



सत्यमेव जयते

**Final Investigation Report**  
**on**  
**Accident to M/S Rajiv Gandhi Academy for Aviation Technology,**  
**Cessna 172R Aircraft, VT-RGT on 08 Feb 2023**

**Government Of India**  
**Ministry of Civil Aviation**  
**Aircraft Accident Investigation Bureau**

## **FOREWORD**

*In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an Accident/Incident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of the above said rules shall be separate from any judicial or administrative proceedings to apportion blame or liability.*

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

## Contents

<b>GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT</b> .....	4
<b>SUMMARY</b> .....	7
<b>SYNOPSIS</b> .....	8
<b>1. FACTUAL INFORMATION</b> .....	9
<b>1.1 History of the flight</b> .....	9
<b>1.2 Injuries to Persons</b> .....	11
<b>1.3 Damage to Aircraft</b> .....	11
<b>1.4 Other Damage</b> .....	11
<b>1.5 Personnel Information</b> .....	11
<b>1.6 Aircraft Information</b> .....	13
<b>1.7 Meteorological Information</b> .....	18
<b>1.8 Aids to Navigation</b> .....	18
<b>1.9 Communications</b> .....	18
<b>1.10 Aerodrome Information</b> .....	19
<b>1.11 Flight Recorders</b> .....	19
<b>1.12 Wreckage and Impact Information</b> .....	19
<b>1.13 Medical and Pathological Information</b> .....	25
<b>1.14 Fire</b> .....	25
<b>1.15 Survival Aspects</b> .....	25
<b>1.16 Tests and Research</b> .....	25
<b>1.18 Additional Information</b> .....	29
<b>1.19 Useful or Effective Investigation Techniques</b> .....	30
<b>2. ANALYSIS</b> .....	30
<b>2.1 Serviceability of the Aircraft</b> .....	30
<b>2.2 Weather</b> .....	30
<b>2.3 Crew Qualification and Handling of the Aircraft</b> .....	30
<b>2.4 Organizational Practices</b> .....	32
<b>2.5 Circumstances Leading to the Accident</b> .....	32
<b>3. CONCLUSION</b> .....	33
<b>3.1 Findings</b> .....	33
<b>3.2 Probable Cause of the Accident</b> .....	34
<b>4. SAFETY RECOMMENDATIONS</b> .....	34

## GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

AAIB	Aircraft Accident Investigation Bureau
AD	Airworthiness Directives
AFIR	Assistant Flight Instructor Rating
AME	Aircraft Maintenance Engineer
AMM	Aircraft Maintenance Manual
AMP	Aircraft Maintenance Program
AMSL	Above Mean Sea Level
AMO	Aircraft Maintenance Organization
ARC	Airworthiness Review Certificate
ARFF	Airport Rescue & Fire Fighting
AIS	Indicated Air Speed
ATC	Air Traffic Control
BA	Breath Analyzer
CAMO	Continuing Airworthiness Management Organization
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
C.R.S	Certificate for release to service
CAME	Continuing Airworthiness Management Exposition
CAR	Civil Aviation Requirements
CFIT	Controlled Flight Into Terrain
CFI	Chief Flight Instructor
CFT	Crash Fire Tender
CG	Centre of Gravity
CL (C/L)	Circuits and Landing
CPL	Commercial Pilot License
CVR	Cockpit Voice Recorder
DATIS	Digital Automatic Terminal Information Service
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
DGCA	Directorate General of Civil Aviation
DVOR	Doppler VHF Omni Range
Dy. CFI	Dy. Chief Flight Instructor
ELT	Emergency Locator Transmitters
EMC	Emergency Medical Centre
FI	Flight Instructor
FIR	Flight Instructor Rating
FOB	Flying Order Book
FRTOL (R)	Flight Radio Telephone Operator License (Restricted)
FT/ft	Feet
FTO	Flying Training Organizations
FTPR	Flight Training Progress Report
GF	General Flying
GP	Glide Path
hrs	Hours
lbs	Pounds
ICAO	International Civil Aviation Organization
IIC	Investigator –In –Charge

IR	Instrument Rating
ILS	Instrument Landing System
Kg	Kilogram
KIAS	Indicated Air Speed in Knots
KT/Kts	Knots
LFA	Local Flying Area
LH	Left Hand
LOC	Loss of Control
M /m	Meter
METAR	Meteorological Aerodrome Report
MHz	Mega Hertz
MSN	Manufactures Serial Number
MTOW	Maximum Take-off Weight
N/A	Not Available
NLG	Nose Landing Gear
NM	Nautical Miles
NSOP	Non Schedule Operator
OEM	Original Equipment Manufacturer
OJT	On-the-Job-Training
PA	Public Announcement
POH	Pilot's Operating Handbook
PPL	Private Pilot License
QNH	Nautical Height
RH	Right Hand
RGAAT	Rajiv Gandhi Academy for Aviation Technology
RPM	Revolutions Per Minute
RT	Radio Telephony
RTO	Rejected Take-Off
SB	Service Bulletin
SOP	Standard Operating Procedure
SPL	Student Pilot License
TEM	Threat and Error Management
TPM	Training Procedure Manual
TRI	Type Rating Instructor
TRV	IATA code for Thiruvananthapuram Airport
TSN	Time Since New
TSO	Time Since Overhaul
USA	United States of America
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VHF	Very High Frequency
VOTV	ICAO code for Thiruvananthapuram Airport

## References

- 1) Aviation Theory Centre, The Flying Training Manual, September 2005, Braking and steering technique, 42-43.
- 2) Colin Cutler, 01.03.2023, Left-Turning Tendencies Explained: Why Your Plane Pulls Left during Takeoff, <https://www.boldmethod.com/learn-to-fly/aerodynamics/why-you-need-right-rudder-on-takeoff-to-stay-on-the-centerline-ground-roll-through-takeoff/>

**SUMMARY**

<b>Aircraft and Accident details of Cessna 172R Aircraft VT-RGT on 08 Feb 2023</b>			
<b>1</b>	<b>Aircraft</b>	<b>Type</b>	Cessna 172R
		<b>Nationality</b>	Indian
		<b>Registration</b>	VT – RGT
<b>2</b>	<b>Owner</b>	M/s Rajiv Gandhi Academy for Aviation Technology	
<b>3</b>	<b>Operator</b>	M/s Rajiv Gandhi Academy for Aviation Technology	
<b>4</b>	<b>Pilot – in –Command</b>	SPL holder	
	<b>Extent of injuries</b>	Minor	
<b>6</b>	<b>Passengers on Board</b>	Nil	
<b>7</b>	<b>Place of Accident</b>	Thiruvananthapuram Airport	
<b>8</b>	<b>Date &amp; Time of Accident</b>	08 Feb 2023 & 0606 UTC (approx.)	
<b>9</b>	<b>Last point of Departure</b>	Thiruvananthapuram Airport (VOTV)	
<b>10</b>	<b>Point of intended landing</b>	Thiruvananthapuram Airport (VOTV)	
<b>11</b>	<b>Latitude/Longitude of accident site</b>	Lat: 08°28'46.149" N	
		Long: 76°.55'12.050" E	
<b>12</b>	<b>Type of operation</b>	Solo Circuit and Landing Training Sortie	
<b>13</b>	<b>Phase of Operation</b>	Take-off roll	
<b>14</b>	<b>Type of Accident</b>	Runway Excursion	

(All the timings in this report are in UTC unless otherwise specified)

## **SYNOPSIS**

On 08 February 2023, a Cessna 172 aircraft VT-RGT operated by M/s Rajiv Gandhi Academy for Aviation Technology (RGAAT), while carrying out a solo training sortie met with an accident on the take-off roll, at Thiruvananthapuram Airport at around 0606 UTC.

On the day of accident, as per training schedule, prior to the accident flight, Student Pilot and a Flight Instructor had performed five circuits and landing exercise as a pre-requisite for 2<sup>nd</sup> Solo release. When the Flight Instructor satisfied with Student Pilot's performance, he did the briefings and released the Student Pilot for 2nd solo sortie.

The Student Pilot taxied the aircraft to the holding point as per ATC instructions. Student Pilot did all vital checks on the aircraft at the holding point. Subsequently, ATC gave the lineup and departure clearance to the aircraft. Aircraft entered runway 32 and the Student pilot gradually increased the power. Aircraft started rolling on the runway centerline. But after few seconds, the student Pilot lost the directional control over the aircraft. Consequently, the aircraft started veering towards left of the runway. The aircraft exited the runway and went into unpaved surface. Thereafter aircraft rolled for few seconds, before a significant uneven surface caused a sudden imbalance and the aircraft flipped on its nose. Finally, the aircraft came to rest in upside down position.

The Student Pilot suffered minor injuries whereas the aircraft sustained substantial damages.

Director General, Aircraft Accident Investigation Bureau vide order no. INV.11011/02/2023-AAIB dated 09 Feb 2023 nominated Shri Amit Kumar, Safety Investigation Officer, AAIB as Investigator-In-Charge (IIC) to investigate and determine the probable cause(s) and contributory factor(s) leading to the accident. Shri K.S. Muthukrishnan, Consultant, AAIB was assigned on OJT.

Unless otherwise indicated, recommendations in this report are addressed to the regulatory authorities of the State having the responsibility for the matters with which the recommendation is concerned. It is for those authorities to decide what action is taken.

## **1. FACTUAL INFORMATION**

### **1.1 History of the flight**

On 08th February 2023, the Student pilot was scheduled to perform dual circuit & landing exercises on a Cessna 172R aircraft bearing registration VT-RGT, as a requirement for 2<sup>nd</sup> Solo release. After satisfactory completion of check sorties, the Student Pilot had to be released for 2nd solo circuit & landing sorties.

The Student Pilot reported at hangar for flying training at 0230 UTC. The Student Pilot had undergone the BA test at 0326 UTC and the result of B.A. test was satisfactory. As per entries made in the Authorization book, the Student Pilot and Flight instructor were authorized for Dual circuit & Landing exercise by the Dy. CFI. The Flight instructor briefed the Student Pilot and they proceeded to the aircraft.

As per organization's policies, the daily inspection on the aircraft VT-RGT was carried out by a company authorized AME. During the daily inspection no abnormality was observed. Post satisfactory daily inspection, AME released the aircraft VT-RGT for flying training activities. The Flight Instructor accepted the aircraft and signed the acceptance section in the technical logbook. The Student Pilot did the pre-flight inspection in the supervision of the Flight Instructor. During the Pre-flight inspection no abnormality was observed.

Flying training sortie started at 0345 UTC. At 0437 UTC, VT-RGT had requested for start-up clearance from ATC, Thiruvananthapuram (VOTV). ATC acknowledge the request and gave the start-up clearance at 0438 UTC. The Student Pilot performed all the checks as per checklist and started the aircraft.

At 0453 UTC, the Student Pilot requested ATC (VOTV) for taxi instruction. However, ATC, VOTV responded 'Standby' due to one arrival traffic. At 0454 UTC, ATC, VOTV cleared the aircraft to taxi behind the arrival aircraft via taxi track P and P4 to holding point runway 32. While taxiing to assigned holding point the Student Pilot had performed brake checks and turning checks. The Student Pilot performed the vital checks at holding point. At 0459 UTC, the aircraft VT-RGT was instructed to line up on runway 32. At 0500 UTC, aircraft took-off with ATC (VOTV) clearance. After completing four touch and go, at 0547 UTC, VT-RGT requested for full stop landing. As requested, ATC (VOTV) acknowledged and cleared the aircraft for full stop landing. After landing VT-RGT vacated the runway via taxiway P1 and Flight instructor informed the ATC (VOTV) that the Student Pilot will be proceeding shortly for two solo circuit & landing sortie. Flight Instructor also informed the ATC (VOTV) that they are not going to switch off the engine.

While briefing to the Student Pilot the Flight Instructor mentioned to expect preponed lifting of aircraft's nose due to reduction of Instructor's weight and then released the Student Pilot for two solo circuits and landings. Subsequently, the flying instructor disembarked from the aircraft and released the Student Pilot for two solo circuits and landings.

At 0551 UTC, the Student Pilot requested ATC (VOTV) for taxi with revised POB-01. ATC (VOTV) instructed the aircraft to taxi up to the holding point runway 32 via taxiway P and P4. When the aircraft reached the holding point, ATC gave the departure instruction as "After

*departure runway 32, turn right and join right downwind, climb to 1000ft, report right downwind runway 32"* and inform the aircraft to expect departure after a departing traffic. Student Pilot read back the same. The Student Pilot did the vital checks while holding. At 0603 UTC, ATC (VOTV) cleared the aircraft to "*line up runway 32 and wait*". As per SOP being followed at Thiruvananthapuram airport, ATC (VOTV), alerted the fire watch tower for standby through hotline and PA system as the solo flight was in progress.

Aircraft lined up on the runway 32 and at 0605 UTC, was cleared for take-off. The student read back the ATC clearance and released the brakes. Power was gradually added to full. The aircraft started rolling down the runway center line. The Student Pilot calls out airspeed alive and while the aircraft was accelerating past 40 kts, the aircraft started to veer towards the left of the runway. Then the Student Pilot applied full right rudder to bring the aircraft's nose back to centerline. But as per the Student Pilot's Statement, the aircraft did not responded to the input. Subsequently, the Student Pilot chopped the power. However, the aircraft was still rolling and went into unpaved surface.

After rolling for some distance in the unpaved surface, the aircraft encounter a sudden imbalance due to a significant uneven surface and at same the aircraft's nose landing gear got stuck in the heap of sand. Due to sudden break, aircraft flipped on its nose. Finally, the aircraft came to rest in upside down position near to the taxiway C.

The ATC controller and fire watch tower officer witnessed the excursion. The watch tower officer immediately activated the fire bell and informed the concerned authority. Meanwhile the ATC controller also contacted the fire services through hotline and cleared the ARFF/CFT to proceed the crash site. The ARFF/CFT vehicles reached the crash site immediately through taxiway C and runway.

Meanwhile, the Student Pilot regained the grips of situation and found himself hanging by the seat belt in inverted position. The Student Pilot tried to release himself but was unable to do so due to seat belt held under tension. The Student Pilot pushed himself up by pushing against the aircraft and released the seat belt. The Student Pilot fell on the windshield. With the assistance of the rescue personnel the Student Pilot came out of the aircraft. By the time, academy team also reached the crash site on the information passed by the ATC controller.

The rescue team member requested academy team to switch off the strobe lights and the Flight Instructor volunteered for it. The Flight Instructor switched off the Master switch. The Student Pilot was taken to EMC in an ambulance for medical check at 0623 UTC. The rescue team also assessed the site for safety from fire and cordoned the area.

The Student Pilot suffered minor injuries, whereas the aircraft sustained substantial damage. There was no fire.

## 1.2 Injuries to Persons

Injuries	Instructor	Student Pilot	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/ <del>None</del>	Nil	01	Nil

## 1.3 Damage to Aircraft

The aircraft sustained substantial damage during the accident. Details of the aircraft damage are given in the section 1.12.

## 1.4 Other Damage

Nil

## 1.5 Personnel Information

### 1.5.1 Student Pilot

Nationality	Indian
Age	34 yrs
SPL date of issue	04.03.2020
SPL Valid Up to	03.03.2025
License Category	Aeroplane
License Class	Single Engine Land
Aircraft Type	C 172
Simulator hours	05.00 hrs
Date of Med. Exam & validity	31.08.22 & 01.09.23
FRTOL (R) Date of Issue/Validity	13.10.2020 /12.10.2030
Total Flying Experience	39:45 hrs
Hours Flown on Type	39:45 hrs
Previous Flight (Date of Last Flight)	07.02.2023
Total Solo Flying Experience on Type	00:15 hrs
Hours flown in last 365 days	21:10 hrs
Hours flown in last 180 days	19:00 hrs
Hours flown in last 90 days	18:10 hrs
Hours flown in last 30 days	06:25 hrs
Hours flown in last 7 days	1:55 hrs
Hours flown in last 24Hr	1:30 hrs
Rest period before the flight	18:00 hrs

### Student Flying History:

Student pilot had joined M/s RGAAT, Thiruvananthapuram on Oct 2019, in CPL course. Student Pilot license was issued to the Student pilot on 04.03.2020 by M/s RGAAT. As per simulator training records provided by M/s RGAAT, Student pilot had attended 05 Simulator training of one hour each prior to starting flying training sorties. As per FTPR, first Air exercise of 20 min was done on 22.10.2020. However, the next air exercise of 01:25 hrs was carried out after 119 days of first air exercise on 19.02.2021. During second sortie instructor had demonstrated taxi related procedures and checks. FI also demonstrated the effect of controls, effect of flaps, effect of powers and slipstream. Further as per records, during flying training following exercises were demonstrated & performed by the Student pilot:

Date	Exercises - Demonstrated/ practice
19.02.2021	Taxi procedures precautions effect of control effect of flap effect of power slip stream and power stream.
24.02.2021	Straight and level with different power setting
12.03.2021	Climbing descending gliding and turns
28.06.2021	Stall and steep recovery
13.07.2021	Normal & Short Field Take-off, pre take-off vital action need of right rudder pressure about slip stream
26.07.2021	Circuit and landing- overshoot undershoot and normal approach
05.08.2021	Circuit and landing approach with different flap settings, high and low approaches
19.12.2022	Circuit and landing emergencies- simulated emergencies during T/o roll immediately after take-off
29.12.2022	Circuit and landing emergencies
11.01.2023	Circuit and landing check (1st Solo)
08.02.2023	Circuit and landing checks (2nd Solo)

As per FTPR, before operating 2<sup>nd</sup> Solo sortie, the Student pilot had accumulated 39.45 hrs of flying. FTPR also indicates that the Student pilot was a picking up slowly. In addition to this Student pilot was irregular in training. During training few relevant remarks made by the flying instructors in Student pilot's FTPR are tabulated below:

S/L	Sortie	Instructor's remarks in FTPR
1.	C/L	Circuit pattern, approach and landing needs to be improved
2.	C/L	Take-off approach - Needs to improved
3.	C/L	Need to use rudder effectively
4.	C/L	Take-off - not applied rudder properly
5.	C/L	Rudder not used properly
6.	C/L	Take-off- not maintaining center line
7.	C/L	Not maintain proper rudder pressure on take-off
8.	C/L	Touch down need to improved
9.	C/L	Pre take-off vital actions to be improved
10.	C/L	RT calls to be improved

As per FTPR, on few occasion Student pilot's rudder input during take-off was improper that indicates that the Student pilot had alignment issue especially during take-off. Before performing 1st Solo exercise, the Student pilot had received three session of C/L emergencies

exercises regarding engine failure during take-off. Subsequently, Student pilot was checked for C/L & emergencies and was found satisfactory.

Total solo flying hours accumulated prior to accident flight was 00:15 hrs. The last Solo flying exercise was done on 11 January 2023. In past 28 months of flying training, Student pilot was assessed only five times. However, as per procedure laid down in Para 4.10.4 of M/s RGAAT's TPM, "*Flying progress checks will be conducted by CI/CFI/Dy. CFI for every 5 Hrs of Dual flying before solo...*". Further the performance of the Student pilot in previous 04 periodical assessments including 04 quarterly assessment was found average by the assessors.

## **1.6 Aircraft Information**

### **1.6.1 General Information**

The Cessna C-172R aircraft is manufactured by M/s Textron Aviation Inc, USA and is certified for Normal and Utility category. The C-172R is an all metal, High Wing, Single engine, Tri cycle landing geared, four seated aircraft.

The aircraft is fitted with conventional ailerons, rudder and elevator control surfaces. The aircraft is equipped elevator trim tab and fixed rudder trim tab. The wings are semi cantilever type and braced with strut. The wing is dihedral type and has integral fuel tanks. The fixed main landing gear has slightly Toe in and positive cambered wheels with disc brake. The Nose wheel is steerable and has oleo strut for shock absorption.

The Aircraft is powered by horizontally opposed type, air cooled, 4 cylinders, wet sump, fuel injected Lycoming IO-360 Engines which could develop 160 HP at 2400 RPM. The thrust is produced by two bladed, fixed pitch single piece forged aluminum alloy Mc Cauley propeller which is 75 inches in diameter.

The aircraft is Owned and registered under category 'A' by M/s RAGAAT. The Certificate of Airworthiness is issued under "Normal category" (subdivision Passenger) by DGCA. At the time of incident, the Certificate of Airworthiness, Aero Mobile License and hull insurances were valid.

The aircraft and its engines were maintained as per the Aircraft Maintenance Programme (AMP) approved by DGCA. All concerned Airworthiness Directive, mandatory Service Bulletins, and DGCA Mandatory Modification on this aircraft and engines have been complied with as on date of accident.

Scrutiny of the Technical Log Book revealed that there were no snags pending on the aircraft prior to the Accident

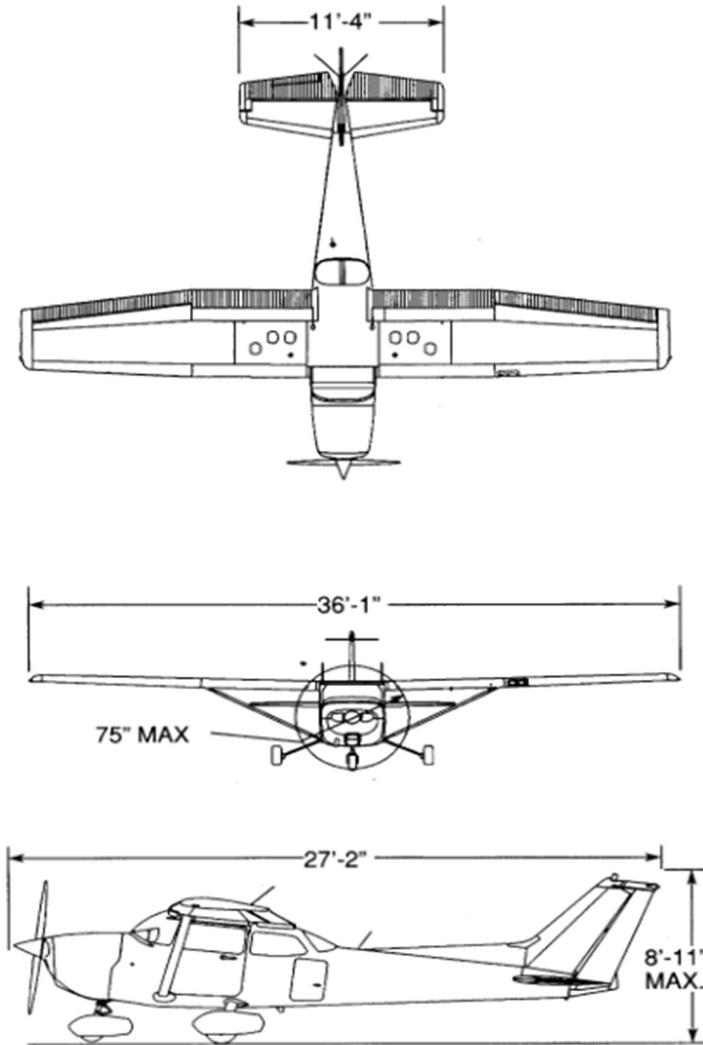


Figure 1: Three view (Courtesy to Cessna POH)

### 1.6.2 Aircraft VT-RGT Specific Information

Aircraft Model	Cessna C-172R
MSN	17281344
Year of Manufacturer	2006
Name of Owner	M/s RGAAT
C of R	3502/2
C of A	Valid
Category/Sub Division	Normal / Passenger
A R C issued (Issued/Validity)	01.09.2022 /31.08.2023
Aircraft Empty Weight	761 Kg
Maximum Takeoff weight	1111 Kg
Date of weighment	08.09.2006.
Max Usable Fuel	144.65 Kg
Max Payload with full fuel	120.35 Kg

Empty Weight C.G	FWD: 35.0 inches aft of datum at 1950 lbs or less, with straight line variation to 40.0 inches aft of datum at 2450 lbs. Aft: 47.3 inches aft of datum at all weights.
Total Aircraft Hours	2948:45
Last major inspection	Ph-III/ 600hr/ Annual inspection done on 19.12.22
List of Repairs carried out after last major inspection till date of incidence:	VRV filter, Main Battery, Altimeter, RH Main wheel Tyre replaced since last major insp
Engine Type	IO-360-L2A
Date of Manufacture	28.04.2006
Engine Sl. No.	L-32831-51E
Engine TSN, TSO	2948:45 / 1646:10
Last major inspection	19.12.22
List of Repairs carried out after last major inspection till date of incidence:	Oil Filter, Induction Air Filter, LH Magneto replaced since last major insp
Propeller Manufacturer	McCauley Propeller System
Propeller Model No.	1C235/LFA7570
Propeller Type	Fixed Pitch
Aero mobile License (Valid till)	A-010/01-RLO-SR (31.12.2024)
AD, SB, Modification	All complied

The Aircraft is registered in “Normal” category & Sub Division - “Passenger”. The C of A and ARC were valid. The aircraft weight schedule was re-computed and approved by DDG, Bengaluru on 19 Nov 2020. There is no requirement as per Civil Aviation Requirement (CAR Section 2, Series ‘X’, Part II, para4) for re-weighing of the aircraft on periodic basis.

Aircraft had logged 20:30 hrs since the last Scheduled inspection to the time of accident. Last scheduled inspection (Phase II/ 100 hrs / 6 months inspection) was carried out at 2927:25 airframe hours (TSN) on 27 Jan 2023. The aircraft engine had logged 1645:20 hrs (TSO). Last scheduled inspection carried out on the engine was Phase II/ 100 hrs / 6 months inspection at 1624:50 engine hrs on 27 Jan 2023. As per Phase II/ 100 hrs/ 6 months inspection task card, brake and rudder control system related components were inspected and rectification was done as per AMM.

All concerned Airworthiness Directives, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine have been complied with. As per aircraft log book entry, the last DGCA Mandatory Modification, DGCA/MM/53 (repetitive) was carried out on 27 Jan 2023.

As per technical logbook no snag was pending for rectification as on the date of accident. However, the last snag reported was “*while taxiing out abnormal Left yawing tendency with neutral rudder and nil wind conditions*” at 2768:45 hrs on 09 Nov 2022. During snag rectification, inspection of nose wheel steering and rudder controls system was carried out by the maintenance personnel. Rigging of both rudder and rudder control system were found satisfactory and within limits. Post satisfactory inspection, the aircraft performance check was carried out by the pilot and was found satisfactory. Post rectification the aircraft had flown 179:10 hrs prior to accident.

For the accident flight, load and trim was found prepared. As per prepared load sheet the center of gravity (CG) was found within limits. Refueling was carried out prior to first sortie of the day. As per aircraft records on the day of accident, before first sortie fuel quantity was 200 liters i.e., 100 liters in each tank. Pre-flight Inspection was carried out by the Student Pilot under the supervision of the flying instructor. During pre-flight inspection no abnormality was observed. During the accident due to impact, ELT was activated and was later switched off by the engineering personnel.

### 1.6.3 Aircraft Steering and Braking system

In the Cessna maintenance manual, aircraft steering and braking system has been described. Extract from the Cessna maintenance manual is given below:

The aircraft has a steering nose wheel that is linked through the rudder pedals to give ground control. The nose wheel steering operates through the use of the rudder pedals. The spring

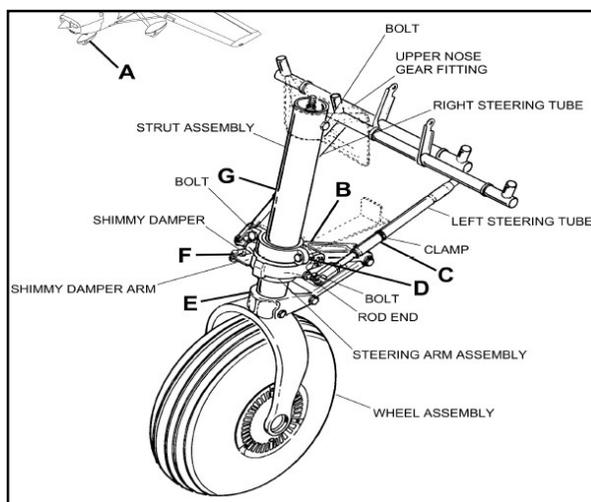


Figure 2: NLG diagram

loaded steering rod assemblies connect the nose gear steering arm assembly to the arms on the rudder pedals. The steering gives up to approximately 10 degrees each side of neutral, after which the brakes can be used to get a maximum deflection of 30 degrees right or left of the center.

The rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system comprise rudder pedals, cables and pulleys, all of which link the pedals to

the rudder and nose wheel steering.

**Braking and steering technique** (Aviation Theory Centre, 2005, P.42): Brake cylinders are

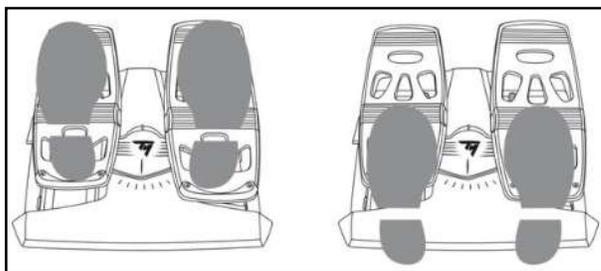


Figure 3: Rudder/Brake Paddle

the toe brakes as required.

situated on top of each rudder pedal. They are individually applied using the ball of each foot. Normally, taxi with your heels on the floor and the balls of your feet on rudder pedals, thereby avoiding inadvertent application of the toe brakes. When braking is needed, slide your feet up and, with the ball of each foot, apply

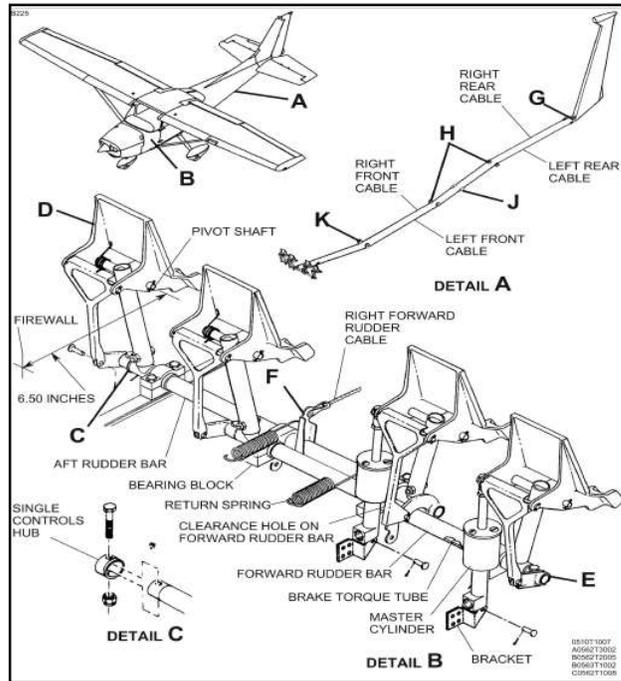


Figure 4: Aircraft Brake

To brake the aeroplane while taxiing in a straight line, both brakes should be applied evenly, but you may have to steer with the rudder pedals at the same time. There is a tendency to freeze the rudder movement while applying the brakes. Avoiding this is simply a matter of practice.

Brakes should be used gently and harsh braking are to be avoided except in an emergency. Differential braking is available by pressing each toe brake individually. This is useful for both turning sharply and maintaining directional control when taxiing in strong cross winds.

#### 1.6.4 Left Turning Tendencies of the aircraft (Cutler, 2023)

A single engine, propeller powered aircraft experiences left turning tendencies during take-off due to four different forces acting upon the aircraft. A Cessna 172 aircraft is equipped with a Lycoming engine and its propeller rotates in clockwise direction (viewing from inside the cockpit). A pilot operating the aircraft should be aware, skilled and alert to handle this aerodynamic phenomenon carefully. Otherwise, with a clockwise rotating propeller the aircraft will veer towards left during the take-off roll.

A left turning tendency occurred due to four distinct forces/effects: Torque, P-factor, spiral slipstream and gyroscopic precession. Torque and spiral slipstream effects are more prominent during take-off roll/high speed taxi.

##### Torque

As the engine is throttled for takeoff, the right-turning direction of the engine produces a torque in right direction and as per Newton's third law a reaction force acts on the aircraft in left direction. This left direction reaction force tries to move the aircraft towards left.

##### P-factor

Asymmetric thrust causes the aircraft to turn left.

##### Spiral slipstream or 'corkscrewing effect'

It happens when the propeller is moving fast and the aircraft is moving slowly. During take-off, air accelerated behind the prop (known as the slipstream) follows a corkscrew pattern. As it wraps itself around the fuselage of the aircraft and it hits the left side of the aircraft's tail, creating a yawing motion, and making the aircraft yaw left. This effect greatly depends on the aircraft design and the flight phase and would be difficult to quantify it.

## **Gyroscopic precession**

During takeoff as the tail comes up, a force is applied to the top of the propeller. And since the propeller is spinning clockwise, that force is felt 90 degrees to the right. That forward-moving force, on the right side of the propeller, creates a yawing motion to the left.

The above mentioned forces give a tendency to the aircraft to veer to its left during takeoff. Therefore, right rudder is used to cancel them out and maintain a perfect centerline throughout the takeoff roll.

### **1.6.5 Wheel Borrowing**

Wheel-borrowing is a problem that may occur in an aeroplane with a tricycle gear configuration during takeoff or landing. As the aeroplane gains speed during takeoff the wing generates an increasing amount of lift although not enough to raise the aeroplane off the ground. The lift reduces the weight supported by the aeroplane's main wheels and this reduces the main wheels' contribution to directional stability, allowing the nose wheel to destabilize the aeroplane's direction along the ground. This form of wheel borrowing is easily avoided by the pilot applying back-pressure to the elevator control during the takeoff roll to reduce the weight supported by the nose wheel.

### **1.7 Meteorological Information**

METAR recorded between 0430 UTC and 0630 UTC at Thiruvananthapuram.

<b>Time (UTC)</b>	<b>0430</b>	<b>0500</b>	<b>0530</b>	<b>0600</b>	<b>0630</b>
<b>Wind</b>	000° 00 Knots	190° 03 Knots	180° 03 Knots	240° 03 Knots	240° 03 Knots
<b>Visibility (m)</b>	5000	5000	5000	6000	6000
<b>Weather</b>	HZ	HZ	HZ	--	--
<b>Clouds</b>	FEW 015				
<b>Temp (°C)</b>	30	30	30	30	30
<b>Dew Point (°C)</b>	23	23	23	23	23
<b>QNH (hPa)</b>	1012	1012	1012	1011	1011
<b>Trend</b>	NOSIG	NOSIG	NOSIG	NOSIG	NOSIG

### **1.8 Aids to Navigation**

Thiruvananthapuram International airport is equipped radio navigational Aids such LOC 32 (CAT-I), GP 32, DME ILS 32 & DVOR/DME. At the time of accident Navigational Aids installed were serviceable.

### **1.9 Communications**

Thiruvananthapuram International airport is located within the Chennai FIR region. To establish two way communication between the aircraft and various ground facilities Thiruvananthapuram international airport utilizes following frequencies:

- a) Tower frequency : 118.10 MHz
- b) Approach frequency : 119.60 MHz

- c) Radar : 125.95 MHz and 132.25 MHz
- d) Ground control : 121.90 MHz
- e) DATIS : 126.6 MHz

At the time of accident, the aircraft was in positive two way communication with ATC. There was no issues regarding communication between the aircraft and the ATC.

### 1.10 Aerodrome Information

#### 1.10.1 General

Thiruvananthapuram International airport is located in Thiruvananthapuram, in Kerala, India. TRV (Kerala) International Airport Ltd (TIAL) is responsible for Operation, Management and Development of the Thiruvananthapuram International airport. However, Air Navigational services are being provided by Airport Authority of India.

The ICAO and IATA Code for Thiruvananthapuram International airport are VOTV and TRV respectively.

Latitude/Longitude : 08° 28.77' N / 76° 55.20'E

Airport Elevation : 17 ft

Runway dimension : 3494 X 150 M

Runway Details:

Runway Orientation	TORA (M)	TODA (M)	ASDA (M)	LDA (M)	RESA (M)
14	3374	3374	3374	2968	90X90
32	3374	3374	3374	3239	140X90

#### 1.10.2 Standard Operating Procedure (VOTV)

As per SOP being followed at Thiruvananthapuram, for every Solo C/L flights ATC tower will alert the Airport Fire Station for Standby. As per practice, the ATC tower had informed the Airport Fire Station regarding the VT-RGT solo C/L flying sortie and they were on standby.

### 1.11 Flight Recorders

Cessna 172R aircraft VT-RGT was not required to be fitted with Cockpit Voice Recorder (CVR) or Digital Flight Data Recorder (DFDR) as per the prevailing DGCA's CAR section 2, Series I, Part V & VI. No Cockpit Voice Recorder (CVR) or Digital Flight Data Recorder (DFDR) was found installed on the aircraft.

### 1.12 Wreckage and Impact Information

a) Aircraft lined up on the runway 32 via P 4 taxiway. ATC gave the take-off clearance, Student pilot released the break and gradually added power. The aircraft started rolling. After rolling for approximately 350 m and at about 40kts, the aircraft started veering towards left. In order to maintain the centerline the Student pilot applied the full right rudder. But aircraft continued veering to the left. Then the Student pilot cut the power. However, the aircraft exited the runway near the taxiway P3, after rolling approximately 85 m.



Figure 5: Accident aircraft track

In unpaved surface, the aircraft continued rolling in the same direction. After rolling for approximately 210 m, the aircraft NLG stuck in the sand and the aircraft bank towards right due to natural slope of the terrain. Consequently, the nose wheel assembly gets pushed backwards toward left side and right forward engine cowling takes the ground impact from lower right side which dislodges the cowling from lower fasteners. The propellers sustains slight bend due to low engine power and stops due to contact with ground. As the aircraft contacted ground with nose low and right wing down attitude, the aircraft tail flips forward due to momentum and aircraft banks left due to reactive bounce from right side. The aircraft left wing tip contacts the ground and the tip breaks. The aircraft finally came to rest in upside down position.



Figure 6: Tyre marks (viewed from runway)



Figure 7: Tyre track in unpaved surface



Figure 8: Last nose wheel marks

b) The wreckage was confined to one place except few aircraft parts which sheared off due to impact and scattered for example Navigation light cover, Induction air filter and air intake duct were found separated from the main wreckage.



Figure 9: Aircraft Final Rest Position.

### C) Damage to the Aircraft

During the accident the aircraft sustained substantial damages. Following are some major damages sustained by the aircraft.



Figure 10: Damaged Nose section

1. Nose Section: Nose wheel, shock strut was found detached from the firewall and ripped the area of attachment and bent towards bottom fuselage in fully extended position. Upper portion of the firewall buckled forward. Upper torque link found broken at the attachment due to impact. Left steering rod end was found broken.

The bottom nose cowling was found split apart and the engine mount was found bent and cracked.

Both Propeller blades bent backwards from the center portion. Spinner was found intact.

2. Engine: Engine mount was found extensively damaged with bents and broken tubes. Front baffles bottom portion under the starter was found bent. Induction air filter and air intake duct attach to the fuel servo unit

were also found cracked and separated from engine. Same was lying on the ground near the nose of aircraft. Battery mounting bracket attachment on firewall was found buckled forward. LH Magneto ground lead was found detached from the terminal leg. Fuel strainer unit found broken and the filter element exposed. Engine exhaust muffler and pipes found damaged.

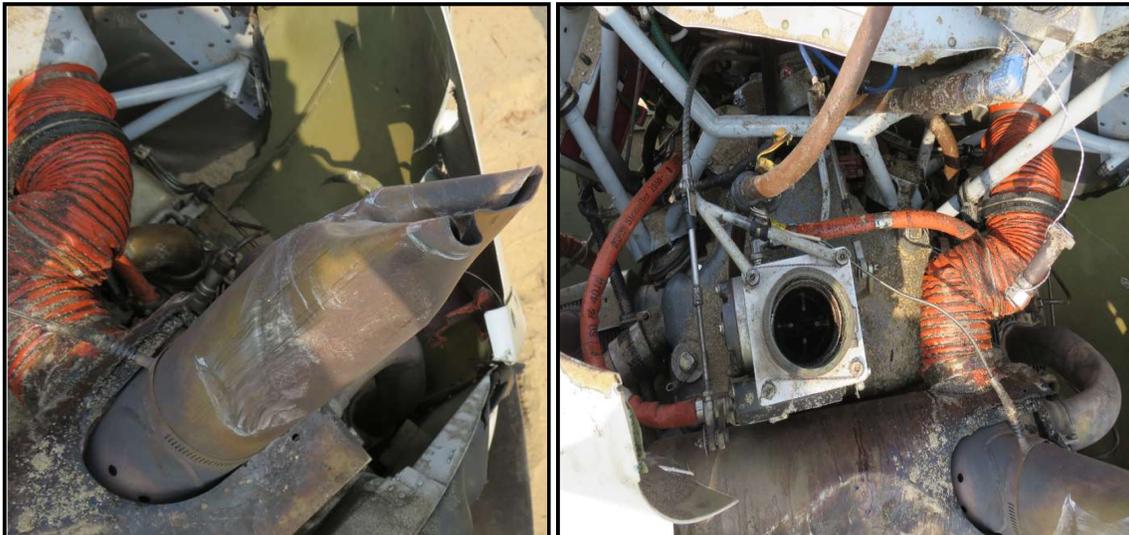


Figure 11: Damaged part e.g. Exhaust muffler

3. Left wing: Navigation light glass and cover were found broken. Skin, out board of strut attachment was found buckled heavily at the area of registration marking. Leading edge, outboard of taxi light buckled and dented near the tip. Leading edge of the wing tip was found broken.



Figure 12: Damaged LH wing

4. Right wing: Navigation light glass dislocated cover was found intact. Wing strut have sharp bent at the center.



Figure 13 Damaged RH wing



Figure 14: Damaged tail section

5. The fin and rudder tips were found buckled and damaged due to impact on ground.



Figure 15: Damaged tail boom section

6. Tail section was found with large dent at bottom of the horizontal stabilizer.

7. Aircraft came to rest in inverted position and inside the cockpit following position of some important equipment/instrument was noticed by the investigation team.

- The throttle lever was in pulled out position whereas the mixture lever was at rich position.
- The flap lever and indicator position was at 10°.
- The trim setting was at take-off.
- As per fire service personnel's statement post-accident, the master switch & Ignition switch was switched off, the ELT was disconnected and fuel shut off was also closed by Flight Instructor. During the wreckage examination same was confirmed by viewing the cockpit instrument panel.



Figure 16: Cockpit instruments condition post-accident

d) Post accident wreckage examination:

During post-accident wreckage examination, the investigation team have made following observations:

- i. Both flaps were found at 30° position. However, in the cockpit the flap lever was at 10°. When battery was connected and the master was put ON, flaps retracted at 10°. The reason for disagreement could be the impact.
- ii. LH Magneto ground lead found detached from the terminal leg. Magneto timing was checked and found within limit.
- iii. All the 8 spark plugs were removed and inspected and found lead free. One plug had slight oil fouling.
- iv. Both main undercarriage wheels and strut were found intact. Both the wheels removed and bearings and brakes were inspected. No abnormalities were observed.
- v. Rudder control cable were examined and was found satisfactory.
- vi. Both main wheels tyre pressure were measured and were within normal range.

### **1.13 Medical and Pathological Information**

The Student pilot underwent the pre-flight medical Breath Analyzer (BA) test inside the academy at Thiruvananthapuram Airport and B.A test result was satisfactory. Post-accident, the Student pilot again underwent to Breath Analyzer (BA) test at Thiruvananthapuram Airport. Subsequently, medical examination was also conducted. As per report Student pilot was not under the influence of any psychoactive substance.

### **1.14 Fire**

There was no fire pre or post-accident.

### **1.15 Survival Aspects**

The accident was survivable.

### **1.16 Tests and Research**

#### **1.16.1 Fuel & Engine Oil Sample Report**

Fuel sample collected from the aircraft VT-RGT was subjected to fuel specification test at DGCA Fuel & Oil laboratory. As per the laboratory test report received, there was no abnormality in the sample and it confirm to its specification.

Engine Oil sample collected from the aircraft VT-RGT was subjected to specification test at DGCA Fuel & Oil laboratory. As per the laboratory test report received, there was no abnormality in the sample and it passed the specification test.

#### **1.16.2: LH side Rod End's Failure Analysis Report**

During wreckage examination, broken LH side Rod end (refer below fig) of the NLG steering arm assembly was found. However, the RH side Rod End was found intact.

Rod End is one of the important component of NLG steering arm assembly. Failure of Rod End would result in steering problem on ground. Therefore, in order to determine the cause of failure of LH side Rod End, both side Rod End was sent to Metallurgical laboratory for failure analysis.

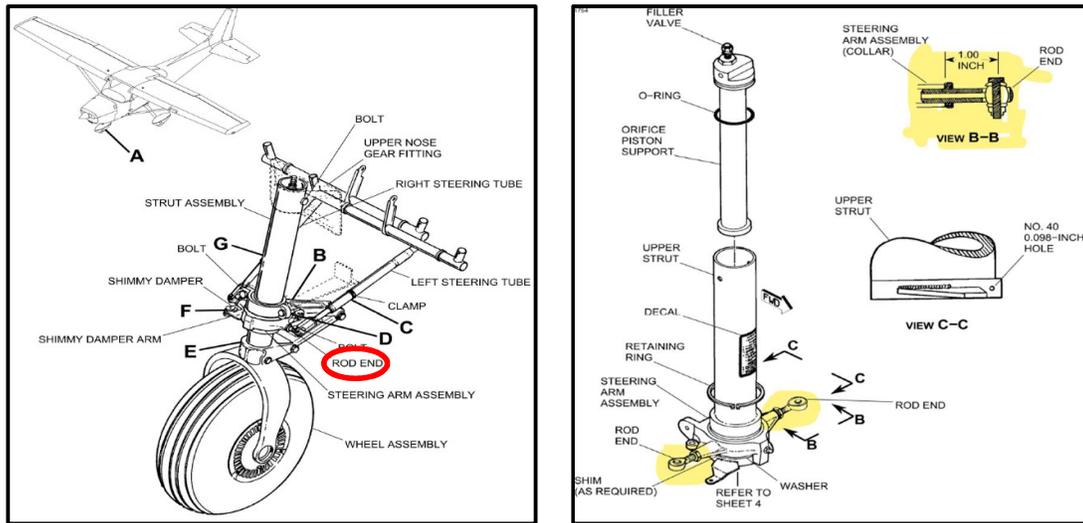


Figure 17: Rod End (Courtesy to Cessna POH)

As per Metallurgical laboratory failure analysis report, the LH side Rod end of the NLG steering arm assembly failed under overload i.e. due to impact.

### 1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION

#### 1.17.1 RGAAT General

M/s RGAAT is a DGCA approved Flying Training Organization (FTO), under CAR section 7 series D Part I to impart training. M/s RGAAT also holds CAMO and AMO approvals, under CAR M. M/s RGAAT is located at Thiruvananthapuram International Airport, Kerala. FTO approval is validity till 22.03.2024. Scope of approval is Aeroplane up to-PPL, CPL, IR, AFIR, FIR and extension of aircraft ratings single engine / multi engine. As on date of accident the organization was having 04 single engine aircraft and one multi engine aircraft in its fleet. Aircraft fleet consists of 04 Cessna 172R and 01 multi engine Piper Seneca PA 34 aircraft.

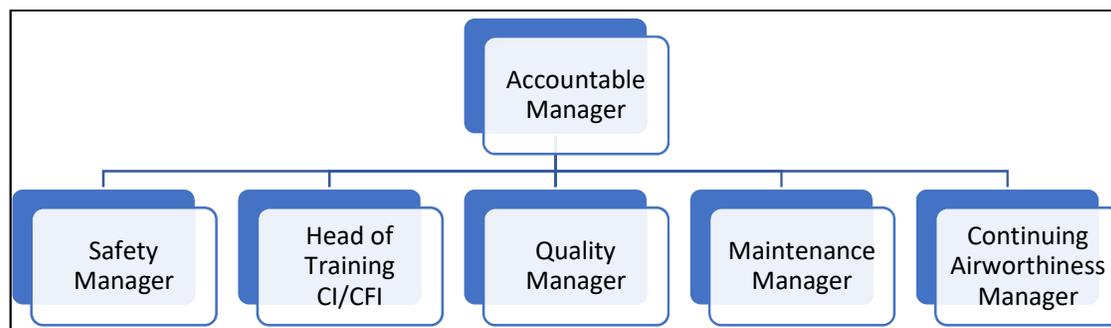


Fig. 18: Organization Chart

Accountable Manager is responsible for management and operation of Organization related activities. Safety Manager, Quality Manager, Head of Training, Maintenance Manager and Continuing Airworthiness Manager directly report to the Accountable Manager and extend their support in managing day-to-day organizational activities.

### **1.17.2 Emergency exercise (Aborted or rejected take-off)**

Normally flying training organizations are more concerned or focused on practicing the emergencies, which took place immediately after take-off or in the air. Hence, the emergencies on ground that requires practice of an aborted /rejected take-off get less importance.

M/s RGAAT's approved TPM does not contain much details about emergency exercises required to be imparted to trainees. However, 'Section 6: Emergency Drills' in M/s RGAAT's FOB, deals with 08 type of emergencies. Out of these 08 type of emergencies only one emergency on ground requires aborted/rejected take-off.

A rejected take-off (RTO) or aborted take-off is the situation that requires to abort the intended take-off of an airplane due to unavoidable reason/circumstances. A rejected takeoff (RTO) or aborted take-off is desirable in many circumstances for safety reason.

Although it is one of the most important desired skill in case of any emergency on ground for the safety of its occupants. However, DGCA's Pilot's proficiency/IR check form does not have any mention regarding rejected take-off/aborted take-off.

Further, there is no DGCA regulation that requires to include an aborted /rejected take-off in the syllabus or TPM as a desired skill. Therefore, practice of an aborted /rejected take-off is very less.

As per Student pilot records, Student pilot had received training on emergencies. However, it is highly subjective to quantify the time spend during the training exercise to practice an aborted /rejected take-off. Subsequently, CFI assessed the Student pilot during emergency check exercise and found satisfactory.

Further, as per Student pilot's statement, when the aircraft started veering toward left, Student pilot had applied right rudder. But the aircraft did not come back to the runway center line and continued veering towards left. In order to abort the take-off, the Student pilot cut the power and didn't apply any further input.

### 1.17.4 Briefing and Debriefing

a) M/s RGAAT's TPM stipulates certain SOP to carrying out pre- flight and post flight briefings. Some extract from the TPM is as quoted below:

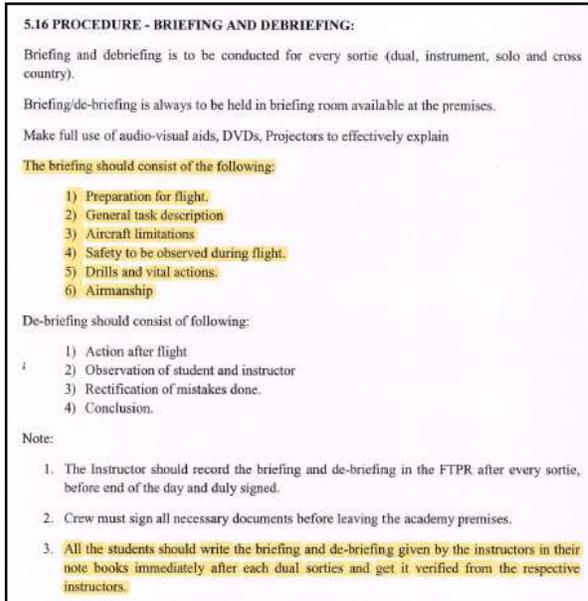


Figure 20: Briefing procedure

*“Preflight Briefings: preflight briefing notes which are used briefly acquaint the student with the main points of the air exercise, He/She is about to have and covering such details as the effect of the weather on the course of flight, any unusual obstacles or restrictions in the circuit or on the airfield and similar information. A list of headings for use of an aid memory for ground lecture covering aspects of principles of flight, Airmanship, Flying and engine control handling and effects etc, which need to be fully described before the flight, backed up with suitable diagrams.”*

*“Post Flight Briefings: The post flight discussion is used to reduce the exercise*

*and amplify or explain any special point of interest or difficulty that has arisen. This discussion is invaluable for consolidating what the student has just learned. Student shall maintain a briefing/ debriefing record verified by respective instructors”*

*“Airmanship is the ability to choose the most effective and safest course of action for a particular set of circumstances. It is important that the student’s sense of airmanship, apart from his individual skill, should develop so that he is able to recognize the approach of a potentially dangerous situation in good time. The student should be made aware of the fact that common sense and airmanship are synonymous and that their use implies careful planning and continuous anticipation.”*

During the investigation it was found that the post satisfactory completion of solo check flying sortie, the flight instructor briefed the student Pilot for 2<sup>nd</sup> solo sortie in the aircraft for few minute while de-boarding the aircraft. Subsequently, aircraft met with accident. But in the Student Pilot’s FTPR, a false debriefing entry regarding the accident sortie was found signed by the Flight instructor. This indicates casual approach towards briefing / debriefing procedure.

#### b) Threat and error management

Definition: Threat and error management (TEM) is an important safety management approach that assumes that pilots will naturally make mistakes and encounter risky situations during flight operations. Rather than try to avoid these threats and errors, its primary focus is on teaching pilots to manage these issues and so that whenever they encounter such situation they do not impair safety. Its goal is to maintain safety margins by training pilots to detect

and respond to events that are likely to cause damage (threats) as well as mistakes that are most likely to be made (errors) during flight operations.

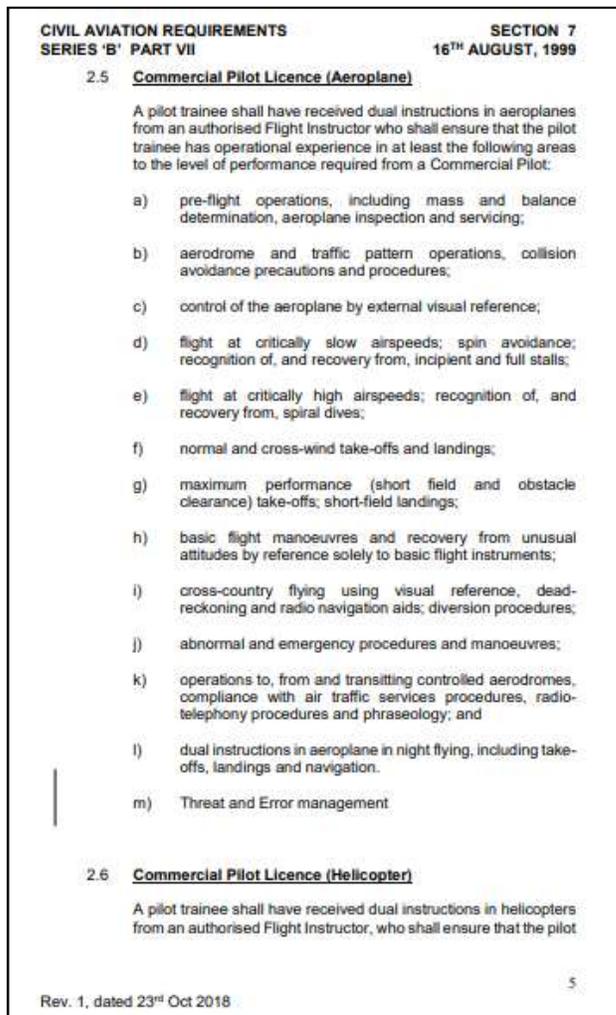


Figure 21: Extract from DGCA CAR

## 1.18 Additional Information

### 1.18.1 Operations Circular No. 2 of 2004

DGCA operation circular no. 2 of 2004, laid down the recency requirement for pilot(s)-in-command & Co-pilot(s) operating aircraft having all-up-weight not exceeding 5,700 kg. This circular was issued to enhance flight safety in Non-Scheduled and General Aviation operations including State Governments and Flying Training Institutes. This circular categorizes the period of absence from flying in three categories and stipulates the requirements of training and checks accordingly.

The student pilots, who are being trained in FTOs do not come under ambit of this circular. DFT, DGCA does not have similar type of circular to deal with long absences of Student Pilots. During the investigation, it is observed that the Student pilot was not regular in flying due to some personal reason. The long absence from training ranges from 01 month to 07 months.

DGCA Section 7 Series 'B', Part VII Issue I, dated 16<sup>th</sup> August, 1999, Rev dated 23<sup>rd</sup> Oct 2018 lays down the flying training syllabus for grant of various pilots' licenses and ratings in accordance with Schedule-II of the Aircraft Rules, 1937.

The extract of requirement for CPL license is appended in figure 21.

Among the various requirement for grant of CPL, one of the requirement is the threat and error management to be covered in flying training. Whereas the scope and depth of the exercise is in ambiguity and left to individuals perception.

Although the FTOs has included the topic in their TPM. However, implementation in FTOs is highly subjective alike to Scheduled and Non-schedule operator.

During the investigation no procedure is found defined in the M/s RGAAT's DGCA approved TPM.

## **1.19 Useful or Effective Investigation Techniques**

Nil

## **2. ANALYSIS**

### **2.1 Serviceability of the Aircraft**

At the time of the accident, aircraft's C of R, C of A, ARC and Aero Mobile License were valid and current as per applicable DGCA CAR. Aircraft weight schedule was also valid at the time of accident. Load and trim sheet was prepared and C.G of the aircraft was within the OEM's prescribed limits. All concerned AD, SB, mandatory SB, and DGCA Mandatory Modifications on this aircraft and its engines were complied with as on date of event.

The last C.R.S. issued at 2927:25 hrs (TSN) on 27.01.2023 after completion of the Phase II/ 100 hrs /6 months scheduled inspection. After last scheduled inspection the aircraft had flown 20:30 hrs prior to accident flight and no snag was pending for rectification. Before entering the assigned runway, flight controls and instruments were checked. During flight control check, no abnormality was observed by the Student Pilot. Student Pilot did all vital checks before initiating the take-off roll. Further during the investigation wheel & brakes and rudder controls system were examined and no abnormality was found. **In view of above, it is concluded that the serviceability of the aircraft was not a contributory factor to this accident.**

### **2.2 Weather**

As per METAR registered by the ATC personnel at 0600 UTC, at the time of accident, visibility was 6000m and wind was 240°& 03kt. Therefore, it is concluded that the weather was as per VFR condition and **weather was not a contributory factor to this accident.**

### **2.3 Crew Qualification and Handling of the Aircraft**

#### **2.3.1 Crew Qualification**

The Student Pilot was holding a valid Student pilot license as per DGCA prevailing regulation and was appropriately authorized to undertake the training flight.

From the records, it is evident that the Student Pilot had not attended the flying training regularly due to some personal requirements. The period of long absence from training ranges from 01 month to 07 months.

There is a DGCA operation circular no. 2 of 2004, which laid down the recency requirement for pilot(s)-in-command & Co-pilot(s) operating aircraft having all-up-weight not exceeding 5,700 kg. However, the student pilots, who are being trained in FTOs do not come under the ambit of this circular.

The long absence from any training breaks the rhythm and momentum of the course. Therefore, in order to maintain the training standards, recency trainings are required to be revise the previous training or the training received before long absence. In the absence of

any mandatory regulation similar to DGCA operation circular no. 2 of 2004 applicable to Student Pilots. This type of situation remains unattended or at the discretion of Training Organization. Further, it depends on the Organization and Flight Instructor up to what extent they repeat the completed exercises and this is highly subjective.

Although the Student Pilot had received some additional training after long absence. However, the number of periodical assessments were not increased in order to assess the progress of the Student Pilot as the total period of training extent due to absence.

**In view of above it is concluded that the Crew qualification was as per regulatory requirements. But the gap created due to the irregular flying practice had affected the overall skill of the Student Pilot. Hence, break in training could have been one of the contributory factor to this accident.**

### **2.3.2 Crew Handling**

After the satisfactory completion of solo check flying sortie, the flight instructor briefed the student Pilot for 2<sup>nd</sup> solo sortie with two circuit and landings. Before disembarking the aircraft the instructor mentioned to expect preponed lifting of nose due to reduction of Instructor's weight.

Student Pilot taxied the aircraft up to the runway holding point. Before entering the assigned runway, flight controls and instruments were checked. During flight control check, no abnormality was observed. With ATC clearance, aircraft lined up on the runway. Till such time there was no abnormality observed by the Student Pilot.

Student Pilot released the brakes and the power was smoothly increased to maximum. The aircraft started rolling down the runway. The Student Pilot saw the airspeed indicator registering. He scanned the instruments in quick succession by maintaining visual outside. As the airspeed was rising above the 40 KIAS, the Student Pilot seems to be fixated on ASI in anticipation of early nose up as briefed. As the cadet got fixated on ASI while it registered past 40 KIAS. The aircraft started veering off due to inherent left turning tendency. The yaw induced roll and lack of slight back pressure (on control) made the aircraft to wheel barrow on the left main gear and nose gear with right gear off the ground which is corroborated by the tyre marks on the runway. When the Student Pilot got startled on noticing left veering and gave right rudder to bring back the aircraft to centerline. The Student Pilot applied right rudder. The aircraft did not respond to right rudder due to less control while the aircraft was wheel barrowing and the aircraft continued in its path. In order to stop the aircraft the Student Pilot chopped the throttle. However, the Student Pilot was not trained/skilled to handle aborted/rejected take-off, thus the action done in the situation were insufficient to stop the aircraft on runway. The Student Pilot was not prepared for aborting the takeoff on slightest sign of anomaly due to lack of exposure which breded startle factor. **This indicates lack of experience and skill to handle an emergency which requires the aborted/rejected take-off.**

After chopping off the power, Student Pilot did not apply any brakes or gave any input due to panic, **this indicates lack of situational awareness.** The correct action could have been to aborted/reject the take-off.

Further, the aircraft exited the paved runway surface. Subsequently, the aircraft made few bounces in the uneven sand surface and lifted its nose after bouncing off a heap of sand and nosed down at steep angle. The aircraft flipped on its nose and rested in the upside down position.

Based on above discussion and considering experience of the Student Pilot, **it is concluded that crew handling was one of the major contributory factor to this accident.**

## **2.4 Organizational Practices**

### **a) Rejected Take-Off /Aborted Take-Off**

As per M/s RGAAT DGCA approved TPM, before first solo Student Pilot required to be assessed by CFI/DY.CFI/FI regarding Aborted takeoff. While imparting training for emergency during take-off, such as engine failure during take-off roll, flying instructor simulated engine failure during take-off as per POH, which requires rejected take-off /aborted take-off. Student Pilot had practice the emergencies. Student Pilot was checked by CFI and after satisfactory completion of emergency check flying, the Student Pilot was released for 1<sup>st</sup> solo flying. However, flying instructor again took the Student Pilot for C/L emergencies and simulated the engine failure during take-off roll. **Carrying out the same exercise after satisfactory completion, indicates some kind deficiencies or lack of confidence. This also indicates lack of confidence in handling the emergencies due to lack of practice in Rejected Take-Off /Aborted Take-Off.**

### **b) Briefing and Debriefing**

M/s RGAAT TPM Para 5.16 lays down the procedure for Briefing and Debriefing. However, it was found that the post completion of solo check flying sortie, the flight instructor debriefed and briefed the student Pilot for 2<sup>nd</sup> solo sortie in the aircraft for few minute while disembarking the aircraft. As per FTFR, Flight Instructor debriefed the Student Pilot even after the accident, indicates negligence towards the Briefing and Debriefing activity. Further, investigation team could not able to find any documented evidence which would suggest that the threat and error management is being exercised to the Student Pilot. **Therefore, it is understood that one of the important aspect of CPL training is being ignored or not taken in true spirit and will impair the overall safety in the flying training academy.**

## **2.5 Circumstances Leading to the Accident**

Following are the circumstances which lead to this accident.

After the satisfactory completion of solo check flying sortie, the flight instructor briefed the student Pilot for 2<sup>nd</sup> solo sortie with two circuit and landings. Before de-boarding the aircraft the instructor mentioned to expect preponed lifting of nose due to reduction of Instructor's

weight. **The pre-flight briefing was carried out but not in accordance with the SOP** given in the TPM. Therefore, the purpose/effectiveness of pre-flight briefing did not meet the desired goal.

Student Pilot taxied the aircraft upto the runway holding point. Before entering the assigned runway, flight controls and instruments were checked. During flight control check, no abnormality was observed. ATC hold the aircraft for some time due to one departure. With ATC clearance, aircraft lined up on the runway. Till such time there was no abnormality observed by the Student Pilot.

After lining up Student Pilot released the brakes and the power was smoothly increased to maximum. The aircraft started rolling down the runway. The Student Pilot saw the airspeed indicator registering. He scanned the instruments in quick succession by maintaining visual outside. As the airspeed was rising above the 40 KIAS, the **Student Pilot gets fixated on ASI in anticipation of early nose up as briefed and lost the focus on the other important aspects.** When the Student Pilot looked outside he got startled by seeing the aircraft veering towards left of the runway due to inherent left veering tendency. The yaw induced roll and lack of slight back pressure made the aircraft to wheel barrow on the left main gear and nose gear with right gear off the ground which is corroborated by the tyre marks on the runway. The Student Pilot applied right rudder whereas the aircraft did not respond due to wheel barrowing and continued in its path.

Then the Student Pilot chopped the throttle as the aircraft exited the paved runway surface. The aircraft made few bounces in the uneven sand surface and lifted its nose after bouncing off a heap of sand and nosed down at steep angle. The aircraft nosed over and rested in the upside down position.

The Student Pilot found himself hanging by the seat belt in inverted position. When the Student Pilot regained the grips of situation, he tried to release himself but was unable due to seat belt held under tension. The Student Pilot pushed himself up by pushing against the aircraft and released the seat belt. The Student Pilot fell on the windshield and was helped by the rescue team who had arrived at the site by then.

### **3. CONCLUSION**

#### **3.1 Findings**

1. Aircraft's C of R, C of A, ARC and Aero Mobile License were valid and current.
2. Aircraft weight schedule was valid and Load and Trim sheet was prepared for the flight and C.G was within limits.
3. No snag was pending on the aircraft and its engine for rectification.
4. Involved aircraft rudder control and brake were examined and no abnormality was observed.
5. At the time of accident, Visibility was 6000m and wind was 240° & 03Kt.
6. Student Pilot was appropriately licensed, qualified and authorized as per prevailing DGCA civil Aviation Requirement (CAR) to undertake the flight.

7. Student Pilot was irregular with breaks in flying training.
8. The student Pilot was not subjected to assessment at interval as stated in TPM.
9. Student Pilot lacks the skills to reject /abort the take-off.
10. DGCA operation circular no. 2 of 2004 does not covers Student Pilot studying at FTOs.
11. Flight instructor signed the debriefing even after the accident.
12. The briefing and de-briefing procedures were not carried out effectively.

### **3.2 Probable Cause of the Accident**

The probable cause of this accident is attributed to the loss of directional control due to inappropriate handling of the aircraft.

The contributory factors to this accident are attributed to the following:

- a) Lack of exposure on rejected /aborted take-off.
- b) Lack of continuity in flying training.

## **4. SAFETY RECOMMENDATIONS**

It is recommended that

**4.1** DGCA may issue directions to all FTOs to include rejected take-off/ aborted take-off in their TPM, so that the training on rejected /aborted take-off will be imparted mandatorily by them and records of the same will be maintained. To highlight the importance of rejected take-off/aborted take-off DGCA may amend its Pilot's proficiency/IR check form to include rejected /aborted take-off in section 2 (i.e., Departure ...).

**4.2** In order to bridge the gap created due to long absence and to maintain the level of training standards, DGCA may issue a circular regarding recency requirement for student pilots who are undergoing training in a DGCA approved Flying Training Organization.

**4.3** In order to enhance the application of Threat and Error management technique in FTOs, DGCA may issue a circular/guidance material on Threat and Error management.

**4.4** The Organization should impart corrective training to the Student Pilot by giving more stress on basic flying skill or handling of emergency such as rejected / aborted take-off

**4.5** The organization should issue a circular to reiterate the importance of briefing and debriefing to its Flight Instructors and Students. DGCA may also ensure the effectiveness of briefing and debriefing in the FTOs during the audits.

**Dated: 14 February 2024**