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**Final Investigation Report on
Accident to M/S Academy of Carver Aviation Pvt. Ltd,
Cessna 152 Aircraft, VT-ALI
On 25 July 2022**

Aircraft Accident Investigation Bureau

**Amit Kumar
Investigator-in-charge**

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.

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GLOSSARY

AAIB	Aircraft Accident Investigation Bureau, India
ADC	Air Defence Clearance
AFM	Aircraft Flight Manual
AME	Aircraft Maintenance Engineer
ARC	Airworthiness Review Certificate
ATC	Air Traffic Control
AUW	All Up Weight
BHP	Brake Horse Power
BMT	Baramati
CG	Center of Gravity
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CAR	Civil Aviation Requirements
CPL	Commercial Pilot License
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
DFDR	Digital Flight data Recorder
DGCA	Directorate General of Civil Aviation
FIC	Flight Information Center
FOB	Fuel On Board
FRTOL	Flight Radio Telephone Operators License
ft	feet
FTPR	Flight Training Progress Report
Hrs	Hours
IST	Indian Standard Time
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
KIAS	Knots-Indicated Air Speed
Kt(s)	Knots
LFA	Local Flying Area
LH	Left Hand
MLG	Main Landing Gear
MTOW	Maximum Take-off Weight
NLG	Nose Landing Gear
NM	Nautical Miles
NO SIG	No Significance
PDR	Pilot Defect Register
PIC	Pilot in Command
QFE	Field Elevation

QNH	Nautical height
QRH	Quick Reference Handbook
RA	Radio Altitude
RH	Right Hand
RPM	Revolutions Per Minute
SB	Service Bulletin
SOP	Standard Operating Procedure
TPM	Training Procedure Manual
VFR	Visual Flight Rules
VHF	Very High Frequency
VT-888	A symbolic aircraft registration number
UTC	Coordinated Universal Time
XPDR	Transponder

Aircraft and Accident details of Cessna 152 Aircraft VT-ALI on 25 July 2022			
1	Aircraft	Type	Cessna 152
		Nationality	Indian
		Registration	VT – ALI
2	Owner	M/s Academy of Carver Aviation Pvt. Ltd	
3	Operator	M/s Academy of Carver Aviation Pvt. Ltd	
4	Pilot – in –Command	SPL holder	
	Extent of injuries	Minor Injury	
6	Passengers on Board	Nil	
7	Place of Accident	Kabdanwadi(Indapur)Village, Pune	
8	Date & Time of Accident	25 July 2022 &0543 UTC (approx)	
9	Last point of Departure	Baramati Airfield	
10	Point of intended landing	Baramati Airfield	
11	Latitude/Longitude of accident site	Lat 18° 08'05.694"N, long 74°50'57.163"E	
12	Type of operation	Solo Cross Country Training Flight	
13	Phase of Operation	Cruise	
14	Type of Accident	Fuel (Fuel Exhaustion)	

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

SYNOPSIS

On 25 July 2022, Cessna152 aircraft with registration VT-ALI of M/s Academy of Carver Aviation Private Limited (ACAPL), while carrying out a solo cross country training sortie, on the route Baramati-Akkalkot-Baramati, made a forced landing on an agriculture field near Kadbanwadi (Indapur) village at 0543 UTC.

The aircraft was under the command of a trainee pilot holding a valid Student Pilot License. As per plan, aircraft took-off from runway 29, Baramati airfield at 0155 UTC. The outbound leg was uneventful and aircraft reached over its planned destination Akkalkot. After reaching over Akkalkot, the aircraft set course back to Baramati and started flying on the inbound track. On the return leg, over Solapur, aircraft transmitted "over flying Solapur". Subsequently, aircraft got deviated from its intended track and the trainee pilot was not able to locate the next check point on the route. After an unsuccessful attempt to regain the track, trainee pilot sought help from M/s ACAPL's another Cessna 172 aircraft VT-888 to locate her position. At that time aircraft VT-888 was on her return leg of the solo cross country (route: Baramati-Solapur-Akkalkot-Maindargi-Baramati) and was flying ahead of VT-ALI. VT-888, acknowledged the VT-ALI's request and guided her in coordination with M/s ACAPL's Chief Flying Instructor (CFI), who was on instructional flying in the local flying area with another student. After sometime aircraft VT-ALI regained the track under the guidance from VT-888, and continued to Baramati.

Subsequently, aircraft VT-ALI reported its location from check point. Few seconds after reporting its location at one check point (approximately 15 NM inbound Baramati airfield), aircraft experienced a rapid loss in engine RPM. Trainee pilot reported the same to CFI. CFI instructed the trainee pilot to repeatedly crank the engine. However, engine did not start and trainee pilot reported to CFI that the propeller is wind milling. The CFI, instructed the trainee pilot to force land the aircraft in the nearby field. Aircraft VT-ALI searched for suitable location and executed the same. Aircraft force landed in an agriculture field, in Indapur district approx 15NM, South-East of Baramati Airfield.

Director General, Aircraft Accident Investigation Bureau vide order No. INV.11011/12/2022-AAIB dated 26 Jul 2022 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. Further, Shri Ajendra Singh, Consultant, AAIB was assigned as 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 24 July 2022, aircraft VT-ALI had carried out three circuits and landing sorties with total 01:45hrs of flying and no snag was reported. As per the prevailing organizational practice, after last sortie in the evening, the aircraft was refueled with 35 liters of fuel.

On 25 July 2022, trainee pilot was assigned on the aircraft VT-ALI, to perform 102NM solo cross country (Baramati-Akkalkot-Baramati) VFR sortie with 85 liter fuel on board (FOB). For this sortie, flight plan was filed and as per filed flight plan, the alternate and 2nd alternate aerodromes were Solapur (VASL) and Pune (VAPO) respectively. The flight level filed for this sortie was 3500ft. As per AME statement, a preflight daily inspection and a ground run were carried out at 0028 UTC. During pre-flight inspection, no observation was made. Post preflight inspection, at 0120 UTC, CFI signed the acceptance in the aircraft technical logbook. However, technical logbook was not filled properly.

As per trainee pilot's FTPR, trainee pilot had operated 19 Solo Cross Country sorties on the same route prior to this accident. Trainee pilot's last Solo Cross Country on the same route prior to the accident was done on 23 July 2022, just two day prior to this accident.

As per training plan, trainee pilot reported to academy at 0045 UTC and signed the pre-flight Breath Analyzer (B.A) declaration as per DGCA requirement. ADC & FIC were also obtained for this sortie. Flying instructor briefed the trainee pilot about the sortie and released her for solo cross country. Trainee pilot did the walk around inspection under the supervision of an instructor and no abnormalities were observed.

As per organization's practice, Cessna 152 aircraft was used to operate solo cross country on the route Baramati-Akkalkot-Baramati about 102 NM. Whereas, Cessna 172 aircraft were used to operate solo cross country flying on the route Baramati-Akkalkot-Maindargi and return, approximately 108NM.

Normally 3-4 aircraft operate cross country flying in a sequence and maintain a 5-10 minutes interval among them. On that day, four solo cross country training sortie were planned. Out of four aircraft, three were Cessna 172 and one was Cessna 152, VT-ALI. The three Cessna 172 aircraft departed first from Baramati followed by VT-ALI. As per trainee statement, aircraft chocks off at 0140 UTC. Aircraft taxied to the runway holding point, while holding on the taxiway, magneto drop was checked and found satisfactory. Aircraft got airborne from runway 29 at 0155 UTC, almost 15 min after engine startup, as VT-ALI was fourth in departure sequence. The departure instructions for VT-ALI were "Depart runway 29 straight, climb 2500ft, turn left at 3000ft and maintain 3000ft after 05NM climb to 3500ft". At the time of departure, visibility was 5000m and wind was 03 KT at 210°.

As per navigation log sheet, during out bound leg, aircraft followed 115° track and transmitted its position from each designated/earmarked check-points. In the outbound leg, flying was uneventful and aircraft reached its planned destination Akkalkot at 0317 UTC. After reaching Akkalkot at 0318 UTC, trainee pilot set course back and read the cockpit instruments; oil

pressure & temperature were in the green arc and fuel quantity indicator was in the middle. During inbound leg, aircraft was required to follow 295° track and it had followed the same till Solapur. After reaching Solapur at 0330 UTC, trainee pilot transmitted its position as “over flying Solapur”. Till that time flight was uneventful.

As per the statement of the trainee pilot, after Solapur, aircraft got deviated from its route as the trainee pilot followed a wrong visual reference i.e., a different highway and the aircraft heading was also not monitored.

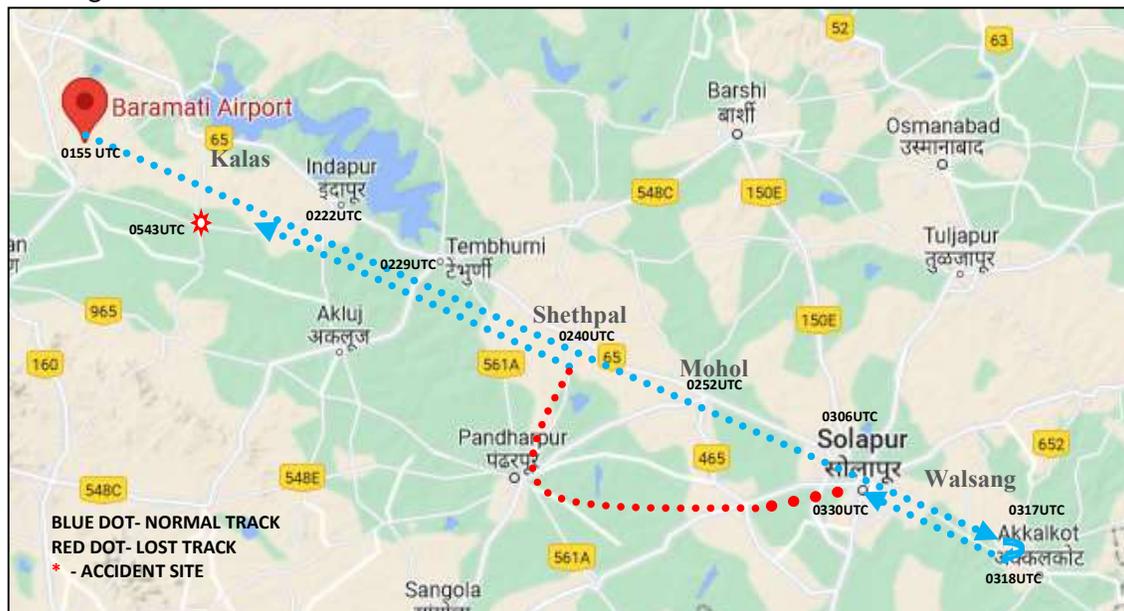


Figure 1: Cross country route (courtesy to Google map)

After exiting Solapur, when trainee pilot was unable to reach the very next check point, which was approx 10-12NM from Solapur. The trainee pilot started searching for the check point. After unsuccessful attempt to locate, trainee pilot sought help from M/s ACAPL’s Cessna 172 aircraft VT-888, which was flying ahead in the sequence. However, the trainee pilot did not initiate the lost procedure. Aircraft VT-888 was on the return leg of the solo cross country route (Baramati-Maindargi- Baramati) and was approx 40NM inbound to Baramati airfield. Aircraft VT-888 acknowledged VT-ALI’s request and entered an orbit pattern between 35-40NM inbound to Baramati at an altitude of 4000ft, to provide guidance to the lost aircraft. VT-888 was also in contact with CFI, who was flying in the local flying area with another student. VT-888, asked VT-ALI to use ‘Google Maps’ in mobile phone and trainee pilot tried the same. Trainee pilot’s mobile phone did not connect to the network. Then VT-888 asked VT-ALI to spell the prominent ground features and visual references. VT-ALI followed VT-888 guidance to locate her position. After sometime with assistance from VT-888, aircraft VT-ALI intercepted the track and continued its flying back to Baramati. VT-888, also resumed its flying to Baramati, keeping an eye on VT-ALI, who was flying 500ft below. However, trainee pilot did not pay any attention toward the in-flight fuel consumption and available endurance.

Aircraft VT-ALI reported its location at one of the check point (approximately 15 NM inbound to Baramati airfield). After about two second of reporting its location, aircraft experienced a

rapid loss in engine RPM. Trainee pilot reported the same to the CFI. As per CFI's instruction trainee pilot cranked the engine. Trainee pilot tried again. Meanwhile, engine RPM dropped further. Trainee pilot reported to CFI that the propeller was wind milling. Then the CFI instructed the trainee pilot to force land on a field which is clear of wires. VT-ALI searched for suitable location. Trainee pilot executed the force landing on an agriculture field near Kadbanwadi village in Indapur district at 0543 UTC approx 15NM SE of Baramati Airfield. As per trainee pilot statement, at all time oil temperature & pressure were in green arc.

Nearby villagers immediately rushed toward the accident site and rescued the trainee pilot from the aircraft wreckage.

Aircraft VT-888 witnessed force landing of the aircraft VT-ALI. After force landing, VT-888 send the accident site location to CFI and proceeded towards Baramati Airfield. VT-888 landed safely at Baramati.

Due to impact ELT got activated and distress signal was detected by INMCC at 0543 UTC. The trainee pilot suffered minor injuries whereas the aircraft sustained substantial damages. There was no fire involved in this accident.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

The aircraft sustained substantial damage in the accident. The front fuselage and the nose section of the aircraft were found severely damaged. Details of the aircraft damage are given in the section 1.12.

1.4 Other Damage

Aircraft forced landed in an agriculture field. Consequently, crop in the agriculture field got damaged due to aircraft impact and dragging.

1.5 Personnel Information

1.5.1 Trainee Pilot

Nationality	Indian
Age	21yrs
License & Validity	SPL & 20.10.2026
Category	Aeroplane
FRT0 License Date of Issue/ Validity	24.11.2021/ 23.11.2031
Date of Med. Exam & validity	11.02.2022 & 23.02.2023
Total flying experience	136:00 Hrs.
Total Experience on type	136:00 Hrs.
Total Experience Solo on type	46.45 hrs

Last flown on type	25.07.2022
Rest period before the flight	12hrs
Total Flying experience during last one year	136:00 HRS
Total Flying experience during last Six Months	116:05 Hrs.
Total Flying experience during last 30 days	40:25 Hrs.
Total Flying experience during last 7 days	05:50 Hrs.
Whether involved in Accident /Incident earlier	No
Date of last periodical assessment	19.06.2022

Student flying history

Trainee pilot joined M/s ACAPL, Baramati in July 2021. As per FTPR, first flying exercise was done on 23 Oct 2021 for 30 min. The first solo was carried out on 20 June 2022, after completion of 32:05 hrs of flying training. Trainee pilot had practiced Radio Communication failure and local lost procedure on 03 May 2022. Trainee pilot had also practiced, forced landing procedure at on 04 May 2022. Total flying hour excluding accident flight was 136.00 hrs. Prior to the accident flight, the trainee pilot had completed 20 Cross Country training exercise. Trainee pilot had done all flying training exercises on Cessna 152 aircraft VT-ALI. 03 dual and 16 solo cross country training exercise were done on the same route. Last solo cross country of 02:45 hrs on the same route was carried out on 23 July 2022. Trainee pilot's performance in 08 periodical assessments including two quarterly were satisfactory. Details of Cross Country training flying done by the trainee pilot are tabulated below:

S. no	Date	Dual/Solo	Route	Time (hrs)
1.	05/06/2022	Dual	BMT O/F Pandharpur O/F Phaltan-BMT	01:55
2.	16/06/2022	Dual	BMT O/F Akkalkot-BMT	02:40
3.	17/06/2022	Dual	BMT O/F Akkalkot-BMT	02:40
4.	19/06/2022	Dual	BMT O/F Akkalkot-BMT	02:40
5.	20/06/2022	Solo	BMT O/F Akkalkot-BMT	02:50
6.	21/06/2022	Solo	BMT O/F Akkalkot-BMT	02:50
7.	22/06/2022	Solo	BMT O/F Akkalkot-BMT	02:50
8.	24/06/2022	Solo	BMT O/F Akkalkot-BMT	02:50
9.	26/06/2022	Solo	BMT O/F Akkalkot-BMT	02:55
10.	27/06/2022	Solo	BMT O/F Akkalkot-BMT	03:00
11.	28/06/2022	Solo	BMT O/F Akkalkot-BMT	02:55
12.	29/06/2022	Solo	BMT O/F Akkalkot-BMT	02:55
13.	30/06/2022	Solo	BMT O/F Akkalkot-BMT	03:00
14.	03/07/2022	Solo	BMT O/F Akkalkot-BMT	02:50
15.	07/07/2022	Solo	BMT O/F Akkalkot-BMT	03:00
16.	08/07/2022	Solo	BMT O/F Akkalkot-BMT	03:00
17.	15/07/2022	Solo	BMT O/F Akkalkot-BMT	03:00
18.	16/07/2022	Solo	BMT O/F Akkalkot-BMT	03:00
19.	21/07/2022	Solo	BMT O/F Akkalkot-BMT	03:05
20.	23/07/2022	Solo	BMT O/F Akkalkot-BMT	02:45

Table 1 - Trainee Pilot's Cross Country flying records				
S. no	Date	Dual/Solo	Route	Time (hrs)
21.	25/07/2022	Solo	BMT O/F Akkalkot-BMT (Accident flight)	03:48

From above table, it is evident that except for the accident flight, the maximum and minimum time taken by the trainee pilot during the past solo cross country flying were 03:05 hrs and 02:45 hrs respectively.

1.6 Aircraft Information

1.6.1 General Information

Cessna 152 aircraft is an all-metal; high-wing equipped with fixed tricycle landing gear and designed for general aviation utility purposes. Aircraft is powered with a four cylinder Avco Lycoming, O-235-L2C engine with displacement 233.3cu.in. The engine provides rated power of 110 BHP with 2550 RPM engine using 100 LL (low lead) fuel. The aircraft is fitted with fixed pitch Propeller of model No.1A103/TCM6958 with 2 blades.

The aircraft was fitted with Long Range Tanks having a total Fuelling capacity of 39 U. S. Gallon and usable fuel is 37.5 US Gallon. (1 U. S. gallon = 3.78541Liters)

The construction of the fuselage is a conventional formed sheet metal bulkhead, stringer, and skin design referred to as semi monocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment at the base of the rear door posts, and a bulkhead with attaching plates at the base of the forward door posts for the lower attachment of the wing struts.

The externally braced wings, containing the fuel tanks, are constructed of a front and rear spar with formed sheet metal ribs, doublers, and stringers. The entire structure is covered with aluminium skin. The front spars are equipped with wing to fuselage and wing-to-strut attach fittings. The aft spars are equipped with wing –to-fuselage attach fitting, and are partial-span spars.

The landing gear is of the tricycle type with a steerable nose wheel and two main wheels. The nose wheel is connected to the engine mount and has an oleo strut to dampen and absorb normal operating loads. The nose wheel is steerable through 8.5° either side of centre. By applying either left or right brake, the degree of turn may be increased up to 30°each side of centre.

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

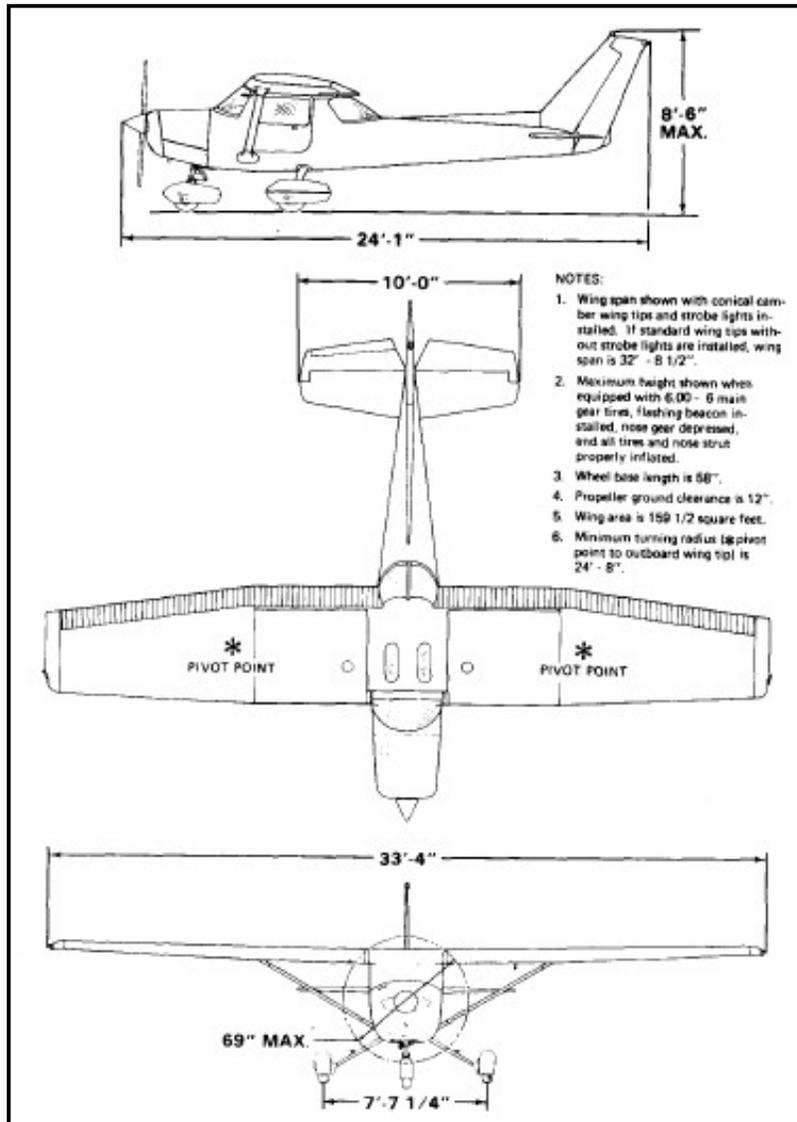


Figure 2: Three dimensional view

General characteristics

- Crew : one pilot
- Capacity : one passenger
- Length : 24 ft 1 in (7.3 m)
- Wingspan : 33 ft 4 in (10.2 m)
- Height : 8 ft 6 in (2.6 m)
- Wing area : 160 ft² (14.9 m²)

Aircraft Performance

- Max speed at sea level : 126 mph (110 knots, 204 km/h)
- Cruise speed, 75% power at 8000 Ft : 123 mph (107 knots, 198 km/h)
- Stall speed : 48 Knots unpowered, flaps down
- Take off roll : 725 ft (221 m)
- Extended range 75% at 8000 ft : 545 Nm with long-range tanks
- Endurance 75% at 8000 ft : 5.2 Hrs.

- Service ceiling :14,700 ft (4,480 m)
- Rate of climb :715 ft/min (3.6 m/s)
- Max. wing loading :10.5lb/ft²
- Minimum power/mass :066 hp/lb (108 W/kg)

1.6.2 Aircraft VT-ALI Specific Information

Aircraft Model	CESSNA-152
Aircraft S. No.	15284825
Year of Manufacturer	1983
Name of Owner	M/s Academy of Carver Aviation Pvt. Ltd.
C of R	2761/5 (Valid)
C of A(Category / Sub Category)	2249 (Normal/Passenger)
ARC (issue on /valid up)	24.08.2021/24.08.2022
Aircraft Empty Weight	528.00 Kgs
Maximum Take-off Weight (MTOW)	757.00 Kgs
Date of Aircraft weighment	30.07.1996
Max Usable Fuel	92.61 liters
Max Pay load with full fuel	76.86 Kgs
Empty Weight CG	80.14 cm aft of datum.
Next Weighing due	N/A
Total Aircraft Hours	21076:55 Hrs
Last major inspection on the aircraft	CH-IV/200 Hrs
List of Repairs carried out after last major inspection till accident	NIL
Engine Type	LYCO-O-235 L2C
Date of Manufacture	30.05.2014 (ENGINE O/H DATE)
Engine Sl. No.	L-23049-15
Last major inspection	CH-IV/200 hrs
List of Repairs carried out after last major inspection till date of incidence	Nil
Total Engine Hours	16847:05 Hrs.
Propeller (Model /SL. no.)	McCaughey / LC-013
Total Propellers Hours	1471:25 Hrs.
Aeromobile License& Validity	A-344/004& 31.12.2023
AD, SB, Modification complied	All applicable complied

The Aircraft is registered in “Normal” category and Sub Division - “Passenger Aircraft”. The C of A remains valid subject to validity of Airworthiness Review Certificate. The aircraft was weighed on 03.07.1996 at Hyderabad, and the weight schedule was re-computed on 10 May 2002, which was duly approved by the office of Director of Airworthiness, DGCA, Mumbai. 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 46:05 Hrs since the last Scheduled inspection to the time of accident. Last scheduled inspection (200 hrs inspection) was carried out at 21030:50 airframe hours (TSN) on 01 July 2022. Pre-flight Daily Inspection was carried out by the AME. A ground run was also carried out by the AME as a part of Pre-flight Daily inspection. During pre-flight inspection no

abnormality was observed. The aircraft engine had logged 2184:25hrs (TSO). Last scheduled inspection carried out on the engine was inspection 200hrs at 2138:20 hrs (TSO) on 14July 2022.

All concerned Airworthiness Directives, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine have been complied with. As per techlog book no snag was pending for rectification as on the date of accident. **However, it is observed that techlog book was not filled properly and some fields were left blank such as oil uplift record section etc.**“Tachometer not working during pre-flight run-up” was the last snag recorded in the techlog on 08.10.2016. The snag was rectified on 09.10.2016. As per the entries made in aircraft log book, the last DGCA Mandatory Modification complied on the aircraft was (DGCA/NEW/MISC/209 R1) on 05 July 2022.

Aircraft load and trim was prepared for the accident flight and center of gravity (CG) was found within limits. After the accident, ELT was found activated and was later switched off by the engineering personnel.

1.6.3 Aircraft Fuel system

a) Description and Operation

The airplane is equipped with a standard fuel system. Fuel systems consist of two vented fuel tanks (one in each wing), a fuel shutoff valve, fuel strainer, manual primer, and carburetor. Please refer figure:3.

Fuel flows by gravity from the two wing tanks to a fuel shutoff valve. With the valve in the on position, fuel flows through a strainer to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the cylinder intake port.

Fuel system venting is essential to system operation. Blockage of the venting system will result in a decreasing fuel flow and eventual engine stoppage. Venting is accomplished by an interconnecting line from the right fuel tank to the left tank. The left tank is vented overboard through a vent line which is equipped with a check valve, and protrudes from the bottom surface of the left wing near the wing strut attach point. The right fuel tank filler cap is also vented.

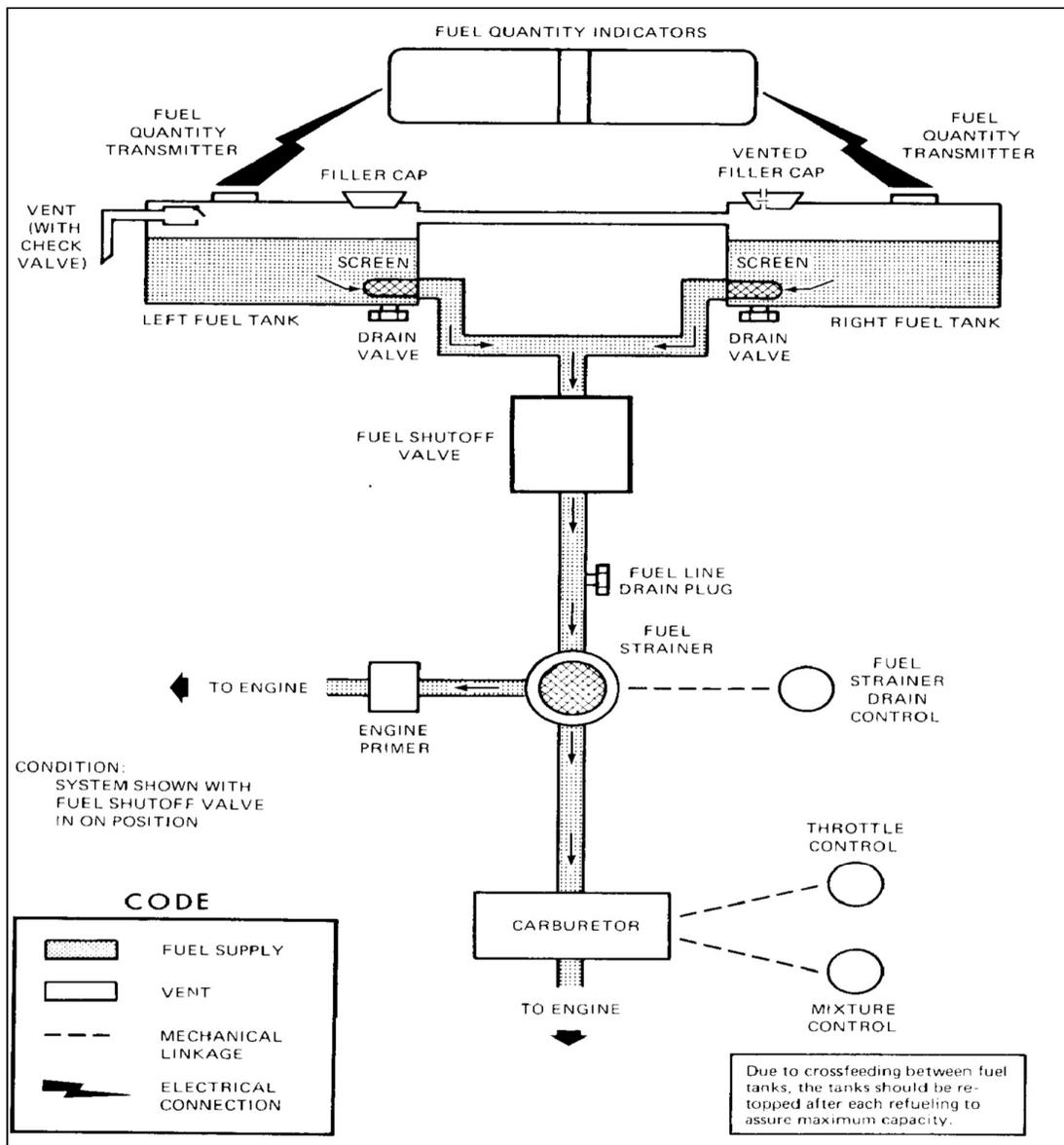


Figure 3: Fuel system

1.6.4 Fuel quantity indication

Fuel quantity is measured by two float-type quantity transmitters (one in each tank) and indicated by two electrically operated fuel quantity indicator on the lower left portion of the instrument panel. An empty tank is indicated by a red line and letter E. When an indicator shows an empty tank, approximately 0.75 gallon remains in a standard tank as unusable fuel. The indicator cannot be relied upon for accurate reading during skids, slips, or unusual attitudes.



Figure 4: Fuel Quantity Indicator

A physical check of the fuel quantity was accomplished by placing an incrementally marked 'dipstick' within each tank and reading the fuel level. The dipstick records fuel in litres, which was the unit of measurement used for all fuel calculations in accordance with the Operator's procedures.

1.6.5 Fuel and ignition System examination

During the onsite wreckage examination by the investigation team, both wing fuel tanks were found intact and almost empty i.e., RH tank was empty however, approximately 1.2 litres of fuel was drained out from the drain point of LH tank. Approximately 50ml of fuel was drained from the fuel strainer. Fuel system related components from tanks till engine intake, such as fuel tank, wing-fuselage attachment points and fuel supply lines etc. were inspected for leakage or abnormalities. However, no sign of fuel leakage or abnormalities were found. Further, Spark plug and magneto were also inspected to ascertain its condition and same was found satisfactory.

1.6.6 Aircraft fuel planning

As per Para 5.14 of M/s ACAPL approved TPM, PIC is assigned with the responsibility of fuel planning. PIC has to ensure fuel onboard prior to departure. While fuel planning additional 45 minutes of holding required to be taken into consideration. Same is quoted below:

"Before undertaking any flight, it is the responsibility of Pilot-in-command to ensure that the Aircraft has sufficient fuel for the flight plus the reserve fuel of 45mins holding."

As per aircraft record F.O.B was 85 litres. The aircraft choke-off at 0140 UTC and force landed at 0543 UTC. i.e., 04:03hrs. In addition, a 5 min ground run was also given during pre-flight inspection. Post-accident, approximately 1.2 litres of fuel was drained from the LH wing draining point.

1.6.7 Emergency procedures as per aircraft POH

The recommended procedures for various types of emergencies and critical situations are specified in Section 3 of Cessna 152 Flight Manual under Emergency Procedures. The relevant extract of the procedures to handle emergencies are quoted below:

a) Engine Failure during Flight

Operational Checklist

1. Airspeed—60KIAS
2. Carburetor Heat—On
3. Primer—In and Locked
4. Fuel shutoff valve—On
5. Mixture—Rich
6. Ignition switch—both (or start if propeller is stopped)

Amplified procedures- Engine Failure

“After an engine failure in flight the best glide speed as shown in the below figure, should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a forced landing without power must be completed.”

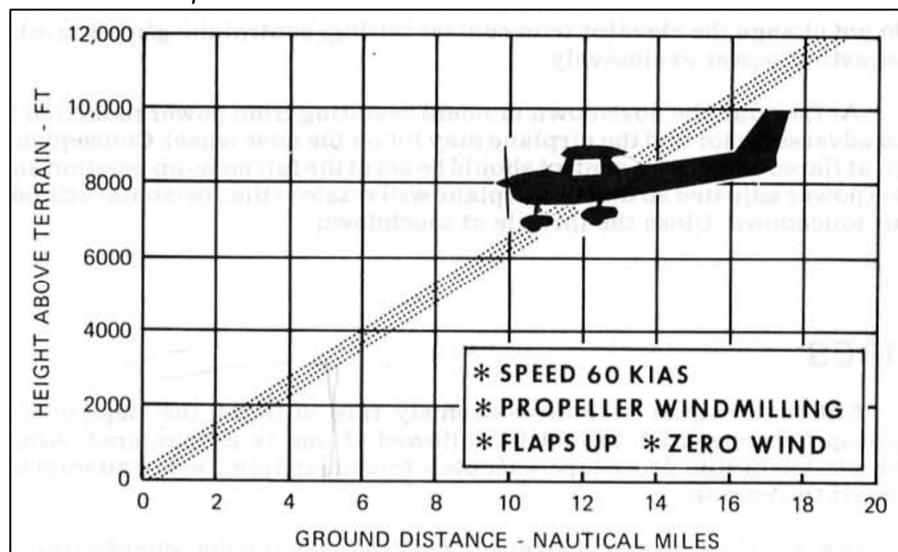


Figure 5: Recommended Glide (courtesy Cessna POH)

As per post-accident cockpit configuration, it indicates that the engine failure checklist & procedure were followed and the trainee pilot made few attempt to restart the engine. However, neither trainee pilot made any effort to identify the cause of engine failure nor CFI asked the trainee pilot for the same.

b) Emergency Landing without Engine Power

Operational Checklist

1. Airspeed-65 KIAS (flaps UP)
60 KIAS (flaps DOWN)
2. Mixture-IDLE CUT - OFF
3. Fuel Shutoff Valve -OFF
4. Ignition Switch-OFF
5. Wing Flaps - as required (300 recommended)
6. Master Switch- OFF
7. Doors-unlatch prior to touchdown

8. Touchdown-slightly tail low
9. Brakes-Apply Heavily

Amplified procedures- Forced Landing

“If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed under the emergency landing without Engine Power checklist.....”

Transmit Mayday message on 121.5 MHz giving location and intentions and squawk 7700 if a transponder is installed. Avoid a landing flare because of difficulty in judging height over a water surface.”

As per trainee pilot’s statement, no MAY DAY call was given prior to force landing and emergency squawk code was also not entered in the XPDR. In addition, from post-accident cockpit configuration i.e., Flap at 0°, Mixture – rich and Fuel Shutoff Valve knob in open position. It is evident that neither checklist nor procedure was followed.

1.7 Meteorological Information

M/s ACAPL, ATC tower is equipped with weather equipment (made up of Davis Vantage Vue instrument) and utilizes the same to obtain Wind data, temp and QNH. The cloud data is based on the Pune METAR and the input given by the pilot flying in the LFA of Baramati.

Table 2 - METAR recorded between 0330 UTC to 0530 UTC on 25 July 2022							
Time (UTC)	Visibility (m)	Wind	Cloud	Temp	Dew Point	QNH	Trend
0330	5000	250° 09KT	SCT060	25° C	21°	1010	No Sig
0400	5000	200° 06KT	SCT050	26° C	22°	1011	No Sig
0430	5000	230° 06KT	SCT050	26° C	22°	1011	No Sig
0500	5000	250° 08KT	SCT060	26° C	22°	1011	No Sig
0530	5000	260° 07KT	SCT060	26° C	22°	1010	No Sig

As per Para 9.5 of M/s ACAPL TPM, trainees are required to fly solo under Visual Meteorological Condition (VMC) i.e., Visibility not less than 5Km.

1.8 Aids to Navigation

There is no radio navigation aids available at Baramati Airport. The Baramati Airport has got only one runway and is a “Visual Approach Runway” which is equipped with a “Wind Sock” installed near the beginning of runway29.

1.9 Communication

Baramati Airfield is an “Uncontrolled Airfield and M/s ACAPL has set up its own temporary ATC Tower for maintaining flight coordination in air. M/s ACAPL, Baramati utilizes 129.25 MHz frequency for VHF communication between ATC (Baramati) and flying aircraft in Local Flying Area (LFA).

VHF communication is basically a line of site LOS communication with frequency between 30 to 300 MHz i.e., VHF is used when there is an unobstructed path between two radios, so is restricted to shorter-range communications. VHF has a maximum coverage radius range of about 60 miles subject to flight level and other factors.

As per Organization's practices, during cross country training, pilot uses Baramati frequency 129.25 MHz up to 55-60 NM outbound to Baramati. Thereafter, they switch over to Solapur frequency 118.60 MHz. While returning, around 55-60 NM inbound to Baramati pilot switched over to Baramati frequency 129.25 MHz.

As per trainee statement, in outbound leg, after take-off, trainee pilot reported aircraft position at each check point at 129.25 MHz frequency. Therefore, after crossing 55NM outbound to Baramati, trainee pilot switched over to Solapur frequency 118.60 MHz and relayed its position to Solapur traffic, as Solapur ATC watch was not available since 15 Feb 2022. While returning, when aircraft lost its track at that time aircraft was tuned to Solapur frequency. **Actually, the aircraft was neither in the contact with the base nor with the enroute Air traffic services.**

During transmission with VT-888, aircraft VT-ALI was tuned to 129.25 MHz Baramati frequency. As instructed by the CFI, VT-ALI switched over to Inter Pilot's frequency 123.45 MHz to minimize the blocking of Baramati frequency as other aircraft were flying in the LFA.

1.10 Aerodrome Information

The Baramati Airfield is an "Uncontrolled Airfield, located at Baramati, in Pune district Maharashtra, India. It is managed by Baramati Airport Limited (BAL). The ICAO Code for Baramati Airfield is IN-0024. It has a 7710ft (2350m) asphalt runway. The orientation of the runway is 11/29. The Airfield Co-ordinates are Lat: 18°13'35.84" N, Long: 74°58'18" E and elevation 1996 AMSL feet.

M/s ACAPL is using the Airport facility for flying training and maintenance related activity. The Air Traffic Control (ATC) is manned by CPL holders during normal working hours. Frequency used for VHF communication is 129.25 MHz.

1.11 Flight Recorders

No Cockpit Voice Recorder (CVR) or Digital Flight Data Recorder (DFDR) was found installed on the aircraft. VT-ALI was not required to be fitted with Cockpit Voice Recorder (CVR) or Digital Flight Data Recorder (DFDR) as per the prevailing DGCA, Civil Aviation Requirement.

1.12 Wreckage and impact Information

As per trainee pilot statement, after unsuccessful attempts to restart the engine, as per CFI's instruction, trainee pilot took the decision to force land the aircraft.



Figure 6: Final Resting position

Trainee Pilot searched for appropriate landing location. While executing the force landing, aircraft descended in LH circuit, aircraft LH wing and landing gear brushed the top branches of approx 30ft Neem tree in the landing path. Thereafter, aircraft's propeller hit the ground first with a steep angle. Due to impact propeller assembly got separated from the propeller hub and remained stuck in the ground. Then aircraft bounced on its RH wing and turned approx 90°. Before coming to rest aircraft's tail cone section dragged for approx 10 ft. Finally, aircraft came to rest on its two main landing gears with the support of empennage.

An eyewitness had captured few moments of force landing from far away. Snapshot of the same is depicted below:

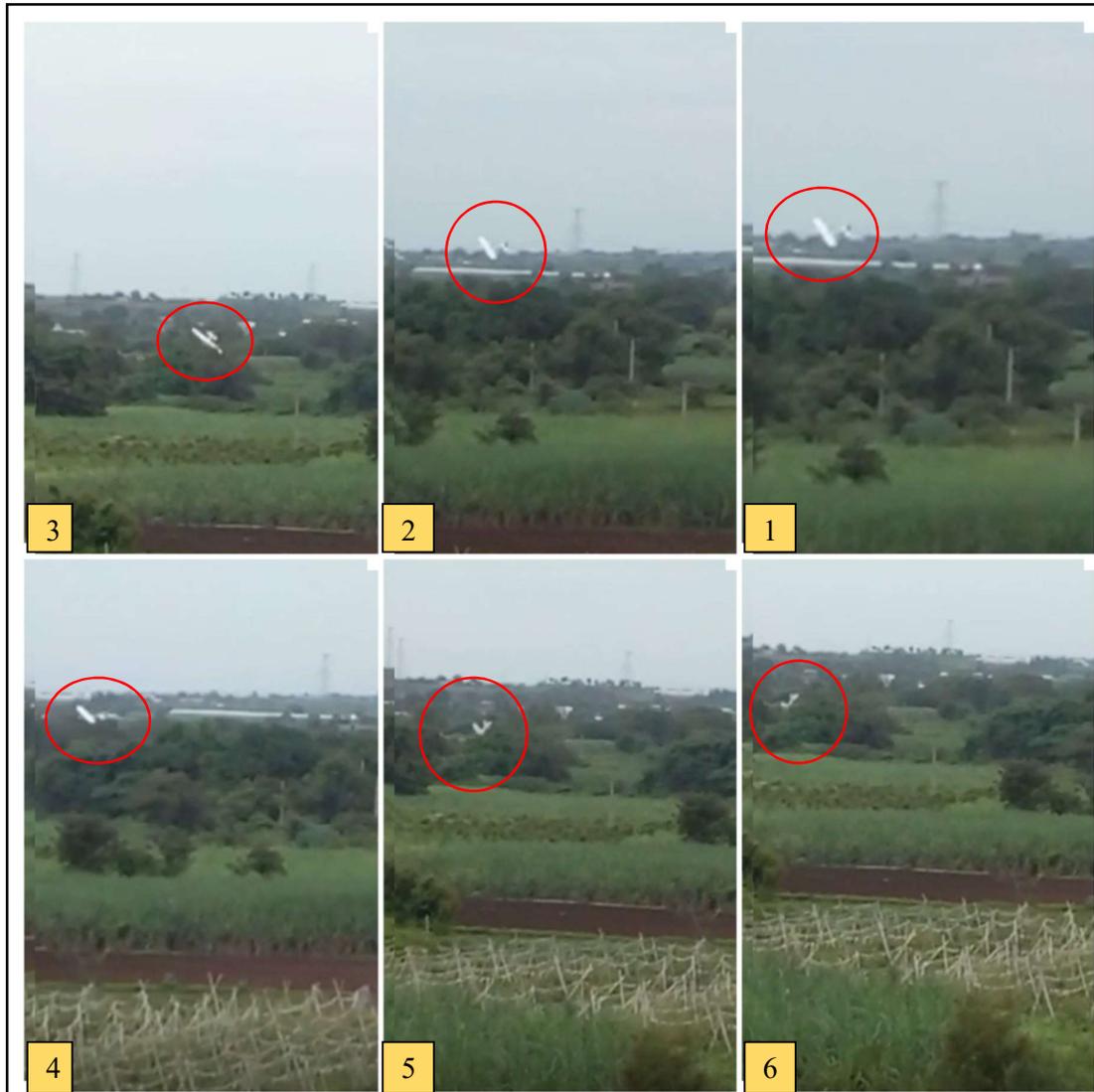


Figure 7: Aircraft images just before crash

a) Wreckage distribution:

Most of the aircraft parts were found intact with main wreckage. NLG, propeller and few small parts were found scattered nearby in the landing path within a radius of 50ft approx. NLG and propeller were found approx 20ft and approx 40ft respectively away from the wreckage. Same is depicted in the below figure: 8.

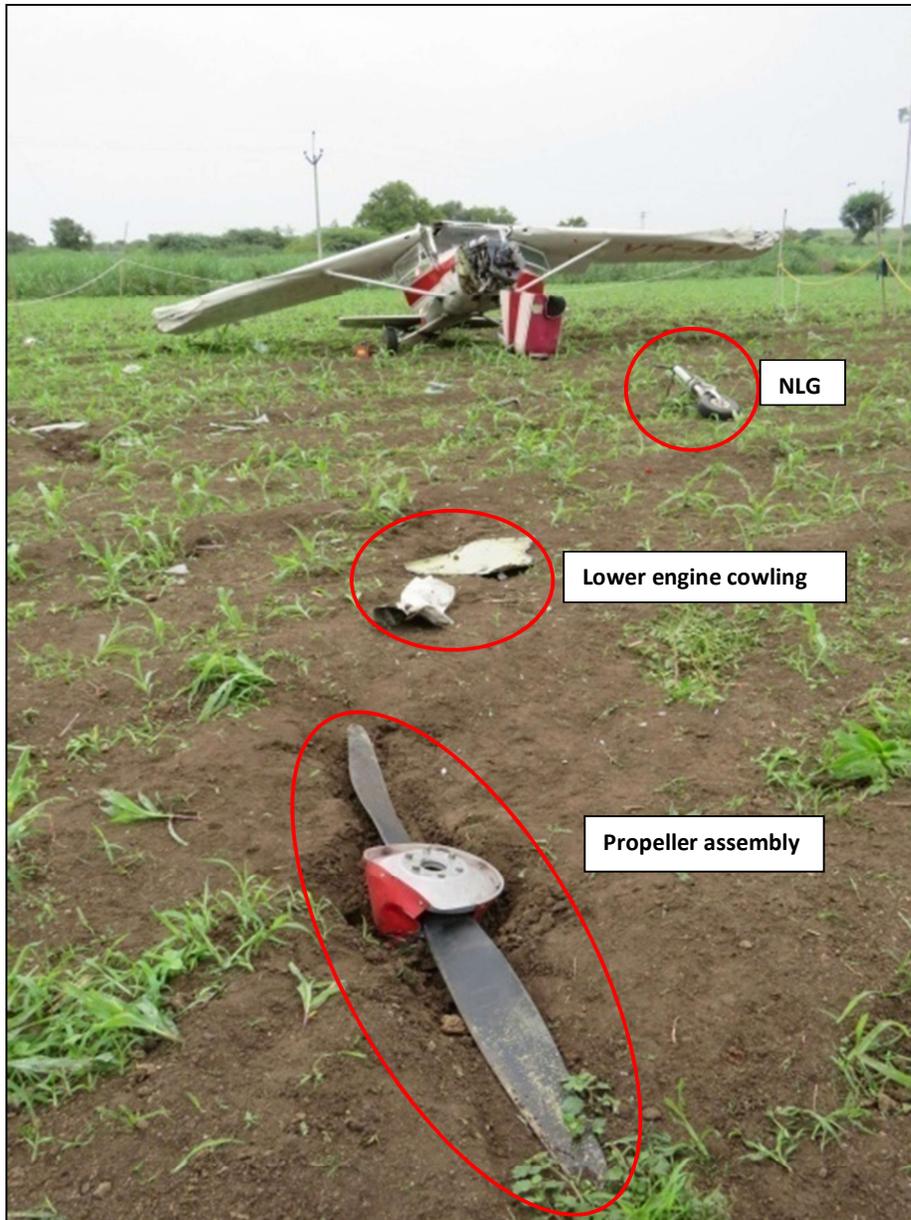


Figure 8: Aircraft wreckage

b) Damage to the Aircraft

In the accident the aircraft sustained substantial damages. Following are some of the damages sustained by the aircraft.

Fuselage: Fuselage skin between STA 00 to STA18.50 was found sheared off, buckled, cracked and bent rearward along with the firewall. Skin between STA 18.50 to STA 133.31 was found

wrinkled. Both front & rear windshields were found broken. Both LH& RH Cabin door were found damaged. Firewall was found sheared off, cracked & bent rearward.

LH Wing: LH wing inboard leading-edge skin was found buckled between station no.WS 22.12 & WS56.87 and also between WS 102.00 & 192.00.Wingtip was found completely damaged.

RH Wing: RH wing inboard leading-edge skin was found wrinkled and broken from station no. WS 22.12 to WS 84.00 and also from station no.WS 84.00 to WS 192.00.RH Wingtip was found completely damaged.

Horizontal Stabilizer: LH side tip was found broken.

Vertical Stabilizer (Fin): Tip was found broken.

Landing Gear & Brakes: Both MLGs were found intact with dents and scratches. However, Nose landing gear assembly got detached from its mounting and was found at approx 21ft away from the forward of the wreckage.

Aileron Control System: LH Aileron inboard skin at lower side & at mid-point were found slightly bent upward.

Wing Flap Control System: LH wing Flap outboard lower skin at trailing edge was found damaged or punctured. RH wing Flap inboard lower skin at trailing edge was found bent upward & leading-edge was found bent inboard side.

Rudder Control System: Rudder's upper fairing was found broken.

Engine: Both top & bottom cowlings were found completely damaged. Engine LH side No.2 & 4 cylinders front and rear baffles were found bent and cracked. Engine mount lower tubular members and upper tubular members were found damaged. Propeller flange was found bent.

Propeller: Propeller with spinner, bulkhead along with its bolts got detached from the engine flange due to severe ground impact and Spinner got damaged and one blade was found bent.

Instruments & Instruments System: LH side Instruments panel mounting assembly shifted to rearward along with the firewall. Control stick was found bent rearward along with the panel. Magnetic compass got detached from its actual position and was found on the cockpit floor.

Electrical System: Relays found damaged. Battery tray found sheared off from firewall due to heavy impact on the ground and battery had fallen on the ground. Landing and taxi lights found damaged along with bottom cowling. Both navigation lights LH &RH found damaged along with wing tips. Figures depicting damages to the aircraft are shown below:



Fig.9: Damaged nose section



Fig.10: Damaged aircraft's aft



Fig.11: Damaged left fuselage



Fig.12: Damaged right fuselage



Fig.13: Separated Propeller



Fig.14: Separated NLG



Fig.15: Damaged RH wing



Fig.16: Damaged RH wing

During the wreckage examination, following were the observations:

- Flap lever was found at 0° position.
- Throttle control knob was found in open position.
- The mixture knob was found in rich position.
- The ignition key position was found at 'BOTH'.
- Fuel Shutoff Valve knob was found in open position.
- NAV and Beacon lights were found in ON position.

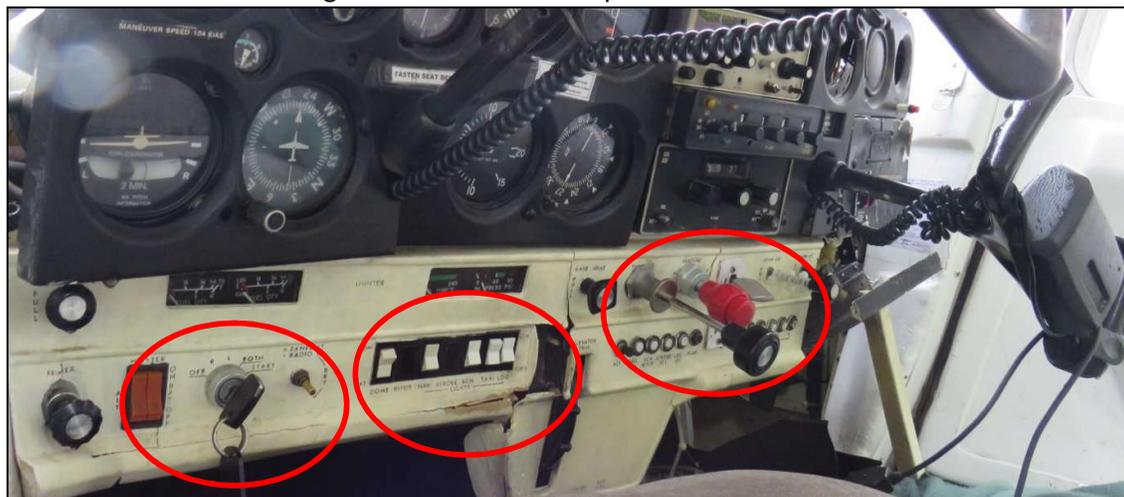


Fig.17: Cockpit view

1.13 Medical and Pathological Information

The trainee pilot had signed a BA declaration for pre-flight medical Breath Analyzer (BA) test at Baramati Airport as per prevailing DGCA regulations. Post-accident, the trainee pilot's medical examination was conducted. As per report trainee 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 and Engine Oil Sample Report

A fuel sample collected from LH fuel tank 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 passed the entire specification test.

Engine Oil sample was collected from aircraft and 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 entire specification test.

1.16.2 Engine Examination

Engine was subjected to Strip examination by a DGCA Licensed AME in the presence of investigation team. All accessories and components were disassembled and thoroughly examined as per applicable maintenance data. Following salient observations were made by the AME during the examination:

- a) **Bearing Surfaces-** No scoring, galling, wear were found on bearing surface. All Journal surface were in good condition and found satisfactory.
- b) **Gears-**No pitting or excessive wear was found on gears. Found satisfactory
- c) **Corrosion on stressed Areas-**No corrosion on interior surfaces of piston pins, the filets at the edges of crankshaft main, crankpin journal surfaces and thrust bearing races. No external damage was found. Crankshaft run out test was found satisfactory.
- d) **Screwed Fittings-**Threads and fittings were found satisfactory.
- e) **Cylinder Head-**Cylinder heads were found intact. No pitting or damage was found on valve seats. Studs were found intact. No damage was found on sparkplugs. Same were tested on spark plug tester for sparks. Gap was checked and was found satisfactory. No scoring or cracks was found on Valve guides. Mounting pads and cooling fins were found in good condition.
- e) **Cylinder Barrel-**No crack or bend was found on skirt. Interior of barrel were found to pickup rust due to storage/ unpreserved for long duration since accident. Nitride barrel, barrel glaze and ring wear step were checked and found satisfactory
- f) **Piston-**Piston pins, rings holes and bosses were found in good condition.
- g) **Piston Pin-**No corrosion or pitting. Found satisfactory.
- h) **Valve Rockers-**No damage, badly worn, pitted or scored tips. Found satisfactory
- i) **Push Rods-**No wear or play at ends rod. Found satisfactory.
- j) **Valves-**No damage, cracks, nicks on valves, stem, face or tip. Run out of face found satisfactory.
- k) **Tappet Bodies-** Tappet bodies were in good condition. No sign of any abnormalities. Found satisfactory.

Conclusion of Strip Inspection

Lycoming engine O-235 L2C, Serial no. L-23049-15 fitted on Cessna -152 aircraft VT-ALI was Strip examined and was found in good condition along with its all accessories. No abnormality was found during inspection. Crankshaft, camshaft, valves, pistons and all other moving parts were found intact and free for movement. No sign of engine stoppage due seize or lack of ignition.

1.17 Organizational and Management Information

1.17.1 ACAPL General

M/s ACAPL is a DGCA approved flying training organization situated at Baramati, Pune, Maharashtra. DGCA FTO approval No. is 05/20150, issued on 19.10.2015 and approval is valid up to 29.04.2024. Scope of approval is aero planes-PPL, CPL, IR, AFIR, FIR and extension of aircraft ratings single engine / multi engine. As on date of accident the organization was having two types of single engine aircraft and one multi engine aircraft in its fleet. Aircraft fleet consists of one Cessna 152, two Cessna 172R, four Cessna 172S and one multi engine P68C aircraft.

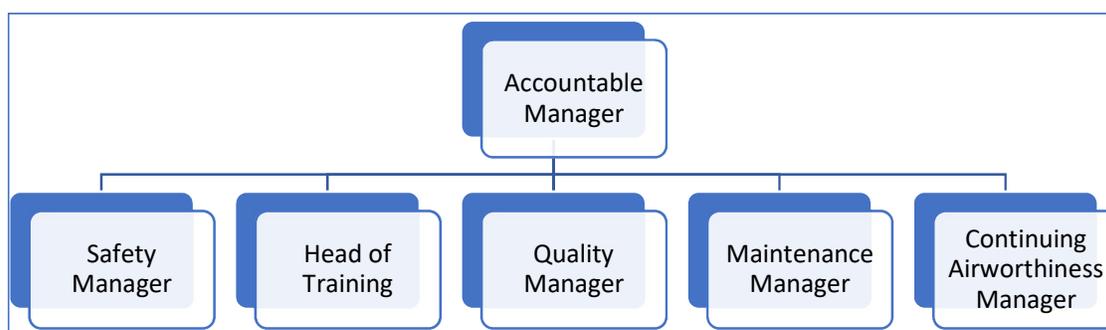


Figure 18: Organization Chart

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 extend their support to the Accountable Manager.

1.17.2 Accident History

As per AAIB's investigation report, M/s ACAPL's Cessna 172 S aircraft met with an accident on 05 Feb 2019 in Indapur district, Baramati. Aircraft was on Solo cross-country training flying on Baramati-Akkalkot- Baramati sector. The probable cause of accident was attributed to fuel exhaustion leading to loss of engine power.

In the investigation report, one of the finding was ***"The PIC did not monitor fuel at regular interval during the flight. Even during RPM drop, coughing of Engine and subsequent shut down of Engine, the fuel indication were never reported. This indicates lack of training imparted about fuel management."***

1.17.3 Flight Plan

PIC responsibility and actions required to be taken during flight planning are documented in Para 7.18 of M/s ACAPL's TPM, Issue No 2, Rev 0 dated June 2021, same is quoted below:

7.18 Flight Planning (General)

Prior to each flight, the pilot-in-command is responsible for the proper planning of the flight. In particular, the PIC is to take into account:

- *Current meteorological reports and forecasts*

- *Weather minima*
- *NOTAMs*
- *Aerodrome information*
- *Current charts and amendments*
- *Aircraft mass and balance ”*

As per flight plan records, flight plans were being filed without taking NOTAMs into consideration. Solapur was filed as an alternate aerodrome; However Solapur was on NOTAMs since 12 Feb 2022.

1.17.4 DGCA Circular 04 of 2020

i) As per Sub-Para (5) of Para 5.2, “Route Assessment” DGCA Circular 04 of 2020, a landing site in the route shall be identified for any contingency. Extract from the same is quoted below:

(5) At the flight planning phase, any selected landing site shall have been assessed by the FTO as acceptable for carrying out a safe forced landing with a reasonable expectation of no injuries to persons in the aircraft or on the ground. Landing sites suitable for a diversion or forced landing shall be a part of navigation log and plotted on map so that track and distance to the landing sites are immediately and continuously available.

During investigation it is observed that M/s ACAPL had not identified any landing site in the route as a contingency plan as required by the above circular except the alternate aerodromes.

ii) As per Sub-Para (e) of Para 5.3, “Important Consideration” DGCA Circular 04 of 2020, a two-way radio contact during entire cross-country is required. Extract from the same is quoted below:

During the entire cross-country, two-way radio contact must be maintained with the base of origin or other en route Air Traffic Services available along the route.

Out bound 55-60NM Baramati, the aircraft was out of contact with Baramati due to VHF range limits and was not in contact with Solapur (ATS) too as Solapur was not on watch.

1.17.5 Fuel Planning

In M/s ACAPL as a regular practice, in preparation to next day flying training, every aircraft is refueled after its last sortie of the day. Normally, Cessna 172 aircraft is refueled up to full tank. However, Cessna 152 is refueled up to 85 liters.

During the investigation, one of the students was interviewed. The student stated that for solo cross country flying, normally before and after flight they do check the fuel on board with dip stick in the tanks. However, they don’t monitor the in-flight fuel consumption as the aircraft are refueled either upto full tank or 85 liters, which appears to be 40-60 min more than the required endurance for solo cross country.

1.18 Additional Information

1.18.1 Actions when uncertain of Position

- i) As per Para 4.5.2 of M/s ACAPL's Flying order book, Issue No 3, Rev 0 dated March 2022, in Flying Order 4.5, "Action when uncertain of Position", it is documented that how to differentiate between Uncertain of Position and being lost. Same is quoted below:

4.5.2 The difference between being uncertain of one's position or being lost is simply a matter of time. For instance, If it is less than 10 minutes since the last known position then the pilot may be considered to be Uncertain of his position. If more than 10 minutes has elapsed, the lost procedure is to be adopted.

- ii) As per Para 4.5.3 of M/s ACAPL's Flying order book, Issue No 3, Rev 0 dated March 2022, in Flying Order 4.5, "Action when uncertain of Position", it is documented that what could be the principal cause of uncertainty of position. Same is quoted below:

4.5.3 The principal cause of uncertainty of position is human error and can occur because the pilot believes he is lost because of the non-appearance of some ground feature which may have passed undetected in poor visibility or which may actually be directly under the aircraft. Other causes are:

- a) Directional gyro incorrectly set in relation to the compass*
- b) Steering an incorrect heading, e.g. steering the ground speed figure instead of the compass heading or steering the calculated track instead of the drift angle etc*
- c) Failure to steer an accurate heading*
- d) Incorrect use or failure of radio navigation equipment*
- e) Failure to time from the last turning point*
- f) Continuing flight in unsuitable weather. "*

However, as per trainee pilot statement, trainee did not follow the above procedure.

1.18.2 Actions when lost

- i) As per Para 4.6.2 of M/s ACAPL's Flying order book, Issue No 3, Rev 0 dated March 2022, in Flying Order 4.5, "Action when lost", the reasons for being Lost. Same is quoted below:

4.6.2 Reasons for being lost

- Incorrect Hdg, G/S and ETAs
- DI not aligned and checked every 10-15 min
- Application of incorrect variation
- Incorrect drift and incorrect fix
- Weather deterioration
- Poor planned diversion
- Mostly human error

ii) As per Para 4.6.3 of M/s ACAPL's Flying order book, Issue No 3, Rev 0 dated March 2022, in Flying Order 4.5, "Action when lost", the action to be taken. Same is quoted below:

"4.6.3 Action to be taken:

- Sequence of Positive checks
- Fly extra 10% of time elapsed after last checkpoint
- GROUND TO MAP Navigation
- Establish Most Probable area
- Distance from last known position + and - 10% area around 30 degrees from your track - you will get a Arc with some thickness
- Draw a circle around the checkpoint you should have been whose radius is 10% of distance flown from last known position
- Establish Safe altitude
- Start Orbiting
- Check for larger area and features
- CONTINUE TO FLY THE AIRCRAFT SAFELY, MAINTAINING AN AWARENESS OF TIME, **FOR LAST LIGHT AND FUEL STATE**
- If Still unable to fix your position, increase your most probable area by 10-15-20-30%
- Turn towards prominent "Line feature" known in the area, ex. Large River, Coast Line, Railway Line, Highway then follow along to next town, now obtain fix
- Try to fly aircraft for BEST RANGE in this whole process
- Keep Navigation log for what so ever you do.
- KEEP TIME
- If Still unaware take the help of GPS or RADAR, use Squake 2000 and ask for the RADAR VECTORS if possible to contact RADAR Station
- Urgency or Distress calls are LAST OPTION before you decide to go for precautionary landing if required and less on time/fuel. "

iii) As per Para 4.6.4 of M/s ACAPL's Flying order book, Issue No 3, Rev 0 dated March 2022, in Flying Order 4.5, "Action when lost", the golden rule when lost. Same is quoted below:

"4.6.4 CLIMB, CONFESS, COMPLY – the golden rule when you are lost.

- **CLIMB.....Climb to 7000ft If you're not sure about the area tune and identify PUN VOR. Intercept and track out bound from Pune on Radial 120, to Baramati Airfield. Radial / Distance 120/44.** Reduce speed to low safe cruise speed and weaken the mixture to increase endurance. Check that the DI is aligned to the compass, estimate remaining endurance and decide if daylight remaining is a consideration.
- **CONFESS.....You are lost. Tell somebody. Start on the frequency currently being used. Don't mince words, say you are lost and give your qualifications so that ATC can tailor their service to your experience. If you cannot make contact then climb 7000ft and contact Pune Approach / Tower on 118.80/123.50. At reasonable**

heights you should receive a swift reply and a prompt position fix using Transponder on board.

- **COMPLY**.....Having made contact comply with ATC instructions. If necessary swallow your pride and ask ATC to guide you home, or to a suitable airfield. Request squawk and Radar Vectors to Baramati

Following the above actions in good time will reduce the chances of the situation getting worse, such as by flying into controlled airspace or running low on fuel”.

As per trainee pilot statement, trainee pilot did not follow the same, as the trainee pilot was not confident about the procedure.

1.18.3 In-Flight Fuel Monitoring

As per procedure documented in Para 5.14 of M/s ACAPL’s TPM, Issue No 2, Rev 0 dated June 2021, in flight fuel consumption is required to be monitored at a regular interval of 20 min. Same is quoted below:

“5.14 Flight planning procedure to ensure carriage of proper fuel on board

*Before undertaking any flight, it is the responsibility of Pilot-in-command to ensure that the Aircraft has sufficient fuel for the flight plus the reserve fuel of 45mins holding. For cross country flights alternate Aerodromes are to be selected as applicable to the route and fuel required should be calculated accordingly. **Fuel consumption is to be monitored at an interval of 20 min during in flight phase.** Post flight left out fuel is to be endorsed in the Log sheet and a feedback should be given to the engineering staff. In addition to the fuel it is equally important to check the oil. This check forms a part of the pre-flight checklist and it should be ensured that sufficient oil quantity is present in the Aircraft for the safe completion of the flight.*

Before going for solo cross country flight trainee have to show Navigation logs, load and trim and other required documents to any of the instructors. If any prepared document not found satisfactory then it’s the responsibility of the instructors to inform HOT/ CFI/ Dy. CFI.”

As per trainee statement, fuel consumption was not monitored in the inbound leg.

1.18.4 NOTAMs

As per NOTAM C0164/22 and subsequent NOTAMs issued by Airport Authority of India, ATC/CNS/MET facilities were not available from 15 Feb 2022 till 12 Aug 2022 at Solapur Airport. In addition, as per NOTAM 24 hrs Prior Notice (PN) is required for flight operation. Hence, Solapur watch was not available from 15 Feb 2022 till 12 Aug 2022. However, as per flight plan of 25 July 2022, Solapur was filed as an alternate destination in the flight plan. The same was not noticed by the instructor, who checked the documents prior to releasing the trainee pilot.

Further as a set practice, all cross country flying on Baramati-Akkalkot and Baramati-Maindargi route were filing the same alternate aerodrome i.e., Solapur. Similarly, the error

had gone unnoticed by the instructors, who checked the documents prior to releasing the trainee pilot.

1.19 Useful or Effective Investigation Techniques

Nil

2. ANALYSIS

2.1 Serviceability of the aircraft and engine

2.1.1 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 valid at the time of accident. Load and trim sheet for the accident flight 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 21030:50 airframe hrs on 01.07.2022 after completion of the last schedule inspection (200hrs and lower inspections). Aircraft had flown 46:05 hrs prior to accident flight and no snag was pending for rectification. Therefore, as per aircraft records the aircraft was airworthy.

2.1.2 Serviceability of Engine

During the investigation involved engine was thoroughly examined by a DGCA license holder AME as per applicable maintenance data in the presence of investigation team. All accessories, parts and components were disassembled from the engine and were subjected to specific tests as per maintenance data. During the examination the condition of engine accessories, components and parts were found satisfactory in accordance with maintenance standard. Main parts such as Crankshaft, Camshaft, pistons, spark plugs and bearing etc. were inspected and were found satisfactory. All other moving parts were found intact and free for movement. Further, no sign of engine seize was observed. Further, trainee pilot stated that at all time, oil temperature and pressure pointers were in green arc.

It is evident from the traces of nose section impact with ground that the propeller was not in rotation, which indicates engine was not running at the time of impact.

2.1.3 Estimation of Fuel requirement

As per M/s ACAPL approved TPM, PIC has to ensure that the aircraft has sufficient fuel for the flight plus the reserve fuel of 45mins for holding.

As per trainee pilot FTPR, the maximum and minimum duration of solo cross country flight were 03:05 hrs and 02:45 hrs respectively.

During the investigation of aircraft wreckage all fuel accessories and components were thoroughly examined. There was no sign of damage to any of the fuel lines from wing tank to engine intake, which could lead to a fuel leakage.

As per aircraft record F.O.B was 85 litres. The aircraft choke-off at 0140 UTC and force landed at 0543 UTC. i.e. after 04:03hrs. In addition, a five min ground run was also given during pre-flight inspection. Post-accident, approximately 1.2 litres of (unusable) fuel was also drained out from the LH wing draining point.

Considering above facts, **the fuel taken onboard was found in accordance with the approved TPM.** The in-flight fuel consumption per hour was found to be approximately 19-20 litres/hour. This doesn't indicate any abnormal engine fuel consumption. Therefore, fuel taken onboard got consumed during the approximately 04:08hrs of engine operation. Therefore, it is concluded that the engine was serviceable when it stopped delivering power mid-air.

In view of above, it is concluded that the aircraft engine stopped in mid-air due to fuel exhaustion and the serviceability of the aircraft and engine are not a contributory factor to this accident.

2.2 Weather

As per Baramati METAR issued at 0530 UTC, at the time of accident, visibility was 5km and wind was 07kt & 260°. Weather condition was above the VMC. **Therefore, it is concluded that weather was not a contributory factor to this accident.**

2.3 Crew qualification and actions

2.3.1 Crew qualification

The trainee pilot was holding a valid Student pilot license as per DGCA prevailing regulation and was appropriately authorized to undertake the training flight. Therefore, it is concluded that the Crew qualification was not a contributory factor to this accident.

2.3.2 Crew Actions

1. In the inbound leg, after leaving Solapur, inadvertently trainee pilot took a wrong visual reference i.e. a different highway; consequently aircraft got deviated from its track. As the trainee pilot had flown 19 times prior to this accident on the same route i.e., she was well acquainted with this route. Getting deviated from its track in clear weather **shows complacency and lack of alertness and vigilance.**
2. After overflying Solapur, when trainee pilot was not able to locate the very next checkpoint in return track, she started searching for visual references. However, the **trainee pilot did not initiate appropriate actions required to be taken in this situation i.e. to follow the actions required to be taken when uncertain of positions and to identify principal cause of uncertainty of position as per documented procedure (Flying Order Book Para 4.5.2 and 4.5.3).**
3. Trainee pilot did not observe the elapsed time since the aircraft was uncertain of her location or position. Considerable amount of time had elapsed when the trainee pilot decided to seek help from the other M/s ACAPL aircraft. **However, the trainee pilot did**

not follow the 'lost procedure' as demanded in the situation as per Flying Order Book Para 4.6.2.

4. In the inbound leg, after Akkalkot, trainee pilot did not monitor the in-flight fuel consumption. After Solapur, trainee pilot did not monitor the endurance. Thereafter, when the aircraft intercepted the return track and resume the inbound journey to Baramati, at that time the trainee pilot was in contact with CFI (directly or indirectly). Neither, the CFI nor the trainee pilot attempted to check available fuel on board and time elapsed. **This indicates lack of airmanship and lack of alertness & vigilance.**
5. The trainee pilot did not check the fuel on-board even when the engine stopped delivering power mid-air. In mid-air, when engine stopped, the trainee pilot did not try to understand the situation and the actual cause of engine stoppage. As per CFI instruction, trainee pilot cranked the engine two–three times. However, the actual cause of engine failure could have been easily identified by scanning the cockpit instruments. **This indicates lack of situational awareness.**
6. When trainee pilot decided to force land the aircraft in an agriculture field, the checklist & procedure for force landing without engine power was not followed. **Thus, there was non-adherence to the SOPs.**

In view of the above facts it is concluded that **non adherence to SOPs is one of the major contributory factor to this accident.**

2.4 Organizational Practices

1) A similar aircraft accident happened in M/s ACAPL due to fuel exhaustion in 2019. Recurrence of similar type of accident in a short span of three and half year **indicates that the safety measures taken by the organization after previous accident are ineffective.**

2) In M/s ACAPL as a regular practice, in a preparation to next day flying training, every aircraft is refueled after its last sortie of the day. As a practice Cessna 172 aircraft is refueled up to full tank. Whereas, Cessna 152 is refueled up to 85 liters. Further, one of the student pilot stated that for solo cross country flying, normally before and after flight they do check the fuel on board with dip stick in the tanks. However, they do not monitor the in-flight fuel consumption as the aircraft are refueled either up to full or 85 liters, which is always 40-60 min more than the required endurance for solo cross country. **This indicates ineffective teaching methodology adopted by the organization, which does not encourage the habit of monitoring of in-flight fuel consumption by the trainee pilot.**

3) **Non-adherence to DGCA circular 04 of 2020:** As per DGCA circular 04 of 2020 organisation is required to identify a suitable landing site for any contingency in the cross country training route. However, no such site was identified by the organisation except for the alternate aerodrome. In addition, landing site suitable for diversion or force landing is required to be assessed by the organisation in the flight planning phase and same is required to be mentioned on the NAV LOG Sheet. However, no such record was found during the investigation. **This indicates non-compliance of Para 5.2 of the above Circular.** As per DGCA

circular 04 of 2020 a two way radio communication during entire cross country is required to be maintained with the base of origin or the *enroute* air traffic services (ATS) available along the route. However, while operating cross country flying on Baramati-Akkalkot or Baramati-Maindargi route, after 55-60 NM outbound of Baramati, due to VHF limitation when the aircraft switched over to Solapur frequency then the aircraft loses its contact with the Baramati base. **Further due to non-availability of the Solapur watch aircraft were also not in the contact with any other *enroute* ATS. This is a non-compliance to the Para 5.3 of above Circular.**

4) When aircraft VT-ALI reported that she was lost, neither CFI nor student pilot (VT-888) advised her to follow the lost procedure as per documented procedure (Flying Order Book). **As such, the CFI as well as the trainee pilot did not follow the documented procedure. This is indicative of Organization's behaviour of non-adherence to documented procedures.**

5) Solapur was filed as an alternate aerodrome in the flight plans filed for cross country on the route Baramati- Akalkot or Baramati –Maindargi, although Solapur watch was not available since 12 Feb 2022. **This indicates prolonged lack of instructional supervision.**

2.5 Circumstances leading to the accident

At 0317 UTC, over Akalkot aircraft VT-ALI set course back to Baramati on 295° track, and trainee pilot checked the fuel gauge. As per trainee pilot statement, it was in the middle i.e. approximately 45-50 litres after reaching Solapur at 0330 UTC.

The trainee pilot transmitted position as overflying Solapur till that time flight was uneventful. While exiting Solapur, trainee pilot took a wrong visual reference i.e. a different highway. Consequently, the aircraft got deviated from its planned track in-advertently. After some time when trainee pilot was not able to locate the next check point, trainee pilot comprehended the situation and started searching for visual references. When the aircraft was not able to find the track, the trainee pilot raised the alarm and sought help from M/s ACAPL Cessna 172 aircraft (VT-888). Aircraft (VT-888) guided VT-ALI in coordination with CFI and finally aircraft VT-ALI intercepted the return track. However, a considerable long time had elapsed. Neither CFI nor trainee pilot observed that the time elapsed and fuel consumed in the intervening period.

Aircraft VT-ALI reported its position at approximately 15 NM inbound to Baramati. Immediately, after reporting its location trainee pilot experienced rapid loss in engine RPM. Trainee pilot reported to CFI and as per CFI's instruction cranked the engine without checking the fuel on board. CFI or trainee pilot did not understand the prevailing emergency situation. Meanwhile, the engine stopped delivering power and both CFI and Training Pilot were not able to realise the actual cause of engine power loss i.e., fuel exhaustion. Therefore, when the Trainee pilot informed CFI that engine did not restart, CFI asked trainee pilot to crank again. Trainee Pilot tried again however, the engine did not start and the trainee pilot reported to CFI that the engine is wind milling. In reply, the CFI instructed the trainee pilot to force land on a field which is clear of wires. As per CFI instructions, the trainee pilot executed

the force landing in an agriculture field near Kadbanwadi village in Indapur district at 0543 UTC.

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 accident flight and CG was within limits.
3. No snag was pending on the aircraft and its engine for rectification.
4. A thorough examination of the involved engine by DGCA license holder in the presence of investigation team showed that all other moving parts were found intact and free for movement and no abnormalities were observed.
5. Aircraft fuel tank was found intact and no leak or abnormality was observed on fuel system or accessories.
6. The engine was serviceable when it stopped delivering power in mid-air.
7. Weather condition was above the VMC.
8. Trainee pilot was appropriately licensed, qualified and authorized as per prevailing DGCA Civil Aviation Requirement (CAR) to undertake the flight.
9. Trainee pilot did not adhere to the emergency landing without engine power procedures.
10. Trainee pilot did not adhere to the lost procedure as required in the situation.
11. Trainee pilot did not monitor the in-flight fuel consumption and endurance at regular intervals after setting course back.
12. Trainee pilot did not check the fuel onboard even after engine stopped delivering power.
13. CFI did not discharge his duty as per documented procedure and did not ask the trainee pilot to initiate a lost procedure.
14. As per company practice, aircraft was refuelled up to 85 litres everyday in the evening after last sortie irrespective of next day schedule.
15. Solapur was filed as an alternate aerodrome on flight plan filed for cross country on the route Baramati-Akkalkot-Maindargi, although Solapur watch was not available since 15 Feb 2022. Instructors releasing the trainees for solo cross country did not verify the same.
16. The organisation has a history of a similar kind of accident due to fuel exhaustion. However, still trainee pilots were found not monitoring in-flight fuel consumption.
17. CFI did not handle the emergency situation in accordance with M/s ACAPL documented procedures.
18. Route assessment was not done, as required by Para 5.2 of DGCA circular 04 of 2020.
19. Landing site in the route was not identified for any contingency, as required by Para 5.2 of DGCA circular 04 of 2020.
20. A two way contact was not available with base or ATS along entire route as required by Para 5.3 of DGCA circular 04 of 2020.
21. Techlog book was not filled properly i.e., oil uplift record was left blank.

3.2 Probable Cause of the Accident

The probable cause of this accident is attributed to the following:

- a) Non adherence to “lost procedure”.
- b) Non adherence to DGCA approved TPM procedure of monitor fuel at regular interval, leading to fuel exhaustion followed by engine power loss.

4. SAFETY RECOMMENDATIONS

It is recommended that

4.1 The Organization should impart a corrective training to the trainee pilot giving adequate stress on basic flying skill or airmanship.

4.2 DGCA may carry out a detailed audit of M/s ACAPL to validate the compliance of all regulatory requirements laid down in DGCA Circular 4 of 2020.

4.3 DGCA may devise means to ensure compliance of requirements laid down in DGCA Circular 4 of 2020 from all approved FTOs. Issues such as Route Assessment (Para 5.2) and VHF coverage Para 5.3 (e), etc. may be specifically included in TPM for better compliance and monitoring.

4.4 DGCA may take action to sensitize all FTOs, the importance of monitoring of essential aircraft and engine parameters during flying training such as in-flight fuel consumption and endurance at regular intervals.



Amit Kumar
Investigator In Charge

Date: 19 June 2023

Place: New Delhi