FINAL INVESTIGATION REPORT ON RUNWAY EXCURSION INCIDENT TO M/s. CHIMES AVIATION PVT LTD CESSNA 172R AIRCRAFT, VT-CAG ON 17.07.2021 AT DHANA AIRSTRIP, MADHYA PRADESH.

GOVERNMENT OF INDIA
OFFICE OF DIRECTOR OF AIR SAFETY (WR)
INTEGRATED OPERATIONAL OFFICE COMPLEX,
SAHAR ROAD, VILEPARLE (E), MUMBAI – 400099

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 13(1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation 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.

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ABBREVIATIONS

A/c	Aircraft
AMSL	Above Mean Sea Level
AOP	Air Operator Permit
ARC	Airworthiness Review Certificate
ASDA	Accelerate -Stop Distance Available
ATC	Air Traffic Control
CFT	Crash Fire Tender
CSN	Cycles Since New
CVR	Cockpit Voice Recorder
FDR	Flight Data Recorder
FRTO	Flight Radio Telephony Operator
GPS	Global Positioning System
IAS	Indicated Air Speed
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IR	Instrument Rating
LDA	Landing Distance Available
LHS	Left Hand Side
MEL	Minimum Equipment List
Operator	AOP holder of the incident aircraft
PAPI	Precision Approach Path Indicator

PDR	Pilot Defect Report
PIC	Pilot in Command
QNH	Pressure Setting to Indicate Elevation of Landing Aerodrome
QRH	Quick Reference Handbook
RA	Radio Altitude
RHS	Right Hand Side
RWY	Runway
SCT	Scattered
SOP	Standard Operating Procedure
SPL	Student Pilot's License
TO/GA	Take-off/ Go-around
TODA	Take-off Distance Available
TORA	Take-off Run Available
TSN	Time Since New
TWY	Taxiway
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VOR	Very high frequency Omni Range

FINAL INVESTIGATION REPORT ON RUNWAY EXCURSION INCIDENT TO M/s. CHIMES AVIATION PVT LTD CESSNA 172R AIRCRAFT VT-CAG AT DHANA, MADHYA PRADESH ON 17.07.2021

GENERAL INFORMATION

1.	Aircraft	Type	:	CESSNA
		Model	:	172R
		Nationality	:	INDIAN
		Registration	:	VT-CAG
2.	Name of the Owner/Operator		:	M/s CHIMES AVIATION PVT LTD
3.	Place of the incident		:	DHANA AERODROME, MADHYA PRADESH
4.	Date and time of incident		:	17.07.2021, approx. 0910UTC
5.	Pilot in Command		:	STUDENT PILOT LICENSE HOLDER
	Extent of Injuries		:	NIL
6.	No. of Passengers onboard		:	NIL
	Extent of Injuries		:	NIL
7.	Geographical location of site		:	Lat 021 Deg 19’ 43” N
	Of Occurrence (Lat. Long)		:	Long 074 Deg 57’ 40” E
8.	Last point of Departure		:	Dhana Aerodrome
9.	Point of intended landing		:	Dhana Aerodrome
10.	Type of operation		:	TRAINING FLIGHT (SOLO)
11.	Phase of operation		:	TAKE OFF
12.	Type of occurrence		:	RE: RUNWAY EXCURSION (OVERRUN)

SYNOPSIS

Cessna 172R aircraft VT-CAG, belonging to M/s Chimes Aviation Pvt. Ltd was involved in a Runway Excursion incident at Dhana aerodrome on 17.07.2021 during a training flight.

The student pilot was authorized for a general solo sortie flying (02 Circuits and Landings) on 17.07.2021. After completing the first circuit and landing uneventfully, the student pilot initiated the second takeoff on RWY 17 with ATC clearances. Crossing the middle markers, after rotation, the student pilot felt that the aircraft was not climbing but shivering. Considering that the Runway was consumed more than half length, and the aircraft not gaining height, the student pilot got anxious and decided to abort the takeoff. During the reject action, the power was reduced to idle and brakes were applied. The aircraft touched down on Runway near Taxi link 'B' and continued rolling. The aircraft did not stop but started drifting towards the right end of the Runway. The aircraft rolled further and moved out of the Runway end into the soft ground area. During its movement, the aircraft came in contact with one of the Runway end lights positioned on the right side of Runway. The aircraft passed over a small ditch near the perimeter fence during which the nose landing gear strut bent back. The aircraft came in contact with the metallic perimeter fence and then moved out of the airport perimeter over the metal fence bending it down. Passing down a small slope beyond the fence, the aircraft turned left and came to halt facing east. The tail of the aircraft was on top of one of the notice boards placed on road side. The Emergency services were activated and the student pilot rescued herself out of the aircraft unhurt.

The incident was reported to DGCA and the investigation was instituted under Rule 13(1) of Aircraft (Investigation of Accidents and Incidents) Rules 2017 by appointing Investigator-in-Charge.

The incident occurred in day time. The investigation revealed that improper checklist compliance by the student pilot to ensure the aircraft in takeoff configuration before takeoff roll resulted in insufficient speed achieved for lift off and subsequent takeoff abort. The speed at the time of touchdown and the shortage of remaining runway length available caused the aircraft to overrun the runway.

1. FACTUAL INFORMATION:

1.1 History of Flight:

On 17.07.2021, a Cessna C172R aircraft, registration VT-CAG was scheduled for training sorties at Dhana Airstrip in Madhya Pradesh. The preflight check including the ground run of

the aircraft was carried out by an authorized engineer and no observations were made. There were no pending snags or MEL invoked as per the records. The aircraft flew multiple sorties with different crew before the incident sortie. All the sorties were uneventful with nil sector snags.

On the day of incident, the student pilot reported to operations room of the academy at 0200UTC for the day's training and completed the BA declaration at 0310UTC, and then made entry in Authorization Book and dispatch documents. The authorization for flight to the student pilot was given by Dy. Chief Flight Instructor, for two solo sorties on the day. The first flight was on aircraft VT-CAC, a sortie of general flying which started at 0320UTC. A total of 01hours 05minutes was the total flying time of the first sortie. After completing the sortie successfully and uneventfully, the student pilot reported to the operations room for the next planned sortie which was on aircraft VT-CAG.

Aircraft VT-CAG was already flown by other crew before it was allocated to the incident involved student pilot. There were no snags entered in the Journey Log Book of aircraft VT-CAG post its previous sorties. The second sortie for the student pilot was solo circuit and landing including two takeoffs and landings. The preflight checks were carried out after completion of entry in authorization book and submission of dispatch form. Total fuel onboard before the flight was 122 liters. The preflight inspection was carried out by the student pilot and the inspection was satisfactory with nil observations. The flight rule of VT-CAG was VFR and the visibility recorded before the previous takeoff was 6000m. After successful preflight checks, start up, taxi and line up, first take off, circuit and landing was carried out.

During the landing roll, landing lights and fuel pumps were switched off by the student pilot and the flaps were retracted up. Post landing, back tracking on RWY 17 was carried out as per ATC instructions and thereafter lined up on RWY17 for the next takeoff. Upon lining up, the student pilot checked the seats and seat belts and also locked the cabin doors and windows. Upon receiving ATC clearance for takeoff, landing lights and fuel pumps were switched ON, brakes were applied, power increased to 1800rpm, however the flaps were not extended. Aircraft started rolling once brakes were released and once the aircraft attained a speed of 57kts (IAS), the control column was pulled to rotate the aircraft. The aircraft did not rotate as expected, instead started shivering upon crossing the middle marker. As and when the student pilot observed that the nose wheel of the aircraft went up in air, but aircraft was still rolling on main wheels and also when realizing that she doesn't have enough runway left, the take-off was aborted.

The student pilot dropped the nose slightly on the ground, followed by power to idle. The aircraft touched back on runway surface near to Taxi link 'B' and continued rolling

further. As runway end was approaching she started applying brakes fully so as to stop the aircraft on the runway itself. The aircraft did not stop on the runway but it kept rolling towards the right edge of the runway and then further out of the runway into the soft ground. There were runway end lights near to the right edge, one of which aircraft came into contact with and got damaged. The aircraft then passed over the small ditch prior to the perimeter fence which caused the nose landing gear strut to get bent backward. The propeller also hit the ground and got damaged during this movement. Further moving forward, aircraft came into contact with the metallic perimeter fence. The aircraft damaged the fence and bent it down further moved out of the airport perimeter over it. The aircraft passed down the small slope next to the fence and during its movement the horizontal stabilizer of the aircraft came in contact with one of the metallic notice boards placed on the road side. The aircraft tail got turned towards left with the tail pivoting on the board, and finally came to halt facing east.

Once the aircraft came to complete stop, the student pilot received an RT call from ATC advising to get out of the aircraft as soon as possible. The student pilot without any communication or delay, removed her headsets, hanged them on control column and tried to get out of the aircraft from left side of the aircraft However, as obstructions were found near the left door, she exited the aircraft via right door of the aircraft. The Emergency services were activated and the student pilot rescued herself out of the aircraft unhurt.

1.2 **Injuries to persons** :

Injuries	**Crew**	**Passengers**	**Others**
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/None	01	Nil	Nil

1.3 **Damages to Aircraft :**

The aircraft sustained following damages:-

i. RH main landing gear fairing assembly (Part no: 0541193-8), was damaged.
ii. RH wing leading edge skin and rib near wing tip (WS 208) damaged, RH wing leading edge near WS 100 near wing strut attach point damaged.(Part no:- 0523029-4, 0523028-20 & 0523034-2).
iii. RH wing-NAV light cover broken (Part no: 0723205-10).
iv. Skin Aft Fuselage RH & Tail cone Fairing, (Part no. - 0512008-4 & 0530011-2) were found bulged/damaged.
v. Fairing attachment point of vertical fin near FS 205.91 sheared-off (Part No-0531012-2).

vi. Tail section at bottom between FS 205.81 TO FS 228.68 damaged.
vii. Bulging/damage on LH side aft fuselage skin (empennage area)-(Part no-0512008-4 & 0530011-2).
viii. LH and RH angle (Part No. 0512001-7 & 0512001-8) was found damaged.
ix. LH side aileron skin upper and lower outboard (part no- 0523800-8 & 0523800-12) damaged.
x. LH side NAV light cover and wingtip assembly (Part No- 0723206-1) was damaged.
xi. LH wing skin leading edge outboard (Part no- 0523029-5) and 02 ribs at WS 172.00 & WS 190.00 (part no. 0523034-1 & 0523035-1) found damaged.
xii. LH Landing Gear Fairing Assembly (Part No- 0541193-7) found damaged.
xiii. Lower cowling (Part no- 0552242-7) found damaged.
xiv. Nose Landing Gear Lower & upper fittings (Part no- 0543016-1 & 0543013-1) were found damaged.
xv. Nose landing gear lower portion (Part no- 0543062-20) was damaged.
xvi. Nose wheel LH and RH steering tube assembly (Part No.-MC0543022-1C & MC0543022-1C) is damaged.
xvii. Shimmy Dampener is found damaged (Part No.- SE-1051-2)
xviii. Fuselage Skin Lower, LH & RH Angle. (Part no.-0513520-18 & 0513000-10 & 0513000-9) was damaged.
xix. Bottom side of Aircraft Firewall (Part No- 0553031-20) damaged.
xx. Lower firewall Reinforcement sheet (Part No- 0553046-1) found damaged.
xxi. Bulkhead Assembly LH & RH tunnel (Part No- 0513363-23 & 0513363-22) found damaged.
xxii. Bracket Assembly Aft & LH & RH Angle, (Part no- 0513359-6 & 0513369-1 & 0513369-2) was damaged.
xxiii. Bulkhead Assembly LH & Anchor LH, (Part No- 0513053-5 & 0513488-11 & 071364-2.)
xxiv. Firewall Angle, (Part no.-0513577-1 & 0513577-2 & 0513109-9 & 0553006-4) was damaged.
xxv. Angle LH & RH Center (Part No- 0513109-11 & 0513109-09 & 0513109-7) got damaged.
xxvi. Weld Assembly & Bearing Assembly (Part No- 0411306-14 & 0411306-25 & S1674-1 & S1675-1) was damaged.
xxvii. Aircraft Propeller (Part No- MTV-6A/187-129, S/N- 061157) and Propeller Spinner (Part no.-B-426_P-1071) damaged.
xxviii. Engine (Part No- TAE-02-02-99, S/N- 02-02-04827) and engine mount (Part No-20-7120-H008101) found damaged.

Fig. 01 Damage to the starboard wing leading edge

Fig. 02 Damage to the port side wing leading edge

Fig. 03 Bulging on LH side empennage area

Fig. 04 Propeller damage

Fig. 05 Damage to bottom part of tail section

Fig. 06 Damage to the bottom cowling

1.4 **Other Damage :**

1. Damage to 01 Runway end light (RWY 17 RH far end) due aircraft hit.

Fig. 07. Damage to RWY 27 end light

1.5 **Personnel Information :**

The details of the licenses and ratings are as follows:-

1.5.1 Pilot in Command:

Pilot	Student Pilot License Holder
Age	19 Years
Date of Issue License	11.03.2021 (SPL)
Licence Valid Upto	10.03.2026 (SPL)
Category	Aeroplane
Class	Single Engine Land
Endorsement as PIC	C-172
Date of Medical Exam	18.12.2020
Medical Exam Valid up to	17.12.2022
FRTO Licence Date of issue of	10.05.2021
FRTO Licence Valid up to	09.05.2031
Total Flying Experience	55:00 hrs
Experience on type	55:00 hrs
Experience as PIC on type	18:05 hrs
Last flown on type	17 July 2021
Total Flying Experience during last 180 days	55:00 hrs
Total Flying Experience during last 90 days	36:35 hrs
Total Flying Experience during last 30 days	26:55 hrs
Total Flying Experience during last 07 days	10:55 hrs
Total Flying Experience during last 24 Hours	01:05 hrs

Upon scrutiny of the records, student pilot had her last flight on same day of incident (0320Z departure) during which she flew 01:05hours in C-172 aircraft VT-CAC.

1.6 **Aircraft Information :**

Airframe details	
Manufacturer	CESSNA AIRCRAFT COMPANY
Type	Cessna 172 R
Aircraft Registration	VT-CAG
Manufacturer Sl. No.	17281483
Year of Manufacturer	2007
Certificate of Registration No.	3728/2
Certificate of Airworthiness No.	4037
C of A issued on	08.04.2008
ARC issued on	07/07/2021
ARC Valid up to	08/07/2022
Category of C of A	Normal
Subdivision category of C of A	Passenger
Minimum Crew necessary	01
Aircraft Empty weight	831.25 Kg
Maximum all up weight	1111.00
Date of aircraft weighment	24/02/15
Last major Inspection	P3-600 Hrs./01 Year Approved Inspection
Last major Insp. Carried out on	16/07/2021
Airframe hours Since New	10859:35 hours TSN
Airframe Hours Since last ARC	16:35 Hours
Aircraft usual station as per C of R	Dhana Airport, Sagar (M P)
Aero mobile License No.	A-043/003-RLO(NR)

Engine details	
Manufacturer	Technify Motors GmbH
Type	TAE 125
SI NO	02-02-04827
Engine hours Since New	600:55 hours
Engine hours Since O/H	600:55 hours
Date of O/H	18/12/2018
Last major Inspection	P3-600 Hrs./01 Year Approved Inspection
Last major Inspection carried out on	16/07/2021
Average Fuel consumption as per fuel/oil register	16.00 Ltr/Hrs.
Manufacturer specified Max. fuel Consumption	28.00 Ltr/Hrs.
Average Oil consumption as per fuel/oil register	0.10 Ltr/Hrs.
Propeller details	
Manufacturer	MT Propeller
Type	MTV-6-A/187-129
SL. No	061157
Last major Inspection	P3-600 Hrs./01 Year Approved Inspection
Last Major Insp. Carried out	16/07/2021
Total hours Since Overhaul	600:55 hours

Nil snags were reported by the previous sector crew on the aircraft and no snag was pending for rectification. No DGCA mandatory modifications were pending. Also at the time of incident there was no MEL invoked on this aircraft. The aircraft and its engine are maintained as per the DGCA approved maintenance program. The inspection details as per Aircraft Maintenance Program are as follows:

Sl.no	Inspection Schedule	Document Reference no.
1.	P1-50HRS/01 MONTH	CAPL/CAMO/172R(STC)/ MCS-001
2.	P2-100HRS/02 MONTHS	CAPL/CAMO/172R(STC)/ MCS-002
3.	P3-600HRS/01YEAR	CAPL/CAMO/172R(STC)/ MCS-003
4	ANNUAL RADIO INSP	CAPL/CAMO/172R(STC)/ MCS-004

1.7 **Meteorological Information:**

Dhana aerodrome is equipped with an Automatic Weather Station setup at the ATC tower which provides MET data from the internet. As per the predicted records maintained at ATC, on 17.07.2021 for Dhana aerodrome for time 0830UTC, winds were 162/06kts, visibility 6000m, clouds SCT060, QNH 1006 and temperature 36 degree Celsius. The METAR register at the ATC shows that the met information is normally recorded every two hours during the active hours. There is a wind measuring anemometer within the aerodrome along with two windsocks. The forecasted weather at Dhana aerodrome for the incident date as per METAR records is as follows:

Time → (IST)	**0600**	**0800**	**1000**	**1200**	**1400**	**1600**	**1800**
Wind	200/04	180/08	200/12	202/08	162/06	182/06	183/06
Visibility	6km	6km	6km	6km	6km	6km	6km
Clouds	Fine	Fine	Cloudy SCT 040 BKN 060	Cloudy SCT 050	SCT 060	SCT 070	SCT 080
Temp	25^0c	25^0c	28^0c	32^0c	36^0c	36^0c	33^0c
QNH	1008	1009	1009	1007	1006	1006	1006

As per the Garmin data, the average wind speed recorded during the second takeoff was 2.9knots.

1.8 **Aids to Navigation :**

Dhana aerodrome is not equipped with any navigational aids except windsock. All the flying activities are based on Visual Flight Rules.

1.9 **Communications :**

At the time of incident, aircraft was having two way communications with the ATC personnel at the tower frequency 122.60MHz. There is no recording facility available at the ATC to record the communications. There was no snag reported in the communication system of either the aircraft or the ATC.

1.10 Aerodrome Information :

The Dhana Airstrip is located in Dhana, in Sagar District, Madhya Pradesh and is near to Sagar, Damoh, Khurai and Bina. Dhana airport is the home base of Chimes Aviation Academy (CAA). The aerodrome is situated at an elevation of 1709ft with coordinates of Lat 023 Deg 45' 14" N and Long 078 Deg 51' 21" E. It has a 3000*75 feet asphalt runway with runway lights installed and a dedicated apron which can accommodate 10–12 small aircraft. The Dhana airfield is not a critical airfield and is used for flying training by CAA. Other than CAA, the airfield is often used by Madhya Pradesh Government Aviation and VIP charter aircraft as well as Medical evacuation flights. There are no radio navigation aids available, the runway orientation is 352–172 (35–17). The air traffic control (ATC) is staffed by the academy during normal working hours. There are no facilities available for ATC tape recording/SMGCS recording at the airport. Night operations are limited to local training flights of CAA. Weather is usually stable, with strong cross winds.

1.11 Flight Recorders :

The aircraft is not equipped with either a Cockpit Voice Recording facility or a flight data recorder. The aircraft is equipped with Garmin navigation system which records and stores the basic flight parameters in a memory card.

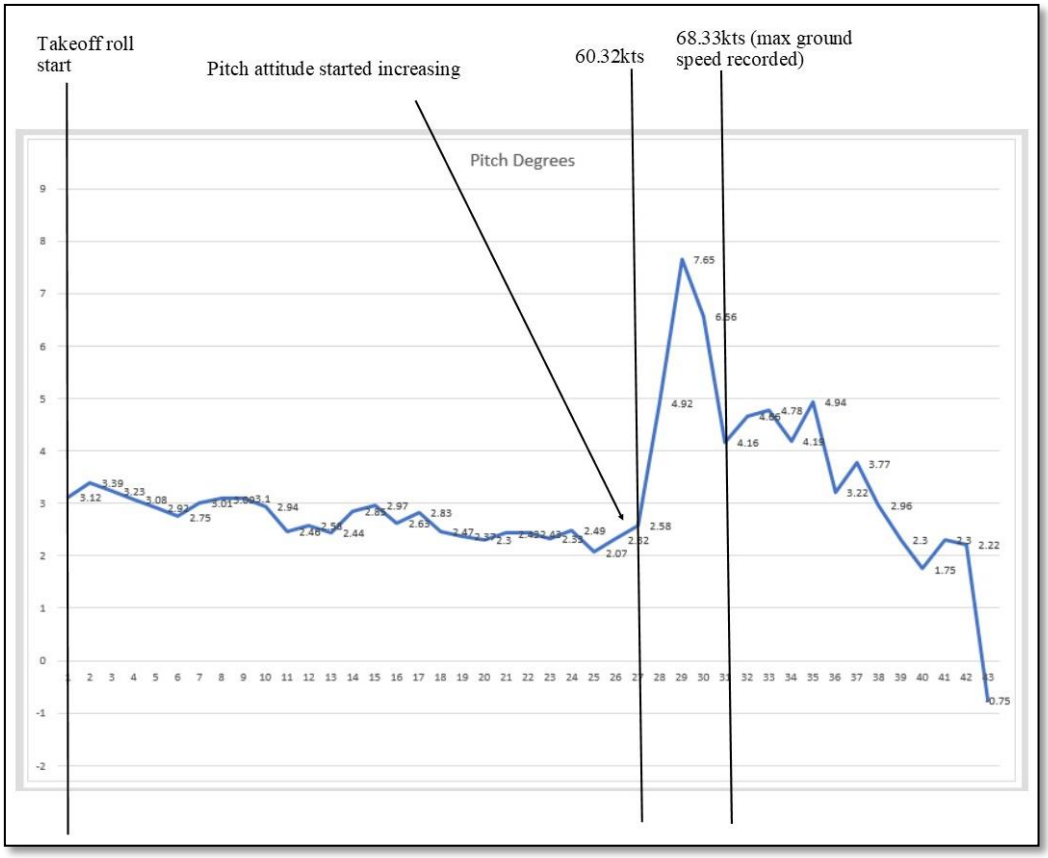

Fig.08 Pitch degree vs relevant time

Based on the data collected from the Garmin memory card, the following observations are made.

The first takeoff and landing was uneventful and the aircraft after the first landing on RWY 17, back tracked from near the Taxiway 'B' and lined up for the second take off. The aircraft started rolling for the second takeoff at 14:43:21hrs (local time) on RWY 17. The pitch angle started increasing at a ground speed of around 60kts and reached a maximum pitch angle of 7.65 degrees. The maximum ground speed attained by the aircraft is 68.33kts during which the pitch angle was 4.16degrees. The aircraft had a pitch angle of 4.19degrees near TXWY B and 3.77degrees near to TXWY A.

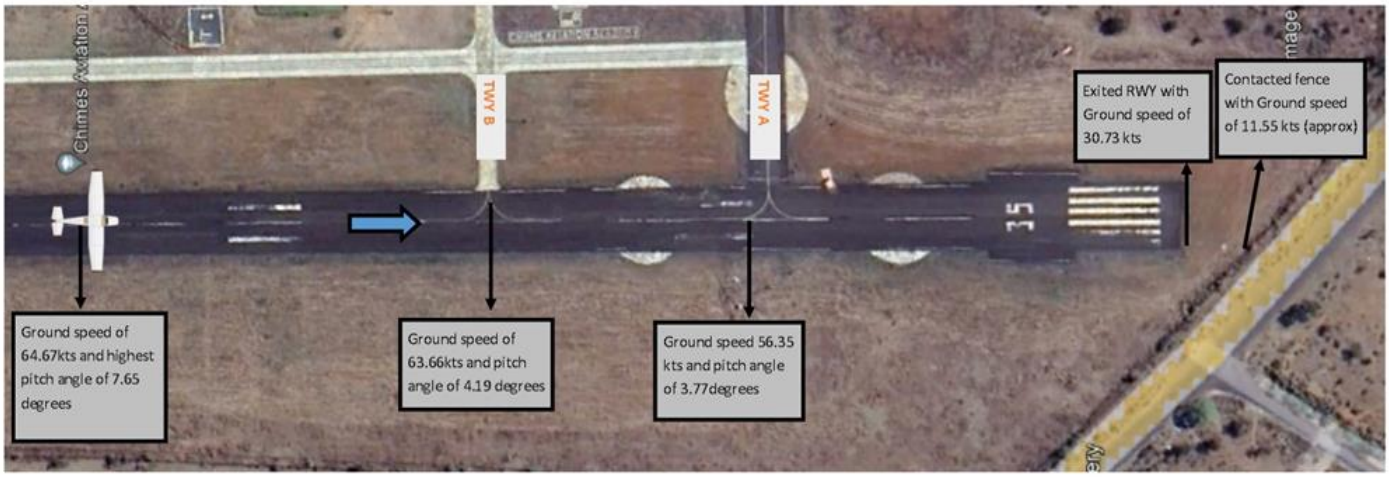

Fig.09 Aircraft ground speed and pitch correlation

The aircraft exited the runway with a ground speed of 30.73kts and contacted the fence with an approximate ground speed of 11.55kts.The average wind speed recorded by the aircraft during the second takeoff roll was 2.9kts. The data of the Mean Sea Level Altitude shows that the aircraft height had not increased more than 10ft from the ground surface. The brake parameters are not recorded in the Garmin data.

1.12 **Wreckage and Impact Information :**

The actual location of touchdown could not be identified hence approximate touchdown location was obtained from the witness statement. The aircraft made the touchdown on RWY surface near to TXWY 'B' at around 2364ft from the RWY 17 beginning. The latitude longitude positions extracted from the Garmin system shows the path followed by the aircraft from the takeoff roll till halt. (Refer fig 13). The perimeter fencing of the airport is located at a distance of 68ft (perpendicular distance) from Runway end. The road is at a distance of 44ft from the fencing. The metallic sign board at the road side is at a perpendicular distance of 16ft from the fencing. The aircraft while moving out of the soft ground, came into contact with the metallic perimeter fence and damaged it and then

rolled over it towards the road. The aircraft passed down the small slope next to the fence and during its movement the horizontal stabilizer of the aircraft came in contact with one of the metallic notice boards placed on the road side. The aircraft got turned towards left with the tail pivoting on the board. The final position of the aircraft was facing east with LH horizontal stabilizer resting on the metal board and aircraft was at a distance of 82ft from the Runway end, measured perpendicular. The flap lever in the cockpit (in-situ) was found in Flaps 0 (UP) configuration. The engine controls were in switched off position and elevator trim NOT in takeoff position.

Fig. 10 Aircraft position after coming to halt (tail resting on notice board)

Fig. 11 Aircraft position after coming to halt (view from road side).

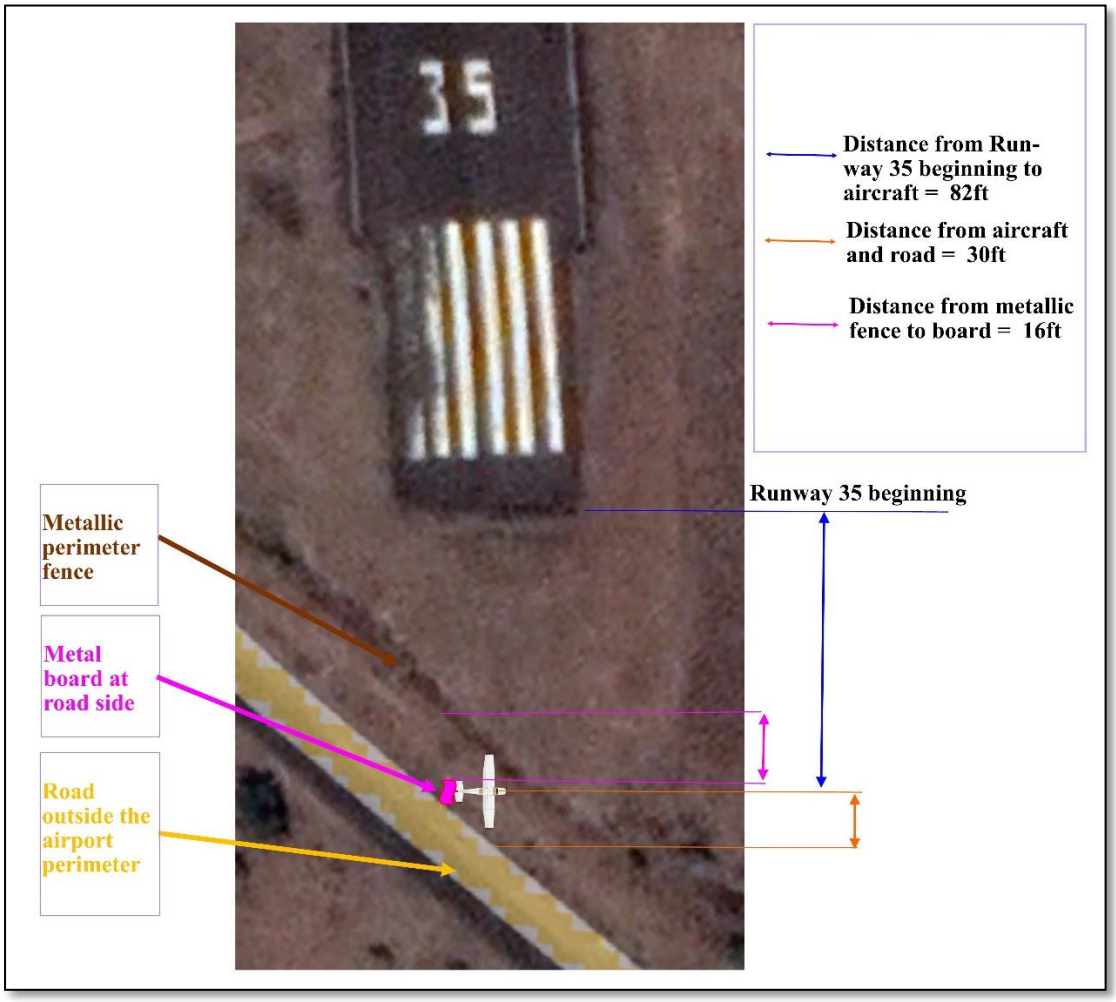

Fig.12.Aircraft position after coming to halt- aerial representation (not to scale)

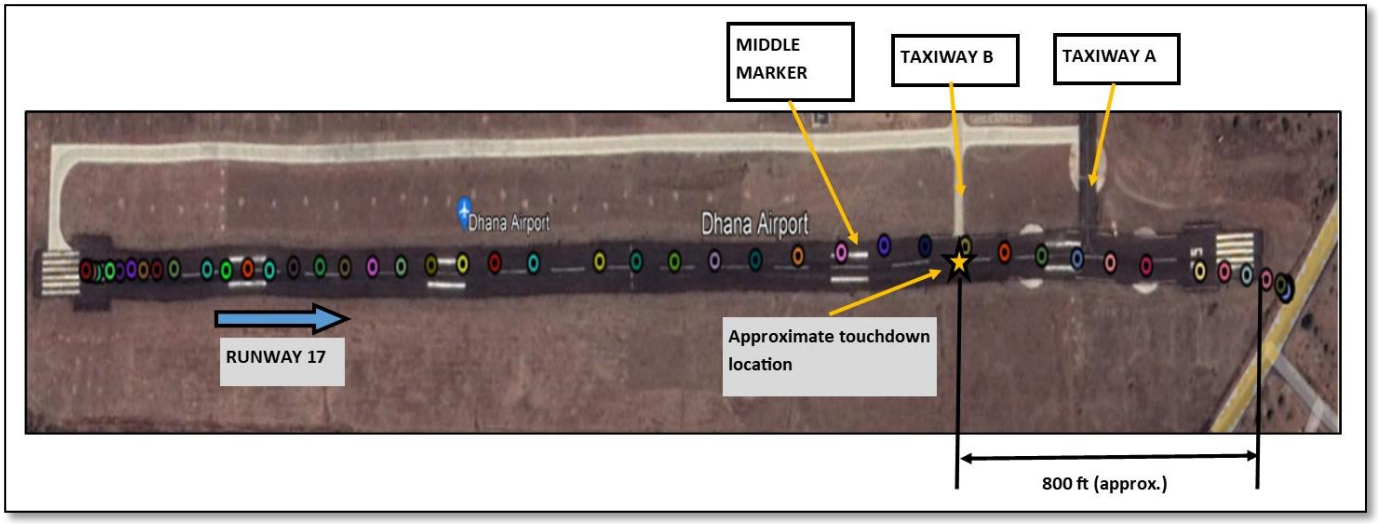

Fig.13.path followed by the aircraft on the runway (aerial view)

1.13 **Medical and Pathological Information :**

There was no injury to the trainee pilot and no injury to any person on ground. The student pilot had submitted the self-declaration with regards to the non-consumption of alcohol before undertaking the flight. The student pilot was subjected to medical checkup after the incident and the doctor observed no injury and no sign of alcohol presence.

1.14 **Fire :**

There was no fire or smoke before or after the incident.

1.15 **Survival Aspects :**

The incident was survivable. The crash siren and fire alarm was activated by ATC. Ambulance and Firefighting facilities reached the site however the student pilot came out of the aircraft unhurt on her own.

1.16 **Tests and Research :**

The fuel and oil sample collected from the incident aircraft were sent to Aircraft Engineering Directorate, O/o DGCA, New Delhi to check the quality on various specifications. The samples were tested and found passed in the respective specification tests. Also the aircraft engine was removed and send to its manufacturer, M/s Continental Aerospace, Germany for detailed strip inspection along with FADEC data. As per the inspection carried out, they concluded that the subject engine was not having any abnormality and worked well within its specifications. From the parameters recorded in FADEC system no warnings were generated from the engine during the flight.

1.17 **Organizational and Management Information :**

Chimes Aviation Academy (CAA), a division of Chimes Aviation Pvt Ltd, New Delhi is one of the Flying Training Organizations (FTO) in India, set up in June 2008, at Dhana Airport, Sagar, Madhya Pradesh. CAA is structured under the management of the Accountable Manager. The FTO is approved by DGCA vide approval no. 04/2015 and had validity till 20.04.2022 (at the time of incident). The academy uses DGCA approved Training and Procedure Manual for carrying out flying training. Chimes Aviation Academy has been established primarily to provide various flying and ground training to students.

The Engineering setup at the academy is under the approval system of DGCA and is an "Approved Maintenance Organization" and an approved "Continuing Airworthiness Management Organization" to cover maintenance and continuing airworthiness activities of aircraft, engine, instruments, radio communication, navigation equipment and battery installed on the aircraft operated by the academy.

1.18 **Additional Information :**

1.18.1 As per student pilot's statement:

- The student pilot was authorized by Dy.CFI for two solo sorties on the day. First sortie of solo general flying was conducted in aircraft VT-CAC uneventfully.
- Second sortie was planned in aircraft VT-CAG for solo circuit and landing.
- After successful preflight checks, start up, taxi and line up, first take off circuit and landing was completed satisfactorily. During landing roll, landing lights and fuel pumps were switched off and Flaps were made up. After landing, as per ATC instructions, back tracking on RWY 17 was done and lined up for the next takeoff.
- On line up, checked whether seats and seat belts were correct and cabin doors and windows were locked. Upon receiving ATC clearance, landing lights and Fuel pumps were switched ON, brakes were applied, power increased to 1800rpm. At IAS 57kts, the control column was pulled to rotate the aircraft but unexpectedly the aircraft didn't rotate. The whole aircraft started shivering after crossing the middle marker.
- As it was observed that nose wheel of the aircraft went up but aircraft was still rolling on main wheels and also realizing that she don't have enough of the runway available, the take-off was aborted.
- The student pilot dropped the nose slightly on the ground, followed by power to Idle, and started applying brakes. After aborting the take-off, while applying the brakes, she could see the end of the runway, so applied brakes with all strength to make the aircraft stop on the runway but it kept rolling and hit the fence. As she gained back senses, aircraft was out of the fencing of academy perimeter.
- Once the aircraft came to complete stop, the student pilot could not complete the aircraft shutdown procedures. She received an RT call from ATC advising to get out of the aircraft as soon as possible. After listening to it, without any further communication, the student pilot removed her headsets, hanged them on control column and tried to get out of the aircraft from left side. However, she exited the aircraft via right door of the aircraft as obstructions were found near the left door.
- The student pilot suffered no injury subsequent to incident.
- The student pilot had practiced flapless landings but no flapless takeoffs were practiced during training.

1.18.2 As per Dy.Chief Flight Instructor's Statement:

- The student pilot was authorized for her solo circuit and landing on 17 July 2021. Her first circuit and landing was normal. The incident happened during the second sortie.

- After coming to full stop post first landing, she lined up for the second circuit and landing. On the takeoff role she aborted the takeoff. She was unable to stop the aircraft within the runway, hit to fence and came to a halt about 20 to 30 feet after the end of the runway. She came out of the aircraft on her own and waited on the side.
- Dy. CFI came to know about the incident after hearing the emergency siren raised by the ATC. He rushed to the aircraft site and observed that the student pilot was uninjured and aircraft had come to a stop. The propeller and spinner was completely broken and left with one blade, the a/c nose was toward East direction tilted downward with nose strut bent backward, and the tail was in upward position. When the cockpit was checked he observed that the Engine Master, Electrical Master were in OFF position, Fuel selector in BOTH position, Flaps UP, Trim was not in Takeoff position. The student pilot's belongings were on the rear seat. There were damages on wings and fuel was leaking from wing root position. The crash crew were already at the site. Then he along with crash crew and maintenance team took charge of the scene of the incident.
- The student pilot joined Chimes Aviation Academy on 22 February 2021. SPL Classes was conducted along with her batch and SPL was issued on 11 March 2021. She was assigned to one of the instructors on 20 March 2021. She started flying on the same date and had her Progress Check on 04 June 2021 and it was satisfactory. During the progress, the instructor of student pilot requested Dy.CFI to fly with student pilot.
- Dy.CFI had flown with her for 03:20hrs and her solo check was conducted by him and released for first solo on 23 June 2021. Her first solo was satisfactory. She was assigned back to her instructor and continued her progress as per syllabus and her progress was found satisfactory in dual and solo hours.

1.18.3 <u>As per ATC controller's statement (Witness):</u>

- The Air traffic controller took over duties at ATC on 17 July 2021 from 0830UTC. Nothing unusual was observed while the student pilot performed her first circuit.
- At about 0910 UTC, gave clearance for VT-CAG to take off from Runway 17. On take-off roll as the aircraft approached abeam ATC, it was observed that aircraft was not getting sufficient height at or after crossing middle marker. When the aircraft approached tower, aircraft was in air and was almost parallel to Runway.
- Controller transmitted on RT to the aircraft to PULL-UP. But only "sir" was heard on RT from the aircraft. Immediately after that the aircraft touched down on the Runway near to B link. After the aircraft was on the Runway, white smoke was observed from main landing gear. Shortly after that, the aircraft started drifting towards right end of the Runway.
- At that time everybody concerned were alarmed by raising the siren and in that process aircraft overrun the Runway and came to a stop. All the emergency vehicles rushed to

the aircraft site and reached the site in less than a minute and took charge at the scene of incident.

1.18.4 Site visit observations:

The visit to the incident site was carried out along with the Dy.CFI on 30.07.2021. No markings were available on the Runway or the soft ground at the end of Runway. It was observed that the perimeter fence was of 06 feet height. The Runway end light which was damaged during the incident was found replaced and was serviceable. The aircraft final position was demarcated using chalk powder and stones. The damaged fence was found restored. The Runway 17 end area near threshold markings were found degraded with loose pebbles. There was no CCTV recording facility at both the Runway ends to capture the approach and landing profile.

1.18.5 Progress of training:

The student joined the flying school in February 2021. First air experience was on 20.03.2021. The Progress check of the student pilot was carried out by the Dy.CFI after total flying of 24hrs 05minutes only (as per syllabus generally after flying time of 11hrs, but as on student improvement). The first solo check was carried out by CFI after a total flying time of 30hrs 10minutes only (as per syllabus after flying time of 15.45hrs), however the check was satisfactory. Remarks of instructors and the time period taken by student pilot during progress of training shows that the she had to concentrate more on takeoff and needed consistence/confidence, as the improvement was slow.

The period of training during checks were found to be not in harmony with the approved syllabus hours as in many cases according to the training records, the checks were happening for less hours than required in the syllabus. (eg. First solo check circuits and landings were done only for 30minutes whereas the syllabus mandates for 45min). The student pilot was in the second phase of her training as per the syllabus. The solo checks were satisfactory and no negative remarks were observed in the training records. During the training progress, flapless landings were practiced however flapless takeoffs were not practiced so far as the curriculum of training does not have flapless takeoffs to practice. The instrument flying was started after completing 53hours of flying time on 15.07.2021. The previous sortie before the incident sortie was carried out on same day on another aircraft which was a general flying and was uneventful. The Flying Trainee's progress as per the records was found satisfactory and no history of any incidents were observed. As per the statements recorded**,** at the time of incident**,** the instructor of the student pilot was in classroom attending an online class.

1.18.6 POH and other SOPs:

- According to Pilot Operating handbook, as per the procedure for normal take off, the wing flaps are preferred to be at 10 degrees. The wing flaps to be retracted at a safe altitude. Also the elevator trim control to be set for takeoff.
- As per Chimes Aviation Academy SOP #10 (Issue 02 dated 15.06.2020), for normal approach and landing, the pre landing checklist to be completed before reaching finals. Thereafter landing checklist to be carried out. For normal landing, the wing flaps (below 85kts) to be selected from a range of 10 deg to FULL flaps as per the conditions. If flaps are FULL, airspeed to be maintained between 60-70kts. The elevator trim control to be adjusted as required.
- As per the same SOP, Post landing when clear of the active runway (aircraft tail past the Holding point), the Pilot Flying is to STOP the aircraft and complete the after landing checks. The after landing checklist requires the FLAPs to be made UP.
- According to the Flying Order Book of Academy, as per order 4/1 (Requirements of solo flying) dated 01.07.2020, all solo flights to be carried out under the supervision of a flying instructor.

1.19 **Useful or Effective Investigation Techniques :**

Nil

2. ANALYSIS :

2.1 Operational aspects:

On the day of incident, the student pilot was authorized to carry out 02 solo sorties by the Dy.CFI. Enough rest was there for the student pilot before the first flight. The student pilot reported to operations room at 0200UTC, and after finishing the briefing and documentation work, reached the aircraft allotted to her i.e VT-CAC and carried out the preflight checks. The sortie which was about 01hour 05minutes was completed uneventfully. After the sortie she reported to operations room for her next planned solo sortie. The aircraft allotted for the second sortie (02 circuits and landings) was VT-CAG.

After necessary documentation works, the student pilot carried out the preflight checks of the aircraft. Upon successful completion of the preflight checks, the aircraft was taxied and lined up on RWY 17 for first takeoff. After getting clearance from ATC, the takeoff was carried out, completed the circuit and later landed back (Full stop landing) on RWY 17. The first circuit was satisfactory and uneventful. During the landing roll, as part of the 'after landing checks', the landing lights and fuel pumps were switched OFF by the student pilot. Also the flaps were retracted to UP position.

Thereafter, ATC was requested to permit for backtrack on RWY 17 and the same was cleared by ATC. After lining up for RWY 17 for the next takeoff, permission for takeoff was requested. The before takeoff checks were carried out partially during which, the elevator trim was not kept in takeoff configuration and also the wing flaps were not extended to 10degrees. After getting the departure permission, the landing lights and fuel pumps were switched ON, brakes were applied, increased the engine power for takeoff, as per the takeoff checks. Once the brakes were released, the aircraft started rolling forward.

The student pilot didn't realize that the takeoff configuration was not set as required, and continued to takeoff. The student pilot was expecting the aircraft to behave as in normal takeoff configuration, but the aircraft was not responding as expected at the rotation speed. The student pilot rotated the aircraft at the usual rotation speed, however since the takeoff configuration was not normal, the aircraft was not acquiring sufficient lift at that speed and was not gaining height after lifting off the ground. Instead aircraft started shivering due to the insufficient generation of lift. As the student pilot felt the same, she decided to reject the takeoff immediately.

The speed at which the rotation initiated was 60kts. The ground speed at the time of maximum pitch attitude achieved (7.65^0) was 64.67kts. As part of rejecting the takeoff, the aircraft nose was dropped down and throttle was reduced. The aircraft after gaining a little height from ground, landed back and continued rolling. By the time the aircraft started rolling on ground with a ground speed of 63.66kts (near to TXWY 'B' link), remaining RWY length available was nearly 800ft. Seeing the RWY end the student pilot applied brakes with full strength however, she could not stop the aircraft within the available RWY length and continued rolling further. The aircraft then moved out of RWY along the right edge of RWY and ran over one of the RWY end lights and further moved towards the perimeter fencing, passing over a small ditch. The nose landing gear collapsed when the aircraft came in touch with the banks of the ditch. The propeller and spinner cone got damaged during the aircraft's movement. The aircraft moved over the fence out of airport perimeter and came to complete stop with its nose facing east and the tail resting on the notice board. After hearing the RT call from ATCO, the student pilot managed to come out of the aircraft unhurt through the RH door. The emergency services and Dy. CFI reached immediately at the site and took over the control of the site. The student pilot was immediately taken to hospital for preliminary analysis and no injury observed. Presence of alcohol was not observed during the checks.

From the incident site photographs it is observed that the engine controls were in switched off position, throttle was in 'IDLE'. Flaps were in 'Flaps 0' configuration and elevator trim was NOT in takeoff position. From the Flying Trainee's Progress Records and the previous flying training school records, no incident history was observed during the student pilot's

training period. The instructor of the student pilot was at the classroom during the time of incident flight and hence it is clear that he was not monitoring his student's flight which is against the requirements of solo flying as per Flying Order Book of the academy (order 4/1 Requirements of solo flying, dated 01.07.2020). Also from the progress training records it is observed that, though as per the approved syllabus the first solo check (circuit and landing) need to be for a time period of 45minutes, the actual time completed by the student pilot during her first solo check was only 30 minutes.

As per the statements collected and the in-situ condition of the aircraft, it is evident that noncompliance of before takeoff checklist and aircraft handling by the student pilot was the prime factor to the incident.

2.2 Weather aspects:

The incident occurred in day time with visibility of 6000m. The records available in METAR register also shows that the weather parameters were conducive for general flying. Hence weather is not considered a factor to the incident.

2.3 Engineering aspects:

All the maintenance/airworthiness documents pertaining to the aircraft VT-CAG was valid at the time of incident. No scheduled inspection was found due on the aircraft before the incident flight. The engine run up and the daily inspection as per schedule performed by approved engineer was satisfactory. No snags were reported by the crew who operated the aircraft before the incident sortie and no snag was pending for rectification before the incident sortie. No DGCA mandatory modification was due on this aircraft and no MEL was invoked at the time of incident.

The aircraft had 122 litres of fuel in tanks and 5.5litres of oil in sump before the chocks off. The fuel and oil samples collected from the aircraft post incident was tested and found within the specification criteria limits. The brake pads were normal and within limits and the brakes were working at the time of incident. The tires were not damaged during the braking and found without any wear. There were no snags reported to the brake system of the aircraft in the near past. No leakage or damage to the brake units were observed after the incident. However, the effectivity of application of brakes by the student pilot could not be verified from Garmin data as the brake parameters are not recorded. The movement of flap system was checked and was found satisfactory. The engine was removed and send to manufacturer for detailed strip inspection. As per the strip inspection carried out by M/s Continental Aerospace and the analysis of FADEC data, the subject engine worked well within its specifications and there were no warnings reported from the engine.

Therefore, the aircraft was considered airworthy before the incident flight and the maintenance factor is ruled out.

3. CONCLUSION:

3.1 Findings:

i. The aircraft was having valid Certificate of Airworthiness (CoA) and Airworthiness Review Certificate (ARC) as on date of incident. The serviceability factor of the aircraft was not a contributory factor to the incident.

ii. Licenses, medical fitness and currency on Cessna 172R of the student pilot were valid at the time of incident.

iii. The student pilot had authorization from Dy.Chief Flight Instructor to carry out general solo flying of circuits and landings and had sufficient rest before the first flight of the day.

iv. The first flight of the day was carried out in another aircraft and was uneventful.

v. Sufficient quantity of fuel and oil of correct specifications was available in the aircraft VT-CAG.

vi. The incident happened during day time and visibility was favorable for general flying.

vii. The aircraft operated within its Center of Gravity and weight limits. The first takeoff and landing of the sortie prior to incident was uneventful.

viii. The student pilot before the second takeoff, did not complete the before takeoff checklist actions. As a result, the flaps were remained in zero position (not extended) and the elevator trim was not set to takeoff configuration. The student pilot continued to takeoff without realizing that the flaps and elevator trim were not set, as done normally.

ix. The aircraft was not gaining height as expected by the student when pitch attitude was increased for takeoff. The aircraft started vibrating due insufficient speed achieved for lifting up, as the configuration set was not.

x. The incorrect aircraft configuration was not realized by the student pilot. The inadequate height gain (as expected) along with vibration, made the student pilot to abort the takeoff even after the rotation speed.

xi. The flapless takeoff was not practiced by the student pilot before, as it was not mandated in the syllabus. Only briefing on flapless takeoff was provided during the progress of training.

xii. The student applied brakes upon touchdown to stop the aircraft on the RWY however the aircraft did not stop within RWY length limits. The available runway

length after touchdown considering the flaps up configuration was marginal to stop within the limits.

xiii. There was no damage to the tires due braking. The brake pads were found normal and within limits and the brakes were working at the time of incident. There were no snags reported on brake system in the near past as per records.

xiv. The damage to the RWY end light assembly was due to the aircraft overrun during its exit out of the RWY.

xv. The runway 17 end portion was found degraded with loose pebbles during site inspection.

xvi. The monitoring the student's flight was not carried out by the instructor from either ATC or apron area as he was in the classroom at the time of subject flight, which was against the procedure.

xvii. The first solo check of the student pilot was only for a period of 30minutes instead of 45minutes which is not in accordance with the approved flying syllabus.

xviii. There was no injury to neither the student pilot nor any other person outside the aircraft.

xix. There was no fire or smoke during or after the incident.

3.2 Probable Cause:

The student pilot's decision to abort the takeoff above rotation speed with marginal runway available caused the aircraft to overrun the runway. The non-adherence to before takeoff checklist items leading to incorrect aircraft configuration was a contributory factor.

4. SAFETY RECOMMENDATIONS:

- Action as deemed fit by DGCA-HQrs in view of the findings viii, xv, xvi and xvii.
- DGCA-HQrs may review the syllabus of flying training with respect to emergency practices and consider to include the flapless takeoffs as part of it, in view of the above findings.

VINEETH SREEKUMAR
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2022.12.28 13:05:28+05'30'

Date: 28.12.2022 (Vineeth S)
Place: Mumbai Investigation-In-Charge, VT-CAG

----End of report—