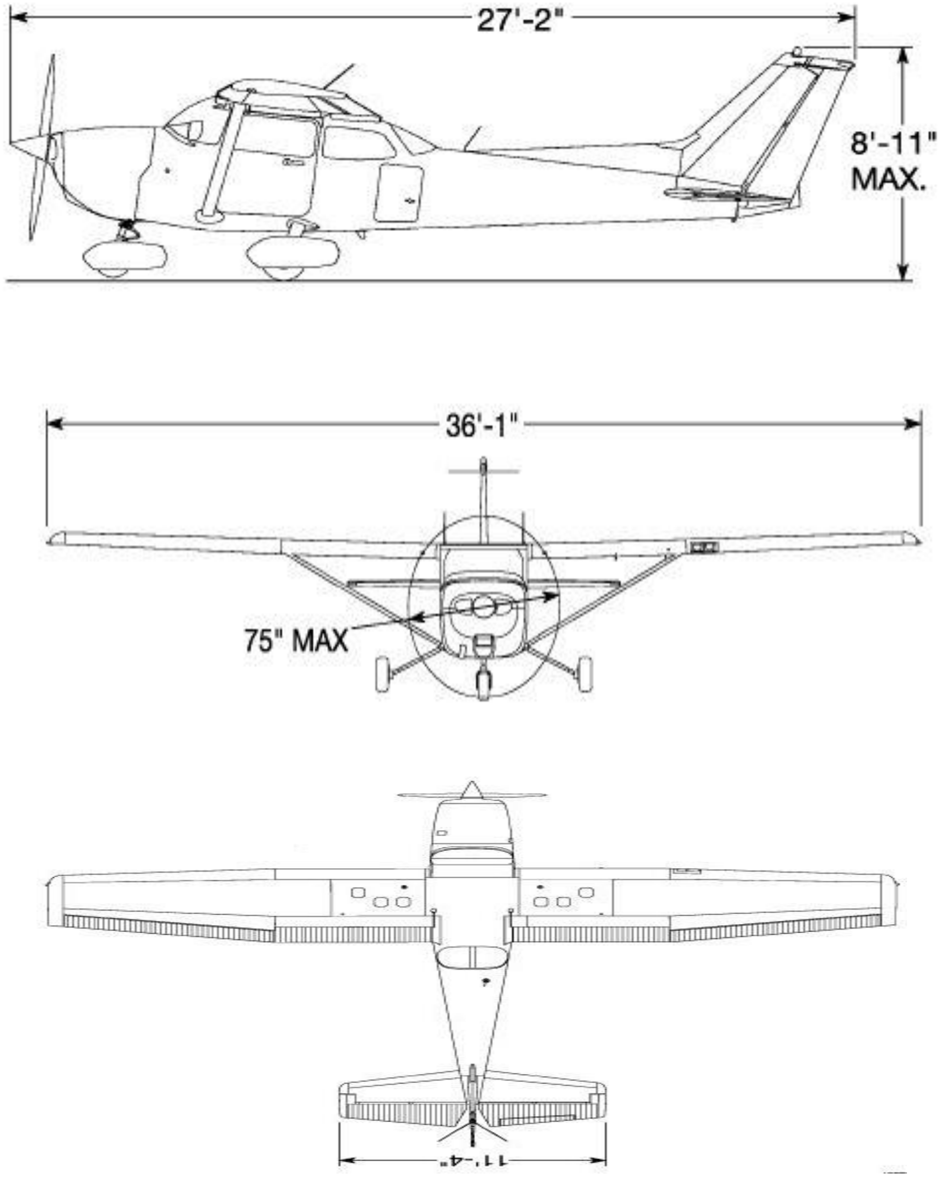


Fig: Three view drawing-Cessna 172R aircraft

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.

1.6.2 Aircraft Technical Information

Aircraft Model	:	Cessna 172 R
Aircraft S. No.	:	17280848
Year of Manufacturer	:	2000
Certificate of Registration (C of R) No.	:	5051
Certificate of Airworthiness (C of A) No.	:	3842/2
C of A Validity	:	Valid at the time of accident
ARC issued on	:	05.11.2018
ARC valid up to	:	04-11-2019
Engine Type	:	Lycoming – IO360 – L2A
Engine Sl. No.	:	L-27911-51A
Propeller Type	:	McCauley 1C-235/LFA 7570
Propeller SL. No.	:	TJ081
Aircraft Empty Weight	:	751.40 Kgs
Maximum Take-Off weight	:	1111.30 Kgs
Date of Aircraft weighment	:	23.11.2017
Total Aircraft Hours	:	6865:50
Engine Hours (Since New)	:	7516:30
Engine Hours (Since Overhaul)	**:**	857:35

The Aircraft was registered in “Normal” category & Sub Division - “Passenger Aircraft”. Certificate of Release to Service (C. R. S.) was issued on 5th Feb, 2019. The C of A was valid subject to validity of Airworthiness Review Certificate.

The Aircraft was holding a valid Aero Mobile License No. A-28/007/RLO (NR) at the time of accident. The Aero Mobile license was valid till 31st December 2019.

The aircraft was being used for flying training purpose only under Flying Training Organization Approval No. 21/2016 issued on 04th May 2016 and valid upto27th July 2020.

The aircraft was last weighed on 23rd November 2005 at Guna, M.P, India and was duly approved by the office of Director of Airworthiness, DGCA, Mumbai. As per the approved weight schedule, the Empty Weight of the aircraft was 751.40 Kgs and Maximum Take-Off Weight (MTOW) of the aircraft was 1111.30 Kgs. Maximum payload with fuel tanks full is 130.46 Kgs. Empty weight CG was 39.22 inches aft of datum (Front face of firewall). As the MTOW of the aircraft was below 2000 Kgs, there was 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 6865:50 hours till the date of accident. Last scheduled inspection 01 & 13 was carried out on the aircraft at 6825:15airframe hours on 5th Feb, 2019. The aircraft had logged 40:35 Hrs since it's last scheduled inspection. Pre-flight inspection on VT-TEH 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 07:20 Hrs. with 05 landing on the day of accident.

As on date of accident, the aircraft engine had logged 7516:30Hrs since overhaul. Last scheduled inspection carried out on the engine was inspection 01 & 13 at 7475:55 engine Hours (since overhaul) on 5th Feb, 2019.

The propeller installed on the aircraft had logged 6865:50 Hrs. as on the date of accident.

1.7 METROLOGICAL INFORMATION

No Indian Metrological Department (IMD) Metrological (MET) office is situated at Guna Airfield. The Guna Airfield is taking assistance from Bhopal Airport for all Metrological information. However, wind sock is available as per requirement at Guna Airfield. Guna Airfield continuously updates METAR with the help of Internet. To have a better control & system functioning, M/s Sha-Shib Flying Aviation has setup their own ATC, manned by the operation personnel of M/s Sha-Shib Flying Aviation. During landing phase, VT-TEH was informed about METAR for runway 14.

1.8 AIDS TO NAVIGATION

No Navigational Aid is available at Guna Airfield. However, windsock is available and is clearly visible from ATC. CFI and other concerned operational personnel do monitor operations through handheld radio sets whenever flying is on.

1.9 COMMUNICATION

During circuit flying, student pilot was in positive two-way communication with Local ATC manned by M/s Sha-Shib Flying Academy's operation personnel. However, no recording facility is available at Guna ATC.

1.10 AERODROME INFORMATION

The Guna Airfield is owned by Government of Madhya Pradesh and is on lease to M/s. Sha- Shib Flying Academy, Guna. It is an uncontrolled airfield and situated at an elevation of 1555 feet (474 Mtrs) with coordinates of Lat 24.6543°Nand Long 77.3467°E. It has only one runway with radial14/32, with a total length of 2982 feet and width of 75 feet. No landing aid is available at the airfield.

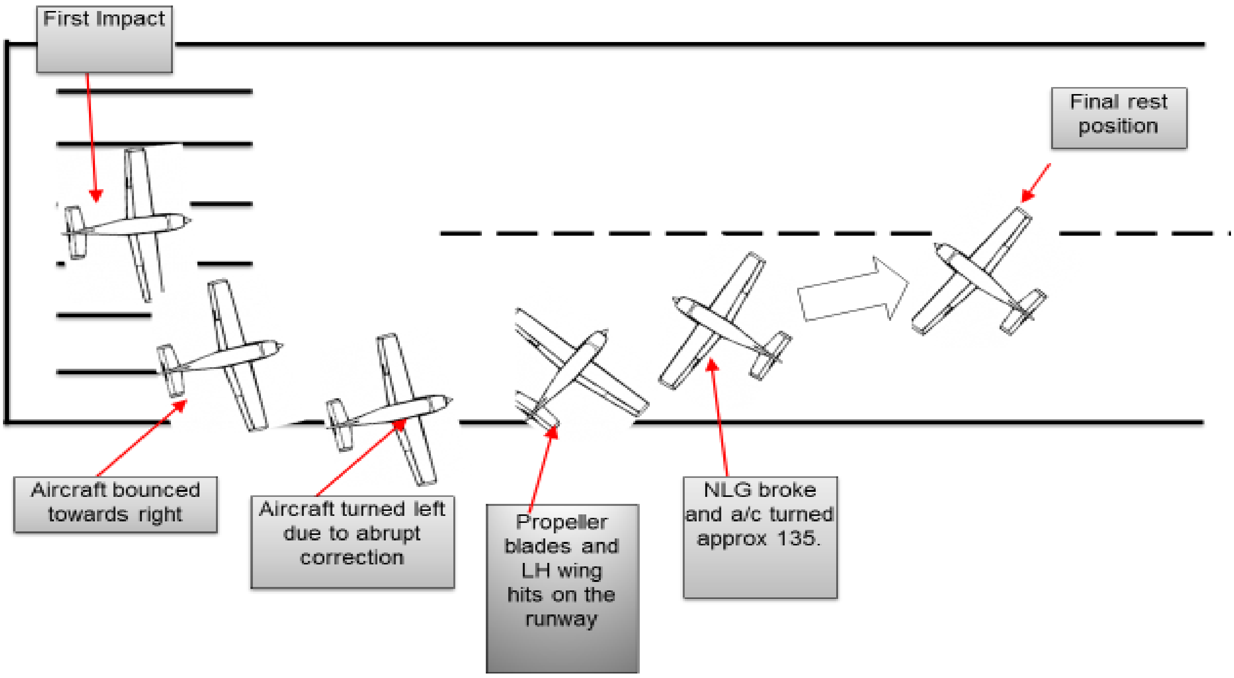
M/s Sha-Shib Flying Academy has set up local ATC which is manned by the Pilots of flying club. Except wind sock, there are no navigational aids available on the airfield. The emergency services i.e. the fire fighting vehicle and the medical emergency is manned by the M/s. Sha-Shib Flying Academy personnel.

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 AND IMPACT INFORMATION

For landing, the aircraft approached from runway 14. The aircraft first came in contact with the runway surface at threshold of runway 14 with the propeller blade marks after collapse of nose gear. At the time of first bounce at threshold point, the LH wing Tip hit runway and aircraft bounced again with a yaw towards right. Propeller rubbing marks were present from second bounce impact onwards which had continued upto 45 feet on Runway. The aircraft finally stopped at 55 feet from the beginning of Runway 14 making an arc. Aircraft had dragged around 40 feet on the runway before coming to final stop. The flap lever was found at 20° position in the cockpit. The rubbing marks were found towards the right of centerline of the runway indicating that during final approach the aircraft was not aligned with the runway.



Aircraft profile after touchdown (Not scaled)

Final Resting position of VT-TEH

1.13 MEDICAL & PATHOLOGICAL INFORMATION

There was no injury to the Student Pilot or any person on ground.

1.14 FIRE

There was no pre or post impact fire.

1.15 SURVIVAL ASPECT

The accident was survivable.

1.16 TEST & RESEARCH

Nil.

1.17 ORGANIZATION AND MANAGEMENT INFORMATION

M/s Sha-Shib flying Academy, is a Flying Training Academy situated at Guna, M.P. The approval of Flying Training Organization was renewed by DGCA on 30.05.2016 and is valid upto 27.07.2020. M/s Sha-Shib Flying Academy is imparting integrated flying and ground training to trainee students for following licensing and ratings:-

(i) Student Pilot License (Aero Plane),

(ii) Private Pilot License (Aero Plane),

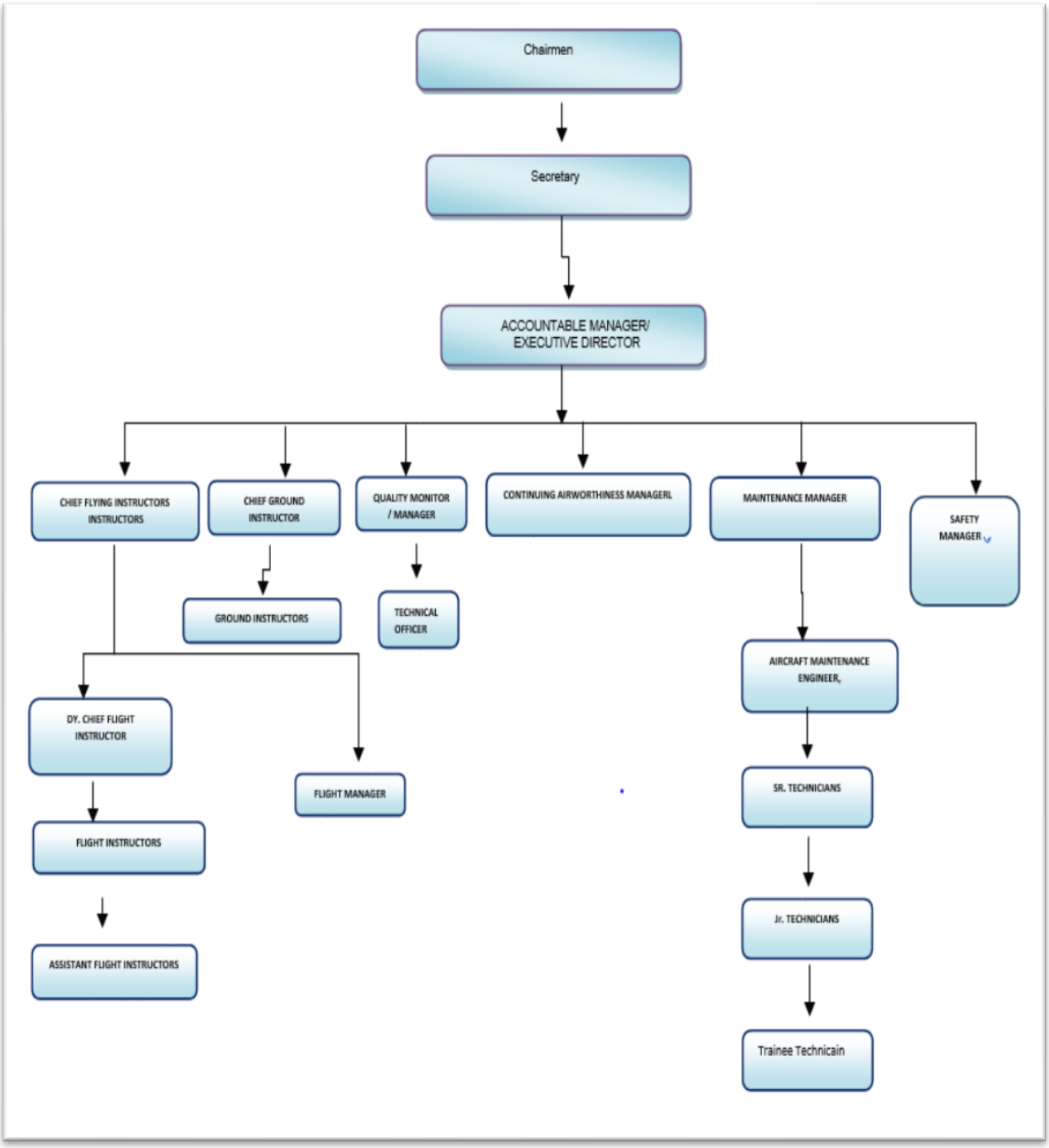
(iii) Commercial Pilot License (Aero Plane) and Instrument Rating

(iv) Assistant Flying Instructors Rating

(iv) Flight Instructor Rating

(vi) Extension of Aircraft Rating

M/s Sha-Shib Flying Academy is using single engine aircraft (Two - Cessna- 172 R & One-Cessna-152) for flying training. The organizational chart of the flying club is shown in the figure below.



Organizational Chart of M/s Sha-Shib Flying Academy

1.18 ADDITIONAL INFORMATION

1.18.1 Ballooning or Bounced Landing Phenomenon

The bounced landing or Ballooning is the result of trying to land an aircraft (Fixed wing) with too much airspeed, then leveling too low, followed by jerking the control stick or yoke back. In this phenomenon, airplane makes contact with the runway and bounces back into the air.

Fig: Ballooning Effect

The inexperienced pilot will relax the control pressure allowing the airplane to contact the runway again. The pilot then applies backpressure, causing the airplane to bounce back in the air. Without the proper recovery technique, the bounce (ballooning) landing will usually conclude with a hard landing when the excess airspeed finally dissipates. At times, it is followed by loss of directional control.

1.18.2 Stall Warning System

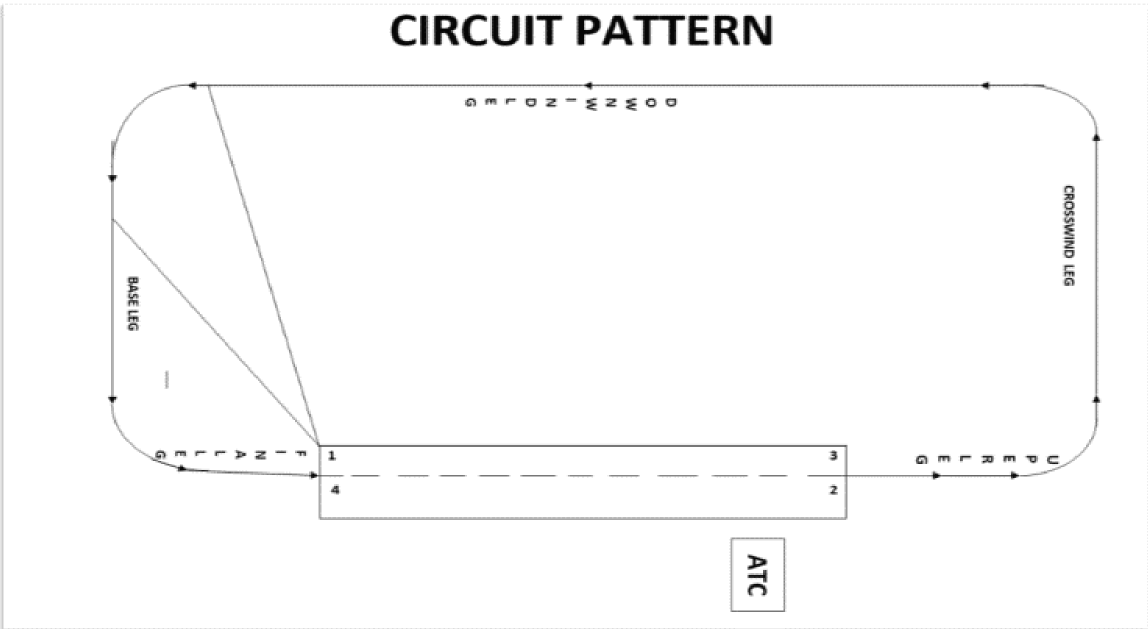
The airplane is equipped with a pneumatic-type stall warning system consisting of an inlet in the leading edge of the left wing, an air operated horn near the upper left corner of the windshield, and associated plumbing. As the airplane approaches a stall, the low pressure on the upper surface of the wings moves forward around the leading edge of the wings. This low pressure creates a differential pressure in the stall warning system which draws air through the warning horn, resulting in audible warning at 5 to 10 knots above stall in all flight conditions.

As per the POH, the altitude loss during a stall recovery may be as much as 230 feet.

The stall warning system should be checked during the preflight inspection by applying suction to the system either by placing a clean handkerchief over the vent opening and applying suction or using some other type of suction device to activate the warning horn. The system is operational if the warning horn sounds when suction is applied.

The training syllabus followed by M/s Sha-Shib Academy as per Chapter 10, T& P manual is annexed to the report.

1.18.3 Circuit Pattern



1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

NIL

2. ANALYSIS

2.1 SERVICEABILITY OF AIRCRAFT

The aircraft VT-TEH had valid C of A and CRS at the time of accident. The last 100 hrs inspection was carried on 05.02.2019 at 6825:50 hrs. At the time of accident, Aircraft had flown 40:35 Hrs since it’s last servicing. The load and Trim sheet was prepared by the Student Pilot. The weight of the aircraft at the time of take-off was

935.4 Kgs (including 160 Kgs of fuel) against the MTOW of 1111.30Kgs. The CG was within limits.

Aircraft VT-TEH had done 6865:50 hours since new and 203:45 Hrs since last ARC (05.11.2018) at the time of accident. The aircraft was fitted with single piston Lycoming engine model no. IO-360-L2A engine bearing S/No. L-27911-51A which had done a total of 7516:30 Hrs since new and 857:35 Hrs since last engine overhaul. Pre-flight inspection was carried out by the CFI. CRS for the aircraft after last maintenance was issued by company authorized AME. No DGCA mandatory modification was due on this aircraft at the time of accident.

So, the serviceability of aircraft was not an issue and therefore the maintenance factor can be ruled out in the incident.

2.2 WEATHER

The weather information provided to Student pilot by ATC for the sortie was above the minima. Further, no variation in the weather condition deterioration and abrupt changes were forecasted by the METAR. The sudden updraft and downdraft experienced by the student pilot as per his statement could not be verified. ***Hence, weather is not considered a factor in this accident.***

2.3 OPERATIONS ASPECTS

On the day of accident, student pilot was authorised by the CFI for solo circuit and landing exercise. After carrying out checks after start up, Student Pilot was cleared for line up on R/W 14 by ATC. Aircraft took off from R/W 14 for Left Hand Circuit. It was the first circuit-landing exercise of the day for the Student Pilot. After takeoff, the performance of the aircraft was reported to be normal to ATC.

The circuit pattern was normal. On finals, VT-TEH was at an altitude of 450 feet and was maintaining an airspeed of 70 knots with a distance of approx 1 nm from threshold. Approximately at 200ft AGL, at a distance of approx 0.3 nm (1823 Feet) from the touchdown point, Student pilot reduced the power to drop the airspeed to 65 knots. Thus, his approach angle was: $tan^{-1}(200/1823) = 6.3$ *degree*.

In all probability, the Student Pilot did an early flare after reducing engine power. The height at flare might have been around 100+ feet or so. As the speed was high, the aircraft gained height due to its momentum, making student feel the effect of an updraft. But since the power was not available, airplane ***stalled*** and came falling to the ground on LH main wheel on the runway threshold itself. LH main wheel tyre didn't burst at the time of impact. The LH main landing gear came out of axle and moved out of runway. Also, as a reaction the aircraft bounced to the right and RH tyre was deflated. To control the aircraft after first bounce, Student might have given abrupt & more than required correction for the left aileron along with input to pitch down. Pitch down aircraft yawed to left accompanied by an obvious roll. The propeller hit the ground while aircraft continued moving forward, scooping out the runways surface. The left wing hit the ground & got bent, ahead of the main spar. From the marks noticed at accident sight, aircraft had turned by 50-60 degree with reference to centerline (for runway14). Since, the base of nose gear may have offered some resistance to forward motion, the aircraft rotated further by 50-60 degree on the broken LH MLG as pivot and then skidded in almost in straight line on nose-base. The aircraft finally stopped at an angle almost perpendicular to runway centerline.

From the above, it is evident that pilot handling is a contributory factor to the accident.

2.4 CIRCUMSTANCES LEADING TO THE ACCIDENT

The aircraft was serviceable and no defect was reported on the aircraft by the Student Pilot prior to or after the accident. At the time of accident, weather was fine (winds 135/05 knots as observed by pilot from windsock). The take off and circuit was uneventful. The pilot was high on approach while coming for landing and did an early flare before touchdown. To compensate high approach, the Student Pilot further reduced the speed of the aircraft consequently entering into stall. This resulted the aircraft floating in air just short of touchdown point. To recover the aircraft from stall, the pilot did increase the power with nose down attitude to come out of stall. The aircraft did not respond immediately due to low on altitude (Just short of touchdown). As a result of delayed increase of power to come out of stall condition, the aircraft hit at threshold point with left wing tip and left MLG as a first impact. Subsequently, the aircraft bounced. The nose gear collapsed during the second impact itself. The pilot tried to control the aircraft by applying forward pressure on stick, however, aircraft impacted its engine cowl with the runway surface and dragged on the runway and finally stopped near the edge of the runway. Ground marks indicate that the aircraft first contacted runway surface on its left MLG. Thereafter, during the second impact propeller blades contacted the runway and aircraft dragged to the final resting position. Hence, the Student Pilot's late reaction after bounce and improper technique to recover from the bounce during landing cannot be ruled out. During the accident, there was no injury to the pilot and there was no post impact fire.

3. CONCLUSIONS

3.1 FINDINGS

(i) The aircraft was airworthy at the time of occurrence, as per records.

(ii) ***Weather***: Visibility was above the minima and wind was 135° / 5-7 knots at the time of takeoff from Runway14.

(iii) Student pilot had done one hour of instrument flying on the same aircraft on the day of occurrence that is on VT-TEH on 14/02/19.

(iv) The student was eligible & authorized for the flight.

(v) The load sheet was prepared by Student Pilot and the CG was well within the limits.

(vi) At short finals, the Student Pilot idled the power quit early at approximately 200 feet and may have flared at around 100 feet or so. Aircraft gained height due to its momentum but due to lack of power it ***stalled*** immediately and came falling on ground inspite of corrective measure initiated.

(vii) The airplane landed on runway threshold itself with left bank on LH Main Landing Gear resulting into the left wing tip damage. Due to impact, the LH MLG came out of axle and moved out of runway but as a reaction, the aircraft bounced to the right. However, LH main wheel tyre didn't deflate.

(viii) Due to correction applied by Student Pilot after first bounce, aircraft turned towards left. Thereafter, aircraft hit the runway at right edge and turned approx 135º with reference to runway centreline. After impact, Propeller blades bent in 'S' shape. Scooping marks of propeller blades on runway surface while moving forward indicate that engine was in power.

(ix) The aircraft stopped around 55 feet from threshold point for runway 14.

(x) The ATC personnel witnessed the occurrence and raised the alarm. Emergency crew and services responded in time.

(xi) The fuel was leaking from the LH wing drain point but there was no fire.

(xii) The aiming marks are at 650 feet from runway threshold on Runway14. As stated by Student Pilot, he was at 200 feet AGL while 0.3 nautical mile from runway, with approach angle around 6 degree.

(xiii) The concept of updraft & down draft or low wind shear may not be appropriate explanation to the occurrence as stated by Student Pilot.

3.2 PROBABLE CAUSE OF THE ACCIDENT

Student Pilot's improper flare during landing resulting into stall and improper bounce recovery technique to recover the aircraft from stall and bounced landing resulted into the accident.

4. SAFETY RECOMMENDATIONS

(i) As the accident occurred due to improper landing technique by the student pilot, therefore, suitable corrective training shall be imparted to him before releasing him for flying.

(ii) All Flying Training Institutes shall give more emphasis on the training enhancement regarding incorrect approach profile, flaring techniques including the go-around procedures and stall recovery techniques during critical phase of operation on immediate basis to prevent any such recurrence.

(Dinesh Kumar)
Investigator

(Anil Tewari)
Investigator-in-Charge

Date: 05 July 2019
Place: New Delhi

Annexure

Extract of training exercise tailored by

M/s Sha-Shib Flying Academy, Guna, MP.

Exercise 10- Stalling

AIM:

1. To teach how to recognise an approaching stall and how to recover from a stall.
2. How to recover with the minimum loss of altitude.

INSTRUCTIONAL GUIDE

General: The ultimate aim of this exercise is to teach the student how to recover with the minimum loss of altitude; however, this aspect should not be over - emphasised in the early stages of the exercise. The student should first be able to identify the symptoms of a stall and know the correct method of recovery under all circumstances.

The first lesson should be taken no further than the fifth sequence of the Air Exercise, but the whole exercise must have been taught by the time the student flies first solo.

BEFORE FLIGHT

Preparatory Instruction:

a. Lift, the stalling angle and the stalling speed.
b. Characteristics of the stall.
c. Factors affecting the stall speed
d. Attitude and the stall
e. Recovery from the stall - use of power
f. Stall warning device

DURING FLIGHT

The student may be a little nervous at first, this is understandable, but he will gain confidence as he himself becomes able to identify and recover from the stall. As soon as possible the student should be allowed to stall the aircraft and recover. He should be given plenty of practice until he becomes thoroughly proficient and confident

In the early stages the student should be watched for symptoms of airsickness and the exercise discontinued if necessary, Principal emphasis must be placed on the recognition of the warning signs and symptoms of the stall and the recovery. Although a practical method of entry must be taught, it is of less importance. If the particular aircraft drops a wing at the stall, the observations dealing with this additional consideration should be brought in from the start. Stalling in the tum I aerobatics is to be considered under steep turns and aerobatics.

1. Airmanship: The checks listed in the Air Exercise must be carried out before commencing any stalling, spinning or aerobatic exercise. In addition to routine lookout the student should perform various clearing turns so that the lower airspace can be visually cleared prior to the stall. The student must appreciate the importance of similar clearing turns before each stall.

It should be understood by the student that the stall is in no way a frightening experience and should rid him of any false ideas of danger and violent sensations. The first stall IS best done at the end of the lesson preceding that on which stalling is to be dealt with in detail.

No instruction should be given during the first demonstration but the point of stall and the commencement of recovery should be indicated. During the subsequent post-flight discussion, the stall as demonstrated should be discussed and the student's questions answered in this way the student is better prepared for the detailed lesson on stalling.

2. Sign of Approaching Stall:

a. A high nose up attitude is not fundamental sigh of an approaching stall. The nose up attitude should only be indication that a stall is imminent.

b. The student must be given plenty of practice in approaching a stall and detecting the signs of himself.

3. ***Stall Symptoms***: The student should become thoroughly familiar with the symptoms of the stall itself.

4. Effect of Power on Recovery: The smaller amount of altitude lost by using power in the recovery should be emphasised. Point out to the student that although practices are carried out with the throttle closed, an accidental stall can occur at any speed and the throttle should be moved to maximum on recovery

5. Recovery when the Wing Drops: The student should be told that the aileron will not always raise a dropped wing and may aggravate the situation under certain circumstances. Therefore, because of this possibility ailerons are not used in the standard recovery.

6. Recovery from the Incipient Stall: An unintentional stall should always be stopped at the incipient stage; therefore, the emphasis should be placed on quick recovery action as soon as any stall warning signs are recognised. The student should be given ample practice in recovering from the incipient stage of all types of stalls.

7. Stall under Approach condition: The demonstration should be made as realistic as possible. Show how lack of attention to _accurate flying can lead to stall when concentrating on the approach to land. Demonstrat.1ons and practices should invariably be done from a simulated circuit, starting on the downwind leg. Not only will the student associate the recovery technique with flying the approach configuration but he will gain useful circuit flying practice.

8. Stall at Higher Speeds: The student should be under no doubt that the aircraft can be stalled at any speed and power. He should understand that the more extreme cases cannot be demonstrated because of the possibility of overstressing the aircraft. Before going solo, the student should be aware that stalling speed increases with bank. This is particularly relevant during the finals tum when speed and power settings are low.

Common Faults

Students often have difficulty in estimating the amount of control column movement required to recover from the stall. Frequent practice and advice from the instructor is needed until the student becomes proficient. When the instructor is demonstrating the recovery, the student should be allowed to rest his hands and feet on the controls.

When a wing drops at the stall, the student tends to correct by instinctive use of ailerons. Only by practice and experience can the proper method be learned.

When power is applied during recovery, the throttle movement is often hesitant or slow. If this is so, the student should be told that the amount of altitude lost and the rapidity with which control is regained both depend on the prompt use of high power.

AIR EXERCISE

Airmanship:

HASELL & HALL checks as per SOP

Sequence	Observations
1) Student's first Stall Stall and recovery from S & L	a) Not violent or unpleasant b) Control easily regained
2) Symptoms of the Stall Demo a stall from S & L and detail the symptoms	a) Entry: - Close throttle and prevent yaw. - Progressive backward movement of the control column to maintain altitude b) Symptoms prior to the stall: - Decreasing airspeed - Decreasing control effectiveness - Decreasing outside noise - High nose attitude - Stall horn I buffet c) Symptoms at the stall: -Sink - Nose drop - Possible wing drop
3) Effect of Power on Recovery Demo a stall from S & L. Recover without power	a) Entry: - Close throttle, prevent yaw and maintain altitude. b) Note stalling attitude & speed c) Recovery: - Ailerons neutral - Control column centrally forward - Gain speed to regain control

	- Ease out of dive - note altitude loss - Apply power as nose cuts horizon and re-establish climb d) Note amount of altitude lost.
b) Demo a stall from S & L and recover with minimum loss of altitude, using power	a) Entry: - Close throttle, prevent yaw and maintain altitude. b) Recovery: - With ailerons neutral, simultaneously apply full power and move control column sufficiently forward to unstall aircraft - Control regained - Ease out of dive, note altitude loss - Re-establish climb c) Smaller movement of control column to regain control. d) Less altitude loss
4) Recovery when the Wing Drops Demo a wing drop stall with standard recovery	a) Standard Recovery - Simultaneous use of full power & move the control column sufficiently forward to unstall wings and use rudder to prevent further yaw b) Control regained - level wings with aileron & ease out of dive.
5)Recovery from Incipient Stall Demo recovery from horn/ I buff et	a) Note stall attitude b) Standard recovery c) Small control column movement to regain control. d) Small altitude loss
6)Effect of Flap on the Stall Demo stall with flap 40 and no power During recovery ensure Vfe is not	a) Speed falls rapidly b) Short duration of stall warning c) Lower stall speed. Point out nose

exceeded	attitude. d)Stall as before e)Standard recovery
7) Effect of Power on the Stall Demo at 1500 RPM	a) Speed falls slowly b) Control effectiveness c)High nose attitude compared to previous stalls d)Short duration of stall warning e) Stall as before f) Standard recovery
8)Approach Configuration Stall Demo using approach power and flap 40 from a descent at 70 kts. Student to practice recovery from both buff et and horn	a) Nose-up attitude b) Control effectiveness c) Lower stalling speed d) Standard recovery e) Importance of recovery in incipient stage - danger of stalling on approach