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# FINAL REPORT ON ACCIDENT TO M/s ACADEMY OF AVIATIONCESSNA 172R AIRCRAFT VT-HRP ON 4th OCT 2019 AT SHIRPUR AIRFIELD, MAHARASHTRA

# ***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 apportion blame or liability. The investigation conducted in accordance with the provisions of 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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# EXECUTIVE SUMMARY

| | | |
|---|---|---|
| **Date and Time** | **:** | 04Oct 2019 at 1200 IST |
| **Aircraft** | **:** | Cessna 172 R |
| **Accident location** | **:** | 24.1943°N 075.740°E |
| **Aircraft owner** | **:** | M/s Academy of Aviation |
| **Type of flight** | **:** | Training Flight: Circuit & Landing(Solo) |
| **Phase** | **:** | Landing |
| **Last point of Departure** | **:** | Shirpur (Distt- Dhule) |
| **Point of intended landing** | **:** | Shirpur (Distt - Dhule) |
| **Persons on board** | **:** | One (Student Pilot) |

**(All timings are in IST unless otherwise stated)**

## ABSTRACT

On 04.10.2019, Cessna 172 R aircraft VT-HRP belonging to M/sAcademy of Aviation while operating a local training flight was involved in an accident at 1200 IST at Shirpur Airfield, Maharashtra.

On the day of accident, Student Pilot was planned by CFI for four solo circuits and landing exercise.Student Pilot reported to base at 0900 Hrs IST and had undergone breath analyzer test, which was negative. After authorization by CFI, Student Pilot had carried out pre-flight inspectionon the aircraft. Before the sortie, Student Pilot was briefed about the ***Circuit & Landing Exercise Procedure*** for runway 27 by Fight Instructor.

After carrying out preflight checks, Student Pilotrequested ATC for startup clearance. ATC gave clearance and weather information was also passed to the Student Pilot. Aircraft lined up on runway 27 and took off at around 1105 hrs IST.

After completion of three circuit and landing exercises uneventfully, Student pilotlined up for fourth circuit after obtaining ATC clearance and took-off from runway 27. Finally, aircraft joined the final approach leg and prepared for landing. No abnormality was reported on the aircraft by Student Pilot at any phase of exercise.

As per the statement of Student Pilot, during final approach, engine was put to idle and aircraft speed was reduced upto 50 knots when it was on short finals. However, aircraft was high on approachand was about 30-40 feet above when the aircraft was at second touchdown point. While attempting to land, aircraft encountered stall and Student Pilot lost the control. Thereafter, aircraft turned towards left and hit on the ground approximately 50 feet away from the runway edge and finally rested nearly 1100 feet from the threshold point of runway 27.

After the accident, ATC activated the siren and emergency services. Aircraft was substantially damaged and Student Pilot received minor injuries during the accident.

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. 11011/08/2019-AAIB dated 9th October, 2019 appointing Shri Anil Tewari, Director, AAIB as an Investigator-in-Charge and Shri Dinesh Kumar, Air Safety Officer as Investigator.

***Probable Cause***

Aircraft was high on approach during landing phase. The aircraft speed had dropped to stalling speed which coupled with delayed / improper corrective measure to recover the aircraft from approaching left wing stall, resulted into the accident.

***Hazard Identified During the Investigation***

Aircraft speed was not maintained upto the prescribed speed limit and late response to recover from approaching stall condition.

***Consequence***

Aircraft banked above the stalling bank angle and finally left wing stalled.

# 1. FACTUAL INFORMATION

## 1.1 HISTORYOF THE FLIGHT

Cessna-172R aircraft VT-HRP belonging to M/s Academy of Aviation was engaged in a solo training flight (Circuit and Landing Exercise) under the command of a Student Pilot at Shirpur Airfield, Dhule, Maharashtra on 04 Oct 2019.

On the day of accident, Student Pilot reported to flying club at 0900 HrsIST. He underwent Breath Analyzer Test for alcohol at 0910 Hrs and test results were negative. The Student Pilot was planned for four Circuit & Landing (Solo) Flying exercise on the day of incident. The take off was planned for 1105 Hrs.

At 1000 Hrs IST, the PIC was authorized for Solo circuit landing on aircraft VT-HRP by the CFI. The preflight briefing to PIC by flying instructor (FI) included weather, taxi – T/O pattern, circuit pattern, approach and landing. As per the company procedure, the PIC completed the preflight inspection on VT-HRP before the sortie.

The PIC obtained ATC clearance for startup and circuit landing for duration of 60 minutes. The engine was started up andall parameters were in green zone. During taxi, he noticed that the winds were calm and visibility was above 5000 meters. Further, VT-HRP was flown by the same pilot on previous day i.e. 03 Oct 19 for one Hrs duration and nothing unusual was reported after the sortie.

***PIC did three uneventful circuits to landings***. He lined up for the fourth circuit after obtaining ATC clearance and took-off from runway 27. At 800 ft AGL, flaps were retracted and at 1100 ft PIC initiated a climbing turn towards left. He levelled out the aircraft on crosswind at 1600 ft, turned for downwind and reported his position to the ATC. ATC instructed VT-HRP to report on the finals.

At the end of downwind, he reduced the RPM to 1800 and selected 10 degrees flap. The speed of the aircraft was 80 knots. When the aircraft was about 10 O'clock position to the runway, student pilot started turning for the base leg. He further reduced the throttle to maintain 1500 RPM, selected flaps to 20 degree maintaining speed of aircraft to 70 Knots and switched on the landing lights.

On finals, at 800 ft altitude and speed of 70 knots, he requested ATC for landing clearance. As per ATC Controller, approach was visually normal and the winds were calm and favourable (with reference to windsock).***PIC had trimmed nose up (four times) at 800 feet AGL as per procedure for landing.***

While approaching runway for landing, when the aircraft was about 30- 40 feet above the runway near 2nd touchdown marker, maintaining a speed of 50 knots, PIC realized that he was too high on runway & initiated go around but, by then the aircraft had entered into stall condition. PIC gave sudden full power to aircraft to come out of stall conditions. The aircraft first sunk and then lifted up with full force turning left (a natural tendency of Cessna 172). Airplane stalled with the left wing dropping and hitting the ground (left of runway). Thereafter, right wing hit the bottom of boundary wall and broke it. Finally, aircraft stopped at edge of the runway fencing with empennage resting on the fence.

Person manning ATC activated the siren, informed CFI and alerted the emergency services. Flight Instructor immediately rushed to the accident site. Rescue team evacuated PIC from the aircraft. Student pilot (PIC) was taken to local hospital for medical checkup. The AMSAFE (Airbags) and ELT were found to be activated post crash.

There was no pre and post crash 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 major structural damages were observed: -

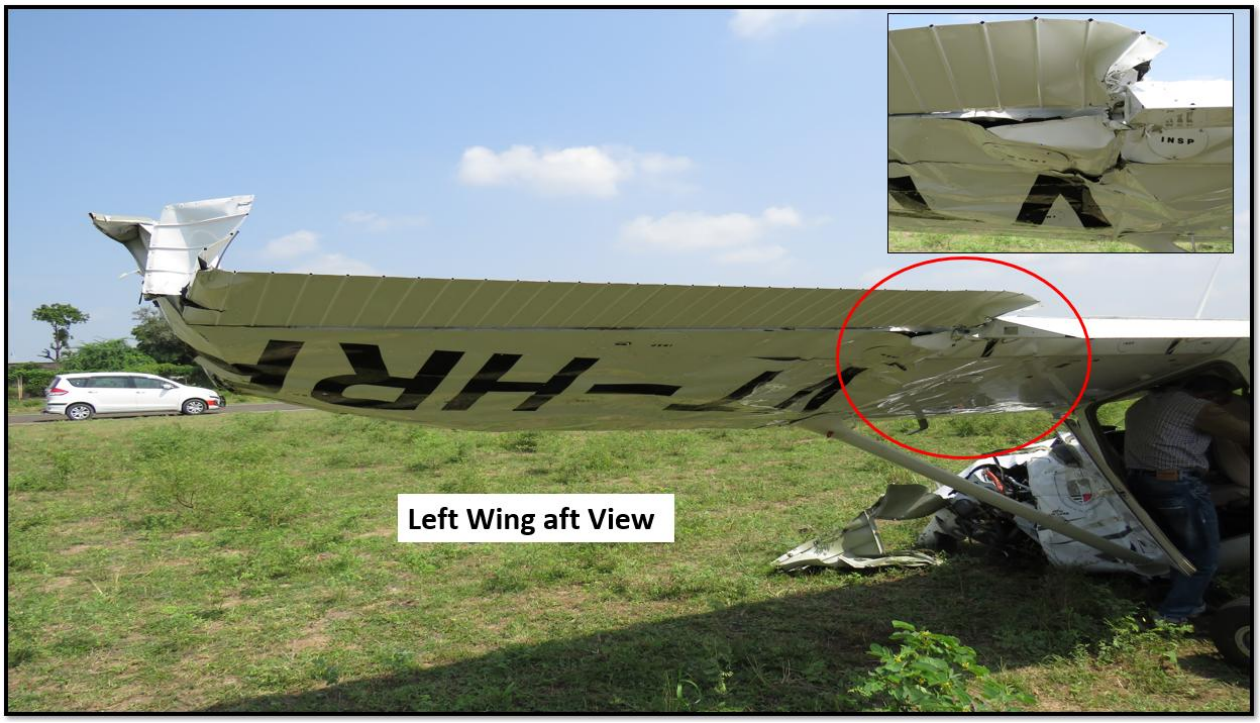
Aircraft was severely damaged in nose section & wing tips. The propeller was twisted and both tips were sheared off. Engine Mount was found broken & nose landing gear found sheared off from its attachments due to impact. Both wings were bent upward at wing tip area. Firewall was found buckled and moved slightly inwards. Cabin & rear section were intact with minor buckling at some places and both main landing gears were intact. The airbag (AMSAFE) assembly was found inflated on pilot seat.

### 1.3.1 **Left Wing**

Left Wing-Front View

Left Wing Tip

(a) Wing bent upwards & aileron found damaged. Wing tip was missing & pieces were recovered from the site.
(b) Leading edge skin of wing found damaged.
(c) Wing upper skin wrinkled & deformed from wing strut attachment point.
(d) Wing lower skin found deformed from wing strut attachment point to tip. Wrinkles were observed from strut attachment point to integral fuel tank.




1.3.2 **Right Wing**


Damages on Right Wing

Damage on Leading edge

Right Wing Lower Surface

(a) Wing tip found bent upwards. Wing tip found attached to the wing with tip broken.

(b) Wing leading edge found crushed from station 140 to Station 208.

(c) Wing lower skin found wrinkled and graze marks were observed on bottom skin below leading edge.

(d) The aileron was found to be bent.

(e) Wing Upper Skin found deformed from Station 140 to Station 208, wrinkled between Station 100 to Station 140 & Crushed between Station 71 to Station 100.

### 1.3.3 **Tail Section**

**Damages on Tail Section**

(a) Rudder fixed trim tab damaged (bent and top two rivets missing).

(b) Rudder bottom static wick broken & missing.

(c) Rudder faring broken (Fin to Fuselage).

(d) Tail plane starboard side – multiple dents and bent.

(e) Elevator starboard completely damaged.

(f) Elevator trim tab completely damaged.

(g) Tail plane attachment at fuselage - compressed and damaged.

### 1.3.4 **Nose section**


(a) Nose section as a whole severely damaged.

(b) LH lower cowling separated at mount section, the attachment rivets found sheared off.

(c) All anti shock cowl mounts found sheared off.

(d) The fuel filter bowl found opened and fuel return hose pipe found to be sheared off.

(e) Nose landing gear sheared off from attachment.

(f) Firewall found crushed & buckled.

(g) The main electronic junction box found bent with cover broken. All internal components CB's panel found sheared off. Battery found damaged with deformation, no evidence of acid leakage were observed.

(h) Lower portion of forward fuselage crushed. LH & RH Steering Rod found bent with part of steering arm attached on it. Upper Nose gear mound found missing and lower nose gear mount sheared and attached to fuselage.

(i) Engine mount found to be broken at all four mounting points towards engine. The shock mounts & frame found attached to the engine. The mount structure at fuselage found attached to firewall at all four points.

1.3.5 **Cabin**

(a) Forward Section of cabin found buckled at floor board Rudder paddles found intact but frozen due to buckling of floor board. Both control column push pull tube found to be bent.

(b) Front windshield broken.

(c) Cabin passenger glass broke (starboard side).

(d) Outside cabin below instrument console got compressed and near the door attachment cabin skin cracked by approx. 2 feet.

(e) Cabin skin between engine and door attachment hinge compressed and broken.

(f) Cabin console damaged (Port & starboard side).

(g) Front windshield - completely broken and damaged.

(h) AMSAFE Inflatable Bag found to be activated due to impact.

(j) Fuselage cabin section found intact with minor deformation on LH&RH side.

(k) RH side window found broken due to flap moved inward.

(l) AFT cabin section found with minor buckling.

(m) Door upper attachment broken.

(n) Doors (Port) top and bottom hinge broken.

1.3.6 **Engine**

(a) Engine air intake box separated from engine.

(b) All four exhaust risers found deformed. The muffler found intact with shroud deformed. Exhaust tail pipe found crushed at the tip.

(c) Oil filter found crushed slightly with oil leaks.

(d) Starter ring gear found crackled at alternator pulley area in one point.

(e) Engine cowling completely damaged.

1.3.7 **Propeller**

(a) Slight graze marks were observed at spinner nose.

(b) Propeller found twisted. Both tips found sheared off about once inch from tip.

1.3.8 **Main Landing Gear**

(a) LH brake cylinder found rubbed on ground & bleeder screw found missing.

(b) Both landing gears found intact with aircraft.

1.3.9 **Nose Landing Gear**

(a) Landing gear sheared off.

(b) Upper torque link attachment bolts found sheared at both points.

(c) Shimmy dampener rear attachment point found sheared and shimmy dampener found attached to gear at front attach point.

(d) Shock strut upper barrel found dented near upper attachment point. Upper attachment point found intact & attached to gear upper strut.

## 1.4 OTHER DAMAGES

Due to impact of the right wing with the base of the boundary fencing, a small portion of the base was damaged.


## 1.5 PERSONNEL INFORMATION

### 1.5.1 Student Pilot

| | | |
|---|---|---|
| **Pilot** | : | SPL Holder |
| **Age** | : | 24 Years |
| **Licence** | : | Valid SPL |
| **Date of Issue** | : | 20/11/2017 |
| **Valid up to** | : | 16/02/2024 |
| **Category** | : | Aeroplane |
| **Class** | : | Single Engine Land |
| **Endorsements as PIC** | : | C-172 R (G1000) |
| **Date of Med. Exam.** | : | 12/06/2019 |
| **Med. Exam valid up to** | : | 11/12/2019 |
| **FRTO License.** | : | Valid |
| **Date of issue** | : | 05/03/2019 |
| **Valid up to** | : | 04/03/2029 |
| **Total flying experience** | : | 56:20 Hrs. |
| **Experience on type** | : | C-172 (56:20Hrs) |
| **Experience as PIC on type** | : | C-172 (29:55Hrs) |

| | | |
|---|---|---|
| **Last flown on type** | **:** | C-172 |
| **Total flying experience during last 180 days** | **:** | 54:20 Hrs |
| **Total flying experience during last 90 days** | **:** | 51:35 Hrs. |
| **Total flying experience during last 30 days** | **:** | 22:30 Hrs |
| **Total flying experience during last 07 Days** | **:** | 06:05 Hrs. |
| **Total flying experience during last 48 Hours** | **:** | 02:00 Hrs. |
| **Total flying experience during last 24 Hours** | **:** | 01:00 Hrs. |

## 1.6AIRCRAFT INFORMATION

### 1.6.1 General Description

The CESSNA 172R aircraft is a four-seater, fixed tricycle landing gear, which is primarily 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 havingtwo blades. The aircraft is certified for a single pilotoperation. 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 mainly of 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.

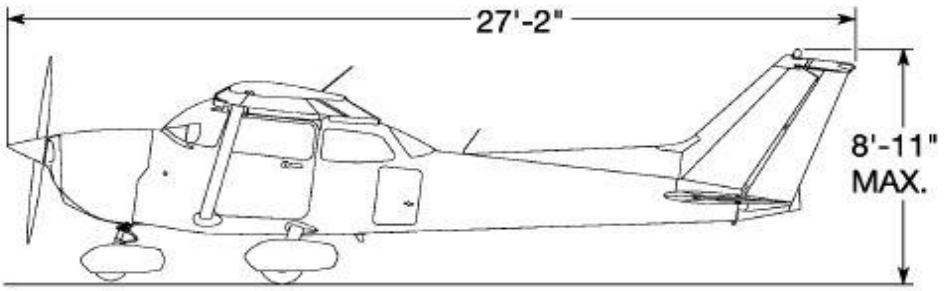
The Cessna 172 is equipped with differential ailerons that move through 21 degrees upwards and 16 degrees downwards. It has single slotted flaps which are electrically operated and deploy to a maximum of 30 degrees. The rudder can move 18º44" (Measured perpendicular to hinge line) to either side and 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

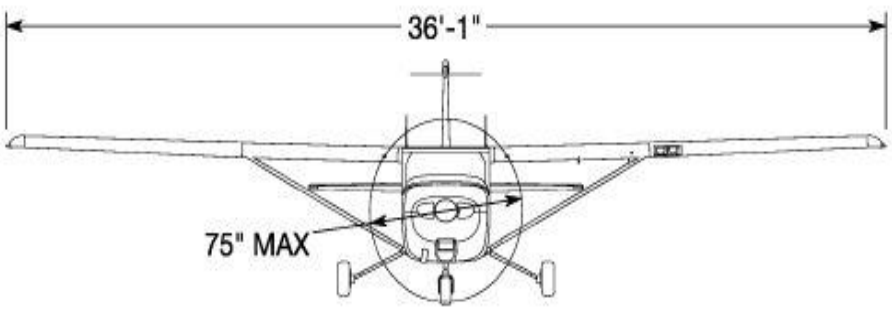
asmall wheel in the center of the control console. The trim tab moves 23 degrees up and 20 degrees down relative to the elevator chord line.

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 taxi, 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.



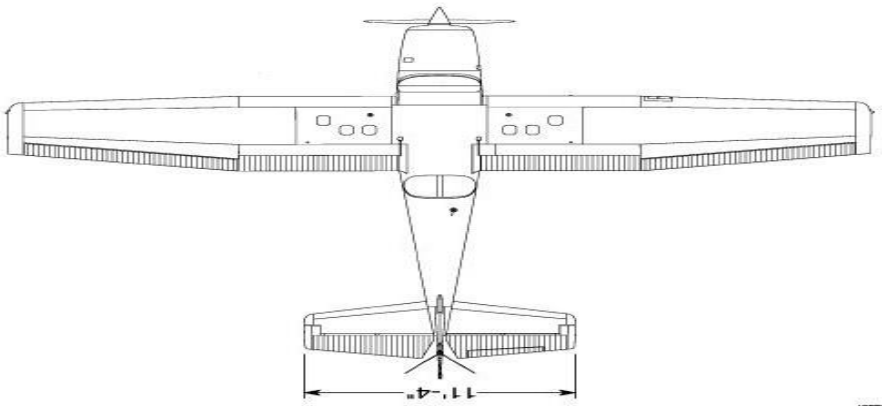


***Fig: Three view drawing-Cessna 172R aircraft***

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 fromthe 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 afollow-up control.

### 1.6.2 Aircraft Technical Information

| | | |
|---|---|---|
| Aircraft Model | : | Cessna 172 R |
| Aircraft S. No. | : | 17281533 |
| Year of Manufacturer | : | 2008 |
| Certificate of Registration (C of R) No. | : | 3888 |
| Certificate of Airworthiness (C of A) No. | : | 5097 |
| C of A Validity | : | Valid at the time of accident |
| ARC issued on | : | 23.09.2019 |
| ARC valid up to | : | 25-09-2020 |
| Engine Type | : | Lycoming – IO360 – L2A |
| Engine Sl. No. | : | RL-20797-51E |
| Propeller Type | : | McCauley 1C235/LFA 7570 |
| Propeller SL. No. | : | ACA48533A |
| Aircraft Empty Weight | : | 782.33 Kgs |

| | | |
|---|---|---|
| Maximum Take-Off weight | : | 1112 Kgs |
| Date of Aircraft weighment | : | 29.09.2016 |
| Total Aircraft Hours | : | 5773:05 |
| Engine Hours (Since New) | : | 1776:25 EH |
| Engine Hours (Since Overhaul) | **:** | NA (Lycoming Re-built Engine) |

The Aircraft was registered in “Normal” category & Sub Division - “Passenger Aircraft”.Certificate of Release to Service (CRS) was issued on 03.10.2019. The C of A was valid subject to validity of Airworthiness Review Certificate.

The Aircraft was holding a valid **Aero Mobile License No. A-050/WRLO-09** at the time of accident. The Aero Mobile license was valid till 31st December 2020.

The aircraft was being used for flying training purpose only under Flying Training Organization Approval No.**AV.22011/24/2007-FG** issued on 13.04.2016 and valid upto 27th Aug 2020.

The aircraft was last weighed on 01/05/2008 at Cessna Aircraft Company andwas duly approved by the office of Director of Airworthiness, DGCA, Mumbai. As per the approved weight schedule, the Empty Weight of the aircraft was 782.33 Kgs and Maximum Take-Off Weight (MTOW) of the aircraft was 1112 Kgs. Maximum payload with fuel tanks full is 144.43 Kgs. Empty weight CG was 103.89 cms 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. For this particular sortie, Load & Trim sheet was not prepared.

Aircraft had logged 5773:05 hours till the date of accident. Last scheduled inspections 01,22,26,27 and 28 were carried out on the aircraft at 5765:15 airframe hours (TSN) on 2nd Oct, 2019. The aircraft had logged 07:50 Hrs since it’s last scheduled inspection. Pre-flight inspection on VT-HRP was carried out by the CFI before the first flight on the day of accident.

As on the date of accident, the aircraft engine had logged 1776:25Hrs (TSN). Last scheduled inspection carried out on the engine was inspection 01,13 and 23 at 1768:35 engine Hours (TSN) on 2nd Oct, 2019.

Last scheduled inspection carried out on the propeller was inspection 01 at 6224:35 Hours (TSN) on 2nd Oct, 2019.

As per the log book, , only engine oil was changed on 3rd Oct 2019 as mentioned in the Last replacements, major repairs and overhaul records section and no major repair or any other unscheduled maintenance activity was carried out on the aircraft. After change of engine oil, aircraft was given ground run which was found satisfactory.

## 1.7 METROLOGICAL INFORMATION

No Indian Metrological Department (IMD) office is situated at Shirpur Airfield. The Shirpur Airfield is taking assistance from Ozar Airport for all Metrological information. However, wind sock is available as per requirement at Shirpur Airfield. Shirpur Airfield continuously updates METAR with the help of Internet. During landing phase, VT-HRP was informed about Wind for runway 27.

As per the METAR issued for Shirpur, following meteorological conditions existed at 0500 UTC.

| Time in UTC | Wind Direction | Speed (K) | Vis (m) | Clouds | Temp (°C) | Dew Point | Trend | QNH |
|---|---|---|---|---|---|---|---|---|
| 0500 | 270 | 04 | 6000 | SCT 025<br>FEW 040 | 29 | 22 | 29.70 | 1014 |

## 1.8 AIDS TO NAVIGATION

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

For navigational purpose, the aircraft are installed with ADF which allows the students to navigate on the route flying.

## 1.9 COMMUNICATION

The aircraft was fitted with VHF radio setwhich catered for communication while flying.

During circuit flying, student pilot was in two-way positive communication with local ATC, manned by personnel of M/s Academy of Aviation, Shirpur. However, no recording facility is available at Shirpur ATC.

## 1.10 AERODROME INFORMATION

The Shirpur Airfield is privately owned by SVKM's NMIMS M/s Academy of Aviation (NIMS), Shirpur. It is an uncontrolled airfield and situated at an elevation of 602 feet (183meters) with coordinates of Lat 21 19 26.8°N and Long 74 57 25.2°E. It has only one runway with radial 27/09, with a total length of 3936 feet and width of 75 feet. The institute has tailored left hand circuit for RWY 27 & right hand for RWY 09 traffic pattern for carrying out the flying training. Both runways are provided with proper markings as per ICAO specifications.

M/s Academy of Aviationhas set up local ATC, operating with allotted frequency 122.75 MHz, and which is manned by qualified ATC personnel from the academy.

Except one wind shock at north of runway which is visible from both ends of the runway, there are no navigational aids available on the airfield. The emergencyservices i.e. the fire fighting vehicle and the medical emergency is manned by the M/s Academy of Aviationpersonnel. Safety services are provided by FTO. Academy has Alarm bell and siren facilities at a suitable location.

## 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


**Fig: Aircraft Final Rest position at Shirpur Airfield**

Based on the meteorological condition, runway 27 was preferred for flying operation on the day of accident.When the aircraft was at 800' AGL, student pilot called the ATC for landing clearance. Subsequently, the local ATC gave permission to land on runway 27.While the aircraft was at second touchdown point, aircraft speed was approximately 50 Knots and height was about 30 to 40 feet. The pilot planned for go-around as per the SOP but as the aircraft was flying in stall envelope, it could not go around.

To initiate a go around, student pilot pushed the throttle lever fully inside and pitched down the nose of the aircraft to recover from the approached stall condition. Suddenly, aircraft turned and banked towards left. Aircraft then lost height and the left wing tip initially hit the ground at approximately 50 feet from the runway edge and 376 feet from the threshold of runway 27.Thereafter, student pilot lost control of the aircraft and aircraft nose had hit the ground due to which nose landing gear collapsed.

Aircraft engine was on full power and propeller blades struck three times on the ground. Due to this, Aircraft kept on changing its position.Further, aircraft drifted and right wing of the aircraft hit the base of boundary wall. At this very juncture, right wing acted as pivot due to which aircraft heading changed again. Finally, the empennage of the aircraft went up and aircraft came to a halt near the boundary fencing in a nose down attitude.

AMSAFE (Airbags) got operated after aircraft nose hit with the ground thus saving the torso of the Student Pilot. However, he suffered minor injuries due to hitting the cockpit control panel and became semi unconscious momentarily.

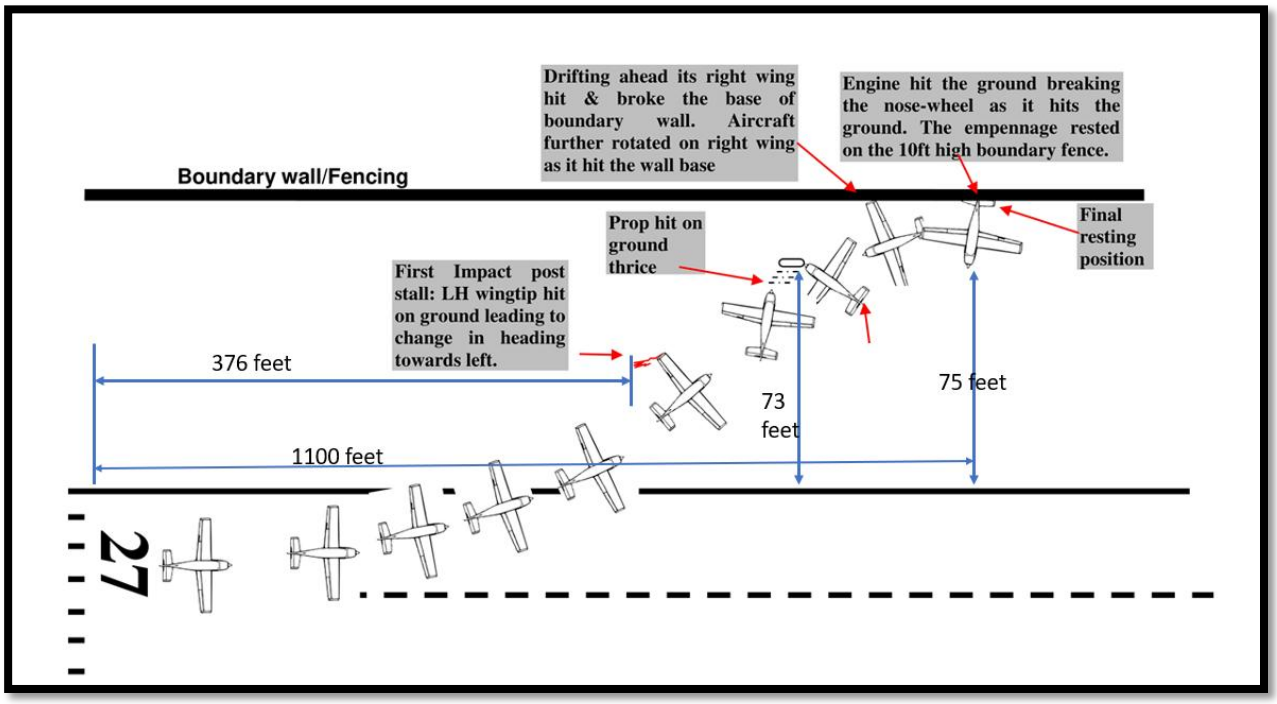



**Fig: Aircraft trajectory and position viewed from runway 27**


**Fig: Final Rest position and damages on VT-HRP**

## 1.13 MEDICAL & PATHOLOGICAL INFORMATION

The student pilot underwent Breath Analyzer test at 0908 Hrs before operating the first flight of the day. As per the report, Breath Analyzer test was negative.

After the accident, he was admitted to a local hospital at Dhule for medical examination. However, the student pilot could not undergo medical examination for alcohol consumption which is the requirement of CAR Section 5 Series F Part III.

## 1.14 FIRE

There was no pre or post impact fire.

## 1.15 SURVIVAL ASPECT

The accident was survivable.

## 1.16 TEST & RESEARCH

Nil

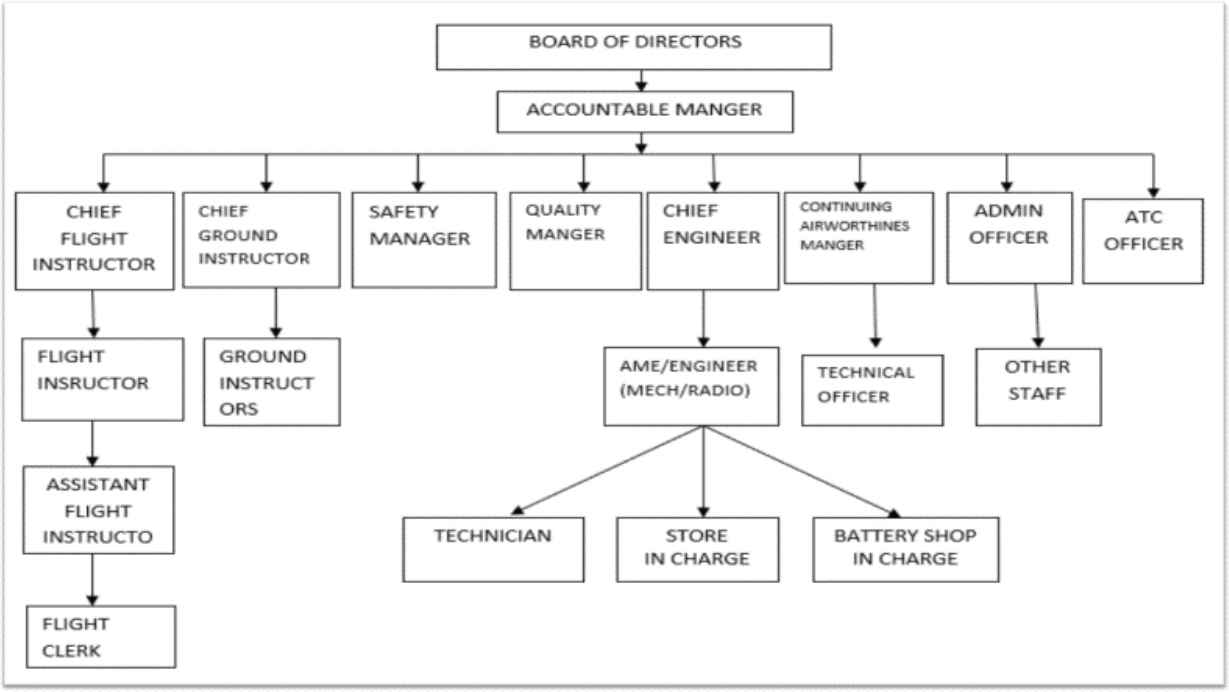
## 1.17 ORGANIZATION AND MANAGEMENT INFORMATION

M/s Academy of Aviation is a Flying Training Organization situated at Shirpur, Maharashtra. The approval of Flying Training Organization (FTO) was renewed by DGCA on 07.04.2016 and is valid upto 27.08.2020. Flying Academy is imparting integrated flying and ground training to trainee students for following license and ratings:-

i. Issue/Renewal of Student Pilot License
ii. Issue/Renewal of Flight radio telephony operator's license(R)
iii. Issue/Renewal of Private Pilot License
iv. Issue/Renewal of Commercial Pilot License Issue and Renewal
v. Issue/Renewal of Instrument Rating
vi. Issue/Renewal of AFI/FI Rating
vii. Issue/Renewal Extension of aircraft rating & conversion

Chief Flight Instructor (CFI) is responsible to coordinate the activities of all departments. The Chief Flight Instructor directly reports to the Accountable Manager who is the head of the organization and all departments have their respective heads.

M/s Academy of Aviation has a fleet of three Cessna 172R aircraft (including the accidented aircraft VT-HRP) to impart flying training. The organizational chart of the flying club is shown in the figure below.




*Organizational Chart of M/s Academy of Aviation*

## 1.18 ADDITIONAL INFORMATION

### 1.18.1 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 indicatedfully operational if the warning horn sounds when suction is applied.

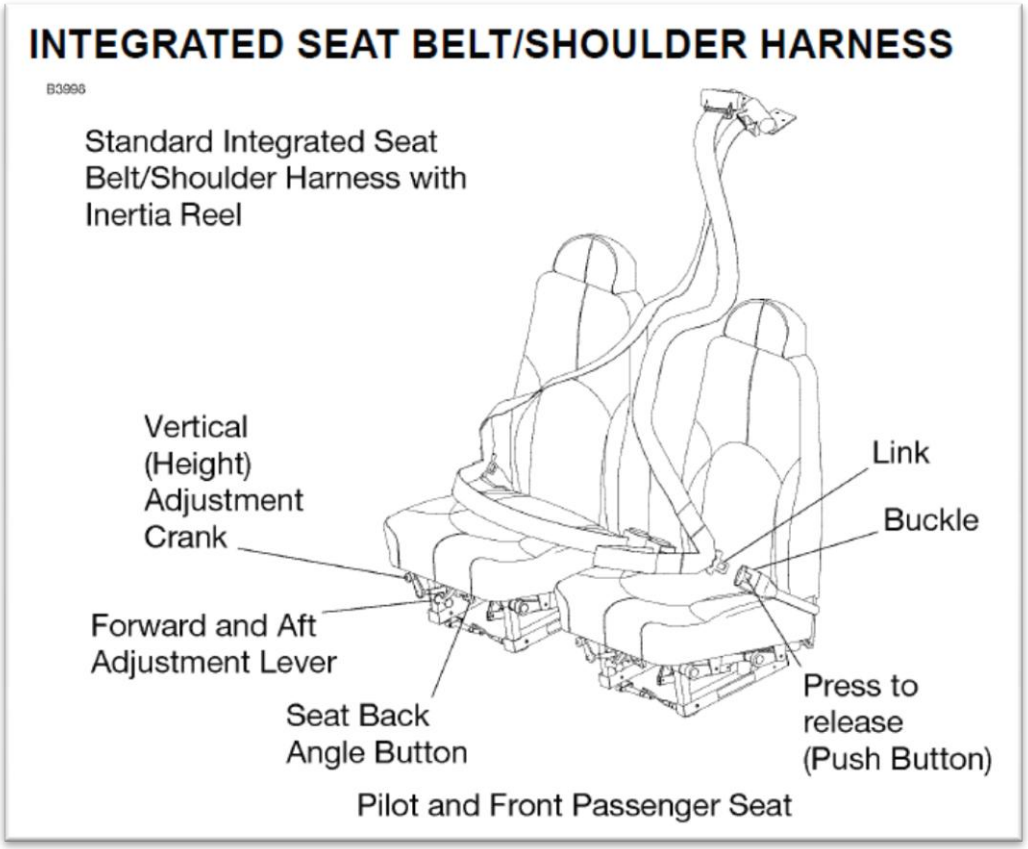
The training syllabus followed by M/s Academy of Aviation as per FOB is annexed to the report.

### 1.18.2 Seat Harness Assemblies

Seat positions are equipped with integrated seat belts/shoulder harness assemblies and the design incorporates an overhead inertia reel for the shoulder portion, and a retractor assembly for the lap of the belt. This design allows for complete freedom of movement of the upper torso area while providing restraint in the lap belt area. In the event of a sudden deceleration, reels lock up to provide positive restraint for the user.

In the front seats, the inertia reels are located on the centerline of the upper cabin area.

To use the integrated seat belt/shoulder harness, grasp the link with one hand, and, in a single motion, extend the assembly and insert into the buckle. Positive locking has occurred when a distinctive “snap” sound is heard.

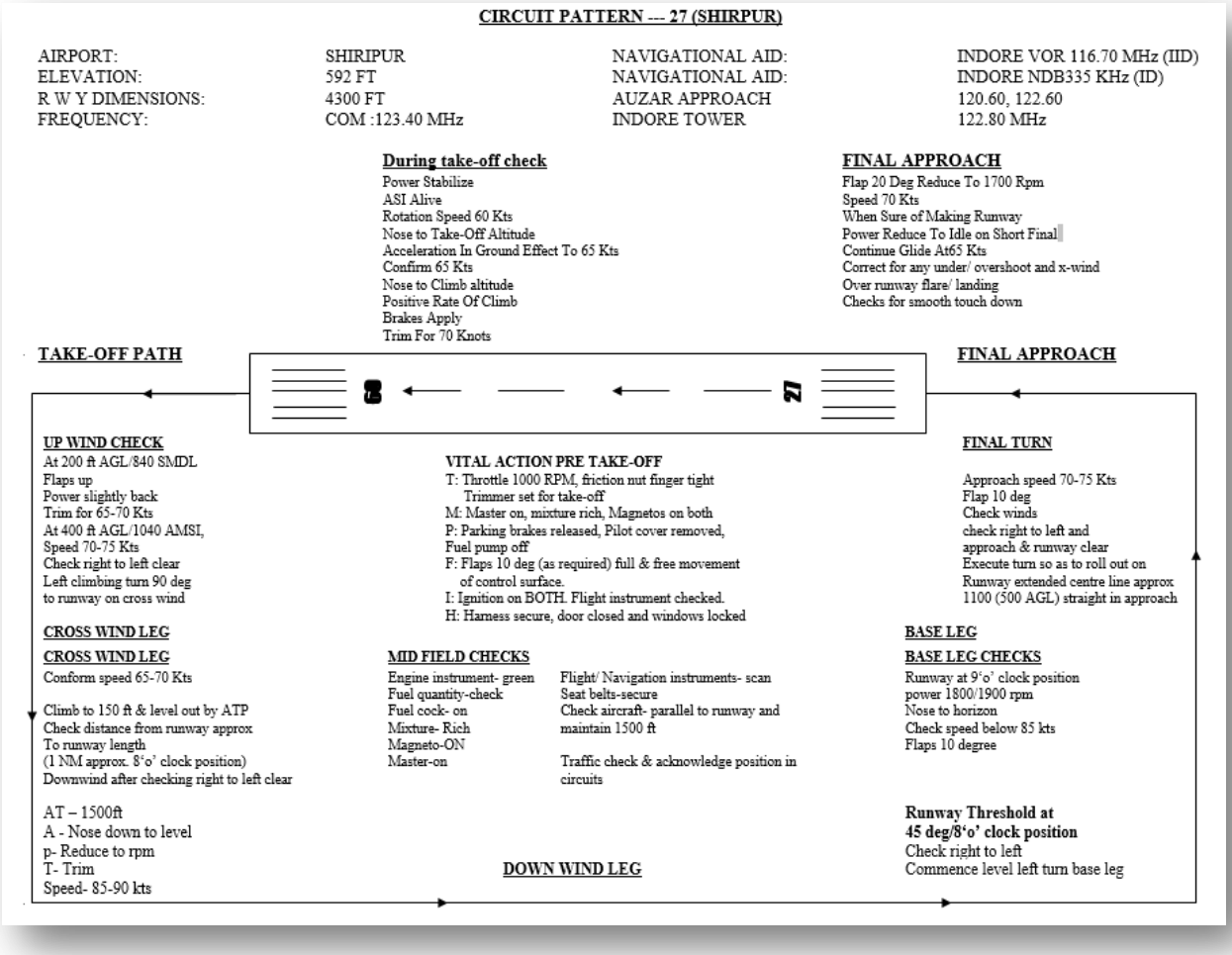


Proper locking of the lap belt can be verified by ensuring that the belts are allowed to retract into the retractors and the lap belt is snug and low on the waist as worn normally during flight. No more than one additional inch of belt should be able to be pulled out of the retractor once the lap belt is in place on the occupant. If more than one additional inch of belt can be pulled out of the retractor, the occupant is too small for the installed restraint system and the seat should not be occupied until the occupant is properly restrained.

Removal is accomplished by pressing the release button on the buckle and pulling out and up on the harness. Spring tension on the inertia reel will automatically stow the harness.

### 1.18.3 Circuit Pattern

Circuit pattern tailored by M/s AOA in respect of runway 27 wherein procedures for all the legs are clearly defined.



***Circuit Pattern:***

The circuit pattern is south of the runway at Shirpur airport. Left-hand pattern is followed for runway 27 and right-hand pattern is followed for runway 09 at Shirpur. The circuit height is 800 feet AGL (1400 feet AMSL).

***Normal Circuit (standard left-hand):***

***Take-off leg*** – At safe altitude i.e. 200 feet AGL after take-off, speed 79 knots, retract flaps, and throttle reduced slightly and trim as required. Turn for cross-wind at 400 feet AGL.

***Crosswind leg*** – continue climb at 80 knots, check abeam the runway, level out at 800 AGL, speed to 90-100 knots, throttle set for 2000 RPM and trim as required.

***Downwind leg*** – continue with cruise parameters in downwind leg, carry-out downwind checks and makes downwind RT call. Commence turn towards base-leg when active dumbbell appears 8 o'clock position on downwind.

***Base leg*** – reduce throttle to 1700 RPM, speed 80 knots, flaps 10 degree and trim as required. When about 10 o'clock to active dumbbell, commence turn towards final approach leg maintaining 80 -85 knots and ensure minimum height at top of finals is 400 feet AGL.

***Final approach leg*** – on finals throttle reduced to 1400 RPM, select flaps to 20 degree and trim the aircraft as required, maintaining speed 65 to 70 knots.

**1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES**

NIL

**2. ANALYSIS**

**2.1 SERVICEABILITY OF AIRCRAFT**

The aircraft VT-HRP had valid C of A and CRS at the time of accident. The last scheduled inspection was carried on 02.10.2019 at 5765:15 hrs. At the time of accident, Aircraft had flown 07:50Hrs since last servicing. The weight of the aircraft at the time of take-off was 935.4 Kgs (including 160 Kgs of fuel) against the MTOW of 1112 Kgs. The CG was within limits. However, the load & Trim sheet was not

prepared by the Student Pilot for the sortie.

Aircraft VT-HRP had done 5773:05 hours since new and 4739:05Hrs since the last C of A renewal at the time of accident. The aircraft was fitted with single piston Lycoming engine model no. IO-360-L2A engine bearing S/No. RL-20797-51E which had done a total of 1776:25Hrs since new and 07:50Hrs since it's last servicing. Pre-flight inspection was carried out by the CFI. CRS for the aircraft after its 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 gust of wind 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 OPERATIONAL ASPECTS

On the day of accident, student pilot was authorised by the CFI for solo circuit and landing exercise on aircraft VT-HRP. The Flight Instructor had given preflight briefing to student pilot which included Taxi, Takeoff pattern, Circuit pattern, approach and landing on runway 27. Before commencing the first sortie of the day, student pilot completed the preflight inspection on VT-HRP. After carrying out checks, he obtained startup clearance from the ATC and was cleared for line up on R/W 27.All parameters were checked and were found in normal operating range after start up. Weather was reported above the minima.

Aircraft took off from R/W 27 for circuit and landing exercise. Three circuit and landing exercises were uneventful. Thereafter, student pilot prepared for the fourth and final circuit and landing exercise. He lined up on runway 27 for final sortie. After takeoff from runway 27, parameters of the aircraft were reported to be normal to ATC.

Takeoff was executed at flaps 10 degrees. After attaining an altitude of 800 feet, flaps were retracted and aircraft speed was maintained at 80 knots. When the aircraft was at 1100 feet, aircraft joined cross wind leg after initiating a left turn. Finally, aircraft was levelled out at an altitude of 1600 feet. During downwind leg, Student pilot continued maintaining 1600 feet and 80 knots. Meanwhile, he also reported his position to ATC as per SOP.

At completion of downwind leg, Student pilot had reduced the throttle to maintain an rpm of 1800.Student pilot selected flaps 10 degree and took a left turn to join the base leg. Throttle was further reduced to 1500 rpm and flaps were selected to 20 degree. Finally, Student pilot maintained aircraft speed at 80 knots and descended to 1100 feet to join the final leg.

During final approach, 20 degree flaps were selected and speed was reduced to 70 knots. At 800 feet approx, Student pilot requested ATC for landing clearance. After obtaining ATC clearance forlanding, student pilot trimmed aircraft nose up 4 times and prepared to land on runway 27.

When the aircraft was at short finals, power was reduced to Idle as per the SOP.However, Student pilot was not able to maintain laid downspeed of 65 knots and aircraft speed dropped to 50 knots. Aircraft was at a height of about 30 to 40 feet above ground at second touchdown point.

As the aircraft had entered stall envelope, and was 30-40 feet above ground, pilot decided to go-around as per SOP.

To initiate a go around, student pilot pushed the throttle lever fully inside and pitched down nose of the aircraft to recover from stall condition in accordance to their company laid down SOP. On increasing the power, aircraft yawed and banked towards left simultaneously. Thereby, aircraft left wing banked more than the stalling angle and lost height. Student pilot could not recover the aircraft from stall. Initially, the left wing tip of the aircraft hit the ground at approximately 50 feet from the runway edge and 376 feet from the threshold of runway 27. Thereafter, aircraft nose hit the ground which resulted into nose landing gear collapse.

Aircraft drifted further and right wing of the aircraft hit the base of boundary wall. The right wing acted as pivot due to which aircraft heading changed again. Finally, the

empennage of the aircraft went up and aircraft came to a halt near the boundary fencing in a nose down attitude.

The ground marks and throttle position in the cockpit clearly indicated that engine was on full power and student pilot had planned for a go around. However, he lost control of the aircraft as the aircraft went into stall condition at a very low altitude.

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

## 2.4 CIRCUMSTANCES LEADING TO THE ACCIDENT

After completion of three uneventful circuit and landing exercises, aircraft took off from runway 27 for the last (fourth) sortie. Take off and climb was reported to be normal and aircraft joined the crosswind leg.Till the base leg, no abnormality was reported and finally aircraft joined the approach leg. While the aircraft was on short finals, student pilot selected Idle power. However, student pilot was not able to maintain the correct approach profile. The speed of the aircraft dropped to 50 knots, which was below the prescribed speed limit *i.e.* 65 knots at short finals. In addition, aircraft missed the touchdown zone and was 30 to 40 feet above the runway at second touchdown point. ***As the aircraft had already entered near stall condition, coupled with high on approach, the simultaneous action to initiate a go around aggregated the situation.*** To recover the aircraft from stall, aircraft nose was pitched down and throttle was fully pushed forward to recover from stall condition. The student pilot did not apply any correction to counter the natural tendency of aircraft drifting left on opening power, which resulted into vicious left bank and yaw simultaneously. Aircraft banked more than the wing stalling angle due to which left wing dropped and wing tip hit the ground. Thereafter, Student pilot lost the control of the aircraft. The aircraft was on full power till the momentum of the aircraft was completely engrossed by the ground afternose had hit on the ground. Finally, aircraft came to a halt near the boundary fencing in nose down attitude.

## 3. CONCLUSION

### 3.1FINDINGS

(i) The student held valid SPL and was authorized for the flight by CFI.

(ii) The aircraft was airworthy at the time of occurrence.

(iii) Visibility was above the minima and wind was 270° / 04 knots which was recorded at 1030 Hrs IST.

(iv) Student pilot had already completed three circuit & landing sorties on the same aircraft on the dayof occurrence before operating the accidented flight.

(v) Before operating the flight, Student pilot had undergone preflight breath analyser examination and result was negative.

(vi) Aircraft Pre-flight inspection was done by the Student Pilot before the sortie.

(v) Load & Trim sheet was not preparedfor accidented flight, which is a mandatory requirement as per DGCA.

(vi) Flight Instructor had given preflight briefing to student pilot which included Taxi, Takeoff pattern, Circuit pattern, approach and landing on runway 27.

(vii) At short finals, the Student Pilot could not maintain prescribed speed limit of 65 knots till touchdown. And speed of the aircraft dropped to 50 knots.

(viii) Aircraft was high on approach and at second touchdown point; aircraft was at height of 30 to 40 feet above the runway.

(ix) Initially, the student pilot tried to recover from stall condition. As per the laid down procedures, aircraft nose was pitched down and throttle was fullypushed in. However, Student pilot delayed execution of go-around.

(x) On initiation of go around, Aircraft drifted towards left and in the absence of any corrective measure, aircraft simultaneously yawed and banked towards left.

(xi) Aircraft left bank angle increased more than the stalling angle due to which left wing dropped and hit the ground. Thereafter, Student pilot lost the control on aircraft.

(xii) The first impact was at 376 feet away from the threshold runway 27 and approx. 49 feet from the runway edge.

(xiii) Propeller ground marks and throttle position in cockpit clearly indicated that engine was on full power when aircraft noseimpacted the ground.

(xiv) The aircraft final rest position was around 1100 feet from end of runway 27 and 75 feet from the edge of runway.

(xv) Aircraft was substantially damaged and student pilot sustained minor injuries.

(xvi) After impact of aircraft nose on the ground, air bag was deployed which reduced the post impact effect, thereby saving the student pilot from major injuries.

### 3.2 PROBABLE CAUSE OF THE ACCIDENT

Aircraft was high on approach during landing phase. The aircraft speed had dropped to stalling speed which coupled with delayed / improper corrective measure to recover the aircraft from approaching left wing stall, 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 for flying.

(ii) All Flying Training Institutes shall give more emphasis on enhancement of training in respect of unstabilised approach and recovery techniques during critical phase of landing including the go-around procedures on immediate basis to prevent any such recurrence.

(Dinesh Kumar)
Investigator

(Anil Tewari)
Investigator-in-Charge

Date: 23 Dec 2019
Place: New Delhi

# Annexure

## Extract of FOB tailored by

## M/s Academy of Aviation,Shirpur, Maharashtra.

**Go Around Action:**

Go around (GA) or also known as Overshoot/ Open-up/ Missed approach/ Baulked landing (in POH) is carried in case of the following:

1) There may be some obstruction on runway, and therefore, intended landing is not possible.
2) The approach path may not be correct and may be too high i.e. it may be an Overshoot approach.
3) As may asked by ATC due some traffic reason.
4) When teaching the trainees the Go around Action or exercise.

***For training purposes, the GA action is carried only at safe altitude/height (usually 150 -200 feet AGL). It involves the following techniques:***

- ✓ ***Open Full Throttle***
- ✓ ***Hold forward pressure on CC***
- ✓ ***Do not raise flaps immediately, let flaps remain extended***
- ✓ ***When positive climb assured & attain safe height***
- ✓ ***At 200 feet AGL, raise flaps UP (in stages)***

**2.9 Go-around action**

Pilots should initiate a go-around if there is any doubt regarding the ability to land safely from the approach. Pilots are reminded that an aircraft must not land on a runway which is not clear of other aircraft. If the runway is not vacant, incase if the aircraft balloons or in case of gust, Pilot is not comfortable then the aircraft has to go around. A radio call "Going Around" should be made.

**A Typical Go Around action is as follows:**

| | |
|---|---|
| 1. Throttle | Full Power |
| 2. Flaps | 20° |
| 3. Position | On dead side of runway |
| 4. RT call | Going Around |
| 5. Climb | Positive Rate of climb |
| 6. Safe Speed Safe Height | Flaps up in stages |

**THE LOW OVERSHOOT( GO AROUND PROCEDURE)**

The decision to overshoot is made late on the final approach.
(Aircraft below 200 ft AGL)

- Full power, attain full altitude(simultaneous action)
- Maintain runway heading
- Retract flap at 300ft AGL
- Radio call
- Turn crosswind at normal point

**13) THE FLAPLESS APPROACH AND LANDING**

- Explain the trainee the purpose of this exercise
- The approach profile is lower than the normal approach.
- It is intentionally flown this way so that it becomes necessary to use power during the approach
- The stall speed increases when flap are not used
- Using power without flap extended is being safe as the stall speed is reduced
- This process enables the flapless approach being flown at the normal approach speed, thus preventing the unnecessary increase in the landing distance.
- The trainee will note the longer float, hence an increase in the landing distance
- The trainee should expect a higher nose attitude during the flare
- The trainee should be aware that with the reduced drag, the chances of ballooning are increased. Back pressure on control wheel should be applied with caution
- It may be necessary to judge the height by looking from the side window during the flare and the hold off stage of the landing

***Therefore, in reference to the above rules prescribed by DGCA and for ensuring Flight Safety during training at AOA:***

1) The recommended minimum height at which stalling and steep turns are taught to trainees of AOA is: **4000 feet AGL**.

2) The recommended Safe height at which recovery from such maneuver can be done is: **2000 feet AGL.**

## 6) TURNING

- Full 360 degree medium turns(bank angle 30 degrees)
- Climbing turns( bank angle 15 degrees)
- Descending Turn(bank angle 20 degrees maximum)
- Gliding turns (bank angle 15 degrees)

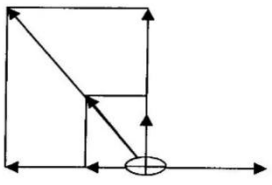
**Note :- The trainee must take a good look in all directions before starting the turns. During a turn, look in the direction of the turn every 90 deg heading change**

The rudder must be utilized correctly during all turns

## 7) ADVANCED TURNING (STEEP TURNS)

A turn in which the angle of bank exceeds 30 deg is classified as an advanced or a steep turn. A steep turn is a collision avoidance maneuvers and is carried out when a conflicting and is carried out when a conflicting situation with an other aircraft or birds is imminent.

The figure depicts the force that act on an aircraft in a turn. When a vector is inclined , it can be observed into vertical and horizontal components. During a turn, the actual lift generated by the wings is inclined and it is the vertical components of the lift force that has to equal the weight of the aircraft in order to sustain level flight . As the angle of bank increase in a turn, the actual lift has to increase an order to maintain the vertical components of lift equal to the weight.



The g force acts opposite to the actual lift force. Logically therefore the g force also increase as the angle of bank increase and the overhaul effect of this is a progressive increments in the aircrafts stalling speed.

| Angle of bank | Increment in g (%) | In stall speed %) |
|---|---|---|
| Level | Nil | Nil |
| 30 | 18 | 8 |
| 45 | 40 | 18 |
| 60 | 100 | 40 |
| 75 | 400 | 100 |
| 83 | 900 | 200 |

With reference to the above table, a point to note is that both the g force and the aircraft's stalling speed increases rapidly as the angle of bank is increased beyond 45 degrees. This could spell danger, if overlooked.

A significant number of the light aircraft accidents have occurred through stalling out in the turns. The pilot's pre-occupation during the sequence of events leading to this accidents had been such that this characteristics of the aircraft had been overlooked. An inadvertent increment in the bank angle may only take seconds, but the price to pay could be far too great if the aircraft is flying at an incorrect air speed.

Most light aircraft will be able to maintain height in a turn at 60 degrees bank at sea level, because of the greater value of lift produces by the winds and the extra thrust horse power available from the engine. At higher density altitudes, this will be not be possible. Infact the aircraft may struggle to maintain level flight in turns at 45 degrees bank at density altitudes in excess of 10,000 feet.

The advanced turn is a 360 degree turn in either direction and is demonstrated and practiced at a bank angle of 45 degree. Before commencing the turn, the aircraft must be at a minimum height of 1500 feet AGL for safety and the pilot must look out all around the aircraft thoroughly. For a steep turn to the left, the look out should commence from the right and end up in the direction of the intended turn. The opposite applies to the right turn.

The correct IAS must also be established prior to applying the bank. The entry IAS is a minimum of 10 knots above the normal cruising speed and the minimum IAS during the turn is the normal cruising speed. This ensures an adequate margin above the stalling speed.

A prominent land mark or a cardinal heading is selected before commencing the turn. As the bank angle increases, so does the back pressure on the control column and the rudder pressure to co-ordinate the turn. Passing through 30 degrees bank, full engine thrust must be applied.
With respect to the trainers, the engine may already be operating at maximum thrust if the flight is being conducted in high density altitude condition to obtain the required entry IAS.

The lift formula consists of only two variables at any given moment in flight:- the angle of attack and the airspeed. The air density and the size and shape of the wing are constant.

For turns where the bank angle is restricted to 30 degrees, the increased angle of attack is adequate to generate the required lift in order to sustain height. Figure shows that the lift requirement at steeper and bank angles is quite significant and the increased angle of attack is in sufficient, additional IAS, and therefore thrust must also be increased to generate the required lift.

If the back pressure on the control column has been progressive, the aircraft will have assumed more or less the correct pitch attitudes as the bank angle reaches 45 degrees. Thereafter, only a minor pitch alteration would be required to sustain height. The needle in the VSI comes in very handy for this purpose.

Once the correct pitch is established, it should maintain through out the turn. An easier way to achieve this is to identify a point on the engine cowling and make it to move along the general contour of the horizon.

Large pitch change during the turn will result in large fluctuations of the IAS and this may in turn result in the IAS reducing below the minimum required. In such circumstances , the angle of bank may be reduced momentarily or the aircraft should be rolled out of the turn.

During the turn the instruments must be scanned in order to insure that the turn Is co- ordinate as the required IAS is being maintained. The VSI and the altimeter will indicate altitude deviations . at least twice during the turn, the operating must be scanned for traffic or birds and , if present, evasive action must be taken to avoid them.

The roll-out from the steep turn should commence 15 degrees (being a third of the angle of bank) before the required heading. The angle of attack is quite large during a steep turn and therefore the pitch change during the turn , and therefore the pitch change during the roll out for level flight Is also significant. Insufficient pitch change and thrust will result in the aircraft gaining height, which should be avoided .

There are three actions , therefore that need to be carried out simultaneously during the roll-out:

a) Progressive reduction of the bank angle.

b) Progressive pitch change to level flight altitude.

c) Progressive power reduction to cruise rpm.

While it may not be necessary to trim the controls during a medium turn, the force in a steep turn do require an amount of trimming to ease the loads; however the effect of this on the recovery would be larger control inputs, which must not be overlooked.

Student pilots often make the execution of the steep turn difficult by not using the correct technique. Chasing the needle of the flight instrument doesn't help. The secret of maintaining height during a steep turn is to fly a constant altitude, while holding a steady bank angle.

This is where the selection of a point on the engine cowling comes in handy and as this point is moving along the general contour of the horizon, there should be no problem in maintaining height. The foregoing also gives time to scan the flight instrument and to look out more frequently.

**8) STALLING**

- Stall in clean configuration, no power. Recovery without power
- Stall in clean configuration, no power. Recovery with minimum loss of height

**Note :- During the demonstration of the above stall, the trainee is expected to note the IAS at which the stall warning is triggered and the IAS at which the buffet is felt. The difference in the loss of height in both cases must be noted.**

- Stall with flap extended , no power . Recover with minimum loss of height. The trainee will not the reduction in warning and buffet speeds.
- Stall in approach configuration-power 1000 rpm, flap 10 . Recover with minimum loss of height . this stall is only for demonstrations. The trainee will note the lower warning and buffet IAS.
- Explain briefly , the effect of AUW, wing icing and damaged wing leading edge on the stall speeds.

Any factor hat increases the total value of lift will reduce the stalling speed of the aircraft. Flaps extension and increased engine power reduce the stalling speed, these being the two variable factors in the lift formula. Increased drag from damaged wing leading edges, increased aircraft weight, undercarriage extension on aircraft fitted with retractable gear and ice accretion on the wing, all increase the stalling speed.

The aircraft is configured and the engine RPM is set as required in level flight. The entry procedure to the stall is as covered during basic stalls. The recovery procedure varies depending on the aircraft configuration and attitude.

During practice, the IAS at which the first airframe buffet occurs must be noted and latter compared with the buffet speed in clean configuration with wings held level.

The following description of the advanced stalls assumes recovery with a minimum loss of height.

**Stall Recovery with Flaps Extended**

The recovery is initiated at the on set of the first buffet by lowering the aircraft's nose to correct pitch attitude and simultaneously applying full engine power. The resulting acceleration will be poor if the flaps are fully extended because of excessive drag. The flaps are therefore retracted to establish the short- field take- off configuration. If the stall has been entered with partial flaps setting in the normal or short field configuration, the retraction is carried out once a positive rate of climb is established.

In order to minimize the loss of height during the recovery, it is important not too accelerate above IAS corresponding to the appropriate flap setting. Therefore, of the flaps are in the normal take off position, the pitch change to climb attitude must commence at 5 knots prior to reaching the normal climb IAS and if in the short – field configuration, 5 knots prior to reaching the climb IAS in that configuration. The flaps are fully retracted in stages, once a positive climb rate is established.

**Power on stall and recovery**

When stalling with partial engine power, the IAS bleeds off much slower compared to a power-off stall. The increased lift due to the thrust available, together with the increased airflow the wings and the tail – plane created by the propeller result in a reduced stalling speed.

During the stall entry, the aircraft will climb if the angle of attack is increased too quickly. This results in the aircraft attaining a high pitch attitude at the stalling angle of attack which can be quite discomforting. The VSI should therefore be closely monitored.

For recovery, full engine power is applied as the pitch is adjusted. Rotation to climb attitude commences at 5 knots prior to reaching the normal climb IAS.

**Approach to landing and recovery**

Lack of concentration during the approach phase of the flight can result in a progressive reduction of the IAS, resulting in a stall. At this phase of the flight the aircraft is most likely to partially configure and partially powered. The stall is therefore practiced in a similar configuration.

A point to note is that some propeller-driven aircraft have an increased tendency to drop a wing when stalling with power ON, 0 flaps extended. The pilot should try to prevent a wing drop during any stall by the correct use of the flight controls. The recovery from the wing drop is detailed in exercise 10.

**Stall in a turn**

The stall teaches the student pilot the correct technique that needs to be applied if the aircraft should stall in a turn. A stalled aircraft in a steep turn may either snap-out of the turn or there is a danger of it flicking over on its back. The stall is therefore demonstrated and practiced with the application of a shallow bank. A full stall in any turn should never be allowed to develop and can be prevented by taking the recovery action at the first warning of an approaching stall.

The stall is entered in clean configuration and the throttle and idle. A shallow bank of 20 degrees is applied as the angle of attack is increased . The recovery is initiated at the first warning of the approaching stall.

## 4.4 Circuit Procedures:-

1. Pilots are to conform to the recommended circuit patterns shown in the diagrams on display in the Club Trainees Room. Within the limitations of the ground tracks please abide by the following guide lines.
2. After take-off continue straight ahead or follow the noise abatement track until reaching 600 ft on QFE before turning crosswind.
3. Continue the climb on the crosswind leg until reaching the circuit height of 1000 ft on QFE, then turn downwind and report position when abeam the upwind end of the runway.

a) If delaying action is required by ATC to fit in an aircraft on a straight in approach then circuit traffic will be instructed to extend downwind leg until the straight in traffic is observed and then position behind. If there is only one aircraft downwind then this aircraft will be instructed to carry out an orbit on the downwind leg.

b) Pilots that extend their circuit unnecessarily and cause problems to others will be instructed by ATC to proceed to the dead side and rejoin the circuit.

c) Students flying solo may expect a full stop landing when doing circuit landing. A departure for further circuits will be strictly allowed only after new clearance for departure. Touch & go not allowed without an approved instructor on board.

d) When RWY 30 is in use, standard pattern is left hand circuits, and for RWY 12 right hand circuits, if any change it will be subject to ATC.

e) Height onto turn on final RWY 30 and 12 should be not below 2450ft

**For Practice Simulated Emergencies:-**

1. The Instructor/Examiner will request ATC permission;
2. Commence the go-around procedure at 500ft- open the throttle gradually;
3. Preferred Runways are RWY 09
4. When a left hand circuit is in force or directed by ATC for RWY climb past Chosen Hill before turning crosswind.
5. Pilots must not land before the numbers. However the full length of the runways is available for take-off.
6. Most of the departures for flying club will be intersection departures. But it's totally trainees will if he wants to use full length of runway. (AS IT'S A GOOD AND A SAFE PROCEDURE TO DO SO)
7. Operating outside of any defined runway area will invalidate our insurance.

**9) THE INCIPIENT SPIN (DEMONSTRATION – WING DROP RECOVERY)**

Since unequal lift generated by the wings results in a wing drop , an inadvertent yaw would complete the requirement of a full spin. It is imperative therefore, that the trainee is able to recognize the incipient stage and prevent the full development of a spin.

- Instructor to demonstrate a stall and allow or induce a slight yaw.
- The trainee recognizes the yaw by promptly steps on opposite rudder pedal and simultaneously moves the control wheel slightly forward of neutral position, thus canceling the conditions required for a spin to develop.

**10) THE NORMAL TAKE OFF AND INITIAL CLIMB**

- Unstick Speed -
- Climb Speed - Flap retraction will be at 300 feet AGL
- Climb Speed -
  Field elevation correction -

**11) THE STANDARD CIRCUIT**

- All Turns -
- Critical Altitude -
- Power -
- On Down Wind -
  A Beam Threshold -
- Power -
- On base leg -
- Configuration -
- Turn final -
- Establish Final -
- Short Final -
- IAS -
- Threshold IAS -

***Stabilized approach and landing:***

Approach must be stabilized with correct alignment, glide-path and speed. Pilot must check and call out "Alignment correct, perspective correct and speed correct". In case any large correction on the approach is required (significant change of engine power or more than one runway width off centerline); the pilot is to immediately initiate go-around.

***Go Around procedure:***

A successful Go-around requires that a positive decision be made and a positive action be taken. The procedure for a missed landing (Go around) is as follows:

a) Smoothly open full throttle and simultaneously bring the nose to the shallow climbing attitude.

b) Check wings level and trim the aircraft.
c) Speed coming to 70 knots, raise the nose to correct climbing attitude.
d) At 200 feet AGL, select flaps up in stages, throttle slightly back and trim the aircraft.