FINAL REPORT ON ACCIDENT INVOLVING CESSNA FA152 AIRCRAFT VT-ENF OPERATED BY M/S GOVERNMENT AVIATION TRAINING INSTITUTE AT BIRASAL, ODISHA ON 08 TH JUNE 2020.

Dinesh Kumar
Investigator -In- charge

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Investigator

FOREWORD

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an accident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of 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
AFIR	Assistant Flight Instructor Rating
AGL	Above Ground Level
AMM	Aircraft Maintenance Manual
AMSL	Above Mean Sea Level
ARC	Airworthiness Review Certificate
ATC	Air Traffic Control
AUW	All Up Weight
C of A	Certificate of Airworthiness
CAR	Civil Aviation Requirements
CPL	Commercial Pilot License
CVR	Cockpit Voice Recorder
DE	Designated Examiner
DFDR	Digital Flight data Recorder
DFT	Directorate of Flying Training
DGCA	Directorate General of Civil Aviation
DI	Daily Inspection
DME	Distance Measuring Equipment
FIR	Flight Instructor Rating
FOI	Flight Operations Inspector
FRTOL	Flight Radio Telephone Operators License
FTO	Flying Training Organisation
FTPR	Flight Training Progress Report
hrs	Hours
IAS	Indicated Air Speed
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IR	Instrument Rating
LDO	Lease Develop Operate
MEL	Minimum Equipment List
MLG	Main Landing Gear
MoD	Ministry of Defence
NLG	Nose Landing Gear
NM	Nautical Miles
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
PPP	Public Private Partnership
QRH	Quick Reference Handbook
SB	Service Bulletin
TPM	Training Procedure Manual
VFR	Visual Flight Rules
VSI	Vertical Speed Indicator
UTC	Coordinated Universal Time

FINAL REPORT ON ACCIDENT INVOLVING CESSNA FA152 AIRCRAFT VT-ENF OPERATED BY M/s GOVERNMENT AVIATION TRAINING INSTITUTE ON 08/06/2020 AT BIRASAL, ODISHA

1. Aircraft Type : Cessna FA152
   Nationality : INDIAN
   Registration : VT –ENF

2. Owner : Aero Club of India

3. Operator : Government Aviation Training Institute

4. Pilot – in –Command : CPL holder on type
   Extent of injuries : Fatal

5. First Officer : SPL Holder
   Extent of injuries : Fatal

6. Place of Accident : Birasal, Odisha

7. Date & Time of Accident: 8th June 2020, 0120 UTC

8. Type of operation : Training

9. Crew on Board : 02

10. Phase of operation : Landing

11. Type of Accident : Crash Landing

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY

Cessna FA152 aircraft, VT-ENF belonging to M/s Govt. Aviation Training Institute was involved in an accident at Birasal on 08.06.2020, wherein both onboard crew received fatal injuries and aircraft was completely destroyed after it crashed at Birasal Airfield.

On the day of accident, the Flying instructor and the trainee pilot were scheduled for local flying at Birasal. After completion of D.I and issuance of CRS, the aircraft tookoff from runway 27 and first sortie was uneventful. Immediately, aircraft again tookoff from runway 27 and while the aircraft was at about 150 feet AGL, crew executed a 180^{0} turn. Aircraft made a right turn initially and subsequently a steep left turn was made. Meanwhile, the aircraft was continuously losing height and finally hit the unpaved runway surface in nose dive attitude. Aircraft suffered substantial damage and both onboard crew received fatal injuries.

The occurrence was classified as Accident as per the Aircraft (Investigation of Accidents and Incidents) Rules, 2017. DG-AAIB vide Corrigendum INV-11011/03/2020-AAIB dated 02.02.2021 appointed Mr. Dinesh Kumar, Assistant Director as IIC and Mr. Amit Kumar, Safety Investigation Officer as an Investigator.

Initial notification of the occurrence was sent to ICAO and NTSB, USA on 8th June 2020 as per requirement of ICAO Annex 13.

1. FACTUAL INFORMATION

1.1 History of the Flight

On 08.06.2020, a Cessna FA152 aircraft, VT-ENF belonging to Government Aviation Training Institute (GATI), was scheduled for local flying at Birasal. The sortie was a "Circuit & Landing Exercise" wherein Student Pilot had occupied the left seat whereas right-side control was with the Flight Instructor.

In pursuant to DGCA circular dated 29.03.2020, which was issued in view of outbreak of COVID-19, crew were exempted from undergoing pre-flight medical examination. Therefore, on the day of accident, both crew did not undergo any pre-flight breath analyser examination, prior to operating the flight. However, they had submitted undertakings stating that they have not consumed alcohol/ psychoactive substance by any means within last 24 hours.

The training sorties for that day were scheduled for 1130 hrs onwards and accordingly student pilots were requested to report for predeparture briefings. After carrying out predeparture briefing, Flight Instructor had assessed the local weather condition based on the landmarks and windsock available at Birasal. Flying was being carried out under VFR.

After completion of daily preflight inspection on the aircraft, it was released by AME for training flight. Subsequently, aircraft was received by crew. However, person from GATI who was deputed as ATC/ADM officer did not report on time at Birasal airfield but training flight was commenced.

The aircraft lined up on runway 27 and took off at around 0100 UTC to carry out circuit and landing exercise. As per the witness statement, who is a trainee pilot enrolled in GATI, crew attempted to land on runway 09 after completing the circuit in 5-7 minutes approximately. However, as the aircraft was high on approach and speed, it missed the touchdown point. Thereafter, aircraft flared for long and

crossed both taxiway ‘A’ and ‘B’ intersection. Thereafter, it was out of sight of the witness trainee pilot. Take off for second Circuit & Landing was also executed from runway 27. As per witness statement, takeoff appeared normal except while the aircraft was on takeoff roll, it was rolling significantly right of runway centreline. During these observations, witness was at ATC area which is close to runway and almost located at midway of runway length.

As per the witness, the takeoff was normal and aircraft attained a height of 150 feet AGL while it was above the end of runway 27. Thereafter, suddenly aircraft was turned to right and subsequently a steep left turn was executed to land on runway 09. Following almost 180^{0} turn, the aircraft started sinking in nose dive attitude. There was no sufficient height available for crew to affect a recovery or to respond in time and the aircraft hit the unpaved surface near threshold of runway 09.

A loud bang noise was heard in the operational office and personnel from GATI started rushing towards the crash site. Immediately, both crew were rescued from the damaged aircraft and rushed to the nearest government hospital. Later, they were shifted to other Government hospital where hospital authorities declared that both crew were fatally injured at the time of accident.

1.2 Injuries to persons

INJURIES	INSTRUCTOR	TRAINEE	OTHERS
FATAL	01	01	Nil
SERIOUS	Nil	Nil	Nil
MINOR	Nil	Nil	Nil

1.3 Damage to the Aircraft

The aircraft was substantially damaged during the accident.

Fig 1: Aircraft at Crash Site

1.4 Other damage

NIL

1.5 Personnel Information

1.5.1 Chief Flying Instructor

Age	: 45 years
License	: CPL
Date of Issue	: 09.12.1999
Valid up to	: 12.03.2022
Category	: Single Engine Land
Date of Class I Med. Exam.	: 04.11.2019
Class I Medical Valid up to	: 04.05.2020
Date of issue FRTOL License	: 09.12.1999
FRTO License valid up to	: 26-09-2021
Endorsements as PIC	: C-152, C-172P, C-172R/S
Total flying experience	: 2765:40 Hrs

Total flying experience during last 1 year	: 393:15 Hrs
Total flying experience during last 6 Months	: 170:40 Hrs
Total flying experience during last 90 days	: 44:30 Hrs
Total flying experience during last 30 days	: 29:10 Hrs
Total flying experience during last 07 Days	: 14:20 Hrs
Total flying experience during last 24 Hours	: 02:35 Hrs

Rest period before flight	: 12 Hrs
Whether involved in Accident/Incident earlier	: No
Date of latest Flight Checks and Ground Classes	: Flight check- 21-23rd Jan, 2020

Although medical assessment certificate held by CFI expired on 04.05.2020, the acidented flight was undertaken in accordance with DGCA Order F.No. DGCA-18014/1/2020-DTL-DGCA issued on 11th May 2020 wherein crew engaged in training flights were exempted provided date of medical assessment expiry falls between 23.03.2020 and 20.06.2020. As per the Order "the validity of medical assessment for pilots not more than 60 years of age and date of expiry of medical assessment falling between 23.03.2020 and 20.06.2020 (both dates inclusive) has been extended by 90 days from the date of expiry of validity period, provided the pilot has not been advised any limitations/recommendations during the previous medical examination.

Scrutiny of medical certificate pertaining to CFI showed that no limitation was raised during previous medical examination.

Brief on Flying history, approvals and checks conducted by DGCA in respect of Chief Flying Instructor is presented below in tabulated form: -

Sr No.	Year	Approvals & Checks	Remarks
1.	2009	M/s Alchemist sought approval from DGCA for	A letter was issued by DGCA granting the approval, however,

		Supervise Training Flying.	relevant noting is not traceable in the personal file of CFI maintained at DGCA.
2.	2010	Request letter was raised by M/s Alchemist to grant approval to supervise training flying.	Approval granted and letter was issued, however, relevant noting is again not traceable in the file.
3.	2011	Request was again submitted to DGCA to grant approval to Supervise training flying.	Approval was granted. Relevant letter was not traceable in the DGCA file. However, as per the file noting, approval was granted based on the letter previously issued by DGCA.
4.	2012	Request letter was re-submitted by the operator to grant approval to Supervise training flying.	Approval was granted by DGCA based on the competency letter issued and submitted by CFI of the parent organisation.
5.	2016	GATI requested DGCA to grant approval as Dy CFI.	After satisfactory performance in Oral examination conducted by DGCA team, Instructor was approved as Dy. CFI. However, Organisation was advised that Instructor needs to undergo Standardisation Check before exercising the privileges of Dy. CFI.
6.	2017	Nagpur Flying Club requested DGCA to grant approval as CFI and DE.	Instructor cleared the Oral examination conducted at DGCA. Thereafter, Instructor was approved as CFI, however, during

			Standardisation Check, Instructor was not found satisfactory for CFI as well as DE.
7.	2018	Instructor had joined the Saraswati Aviation Academy as CFI.	No relevant details are traceable in the DGCA file.
8.	2019	Again joined the GATI as CFI on 10.05.2019.	Underwent Standardisation Checks to exercise the privileges of CFI. This time too, instructor performance was not found satisfactory to render services as CFI or DE.
9.	2020	Approved as CFI at GATI	After successfully clearing all required checks, instructor was approved to exercise the privileges of CFI on 30.01.2020.

Based on the scrutiny of personal file of CFI, it is revealed that while Instructor was flying with Alchemist Aviation Pvt. Ltd., organisation underwent DGCA inspection from 25th to 26th Aug 2010. During that inspection, Instructor was checked on simulator as well as for proficiency on aircraft and his performance was found unsatisfactory.

In the year 2016, Instructor was offered Dy. CFI position at GATI. Organisation requested DGCA to conduct standardization check so that Instructor could exercise the privileges of Dy. CFI. FOI nominated by DGCA visited Bhubaneshwar on 24.11.2016 and conducted the standardization check and following observations were made:

Valid for following skill tests: to carry out skill test for issue/renewal for pilot licences.

1. To carry out all skill test for extension and renewal of aircraft ratings. Not cleared for IR test and Patter for AFIR(A). Cleared for single engine aircraft.

Later in the year 2017, Instructor was appointed as CFI in Nagpur Flying Club and in pursuant to DGCA laid down requirements, DFT was requested to conduct standardization checks so that Instructor could exercise the privileges of CFI. The Standardization check was conducted by DGCA from 14.02.2018 to 15.02.2018 on Cessna 172 aircraft. The final assessment and recommendation by the DGCA team is provided below:

"*Performance found poor, not cleared for CFI or DE. Recommended corrective flying covering all exercises upto the satisfaction of CFI -DE along with certificate that Instructor is competent enough to carry out check with the FOI-FTO. Also recommended to carry out instrument flying on simulator upto the satisfaction of CFI along with the certificate that Instructor is competent enough in IR flying before carrying out check by the FOI(FTO).*"

Final remarks by DGCA FOI(FTO) after the *check was "Performance not found satisfactory as CFI*".

Instructor received Non-Satisfactory comments broadly for following assessments:

1. Level Turn
2. Medium Turn
3. Precautionary Landing
4. Stall and recovery
5. Side slips
6. Carried out sustained steep turn through 360^0 (not less than rate 2^0 turns) one to the port & one to the starboard in lieu of spinning and recovery exercise.
7. Assessment

a) Assessment as AFIR examiner

b) Assessment as FIR examiner

On 23.02.2018, the final result was communicated to the Nagpur Flying Club that Instructor did not meet the requirements laid down for approval as CFI and as DE. Thereafter, Instructor joined another Flying Club Saraswati Aviation Academy on 21st March 2018.

Instructor re-joined the organisation GATI on 10.05.2019 as CFI. DGCA guidelines were followed and Instructor again underwent standardization checks on 03.07.2019 at Bhubaneswar. The Instructor was again not found suitable to deliver the services as CFI or DE by DGCA. While undergoing assessment, Instructor performance was found non satisfactory for following manoeuvres:

1. Medium turn
2. Gliding & Climbing turns

a) Use of bank in a climbing turn

b) Medium gliding turn with flaps up & down

c) Descending turns at given speed and rate of decent.

3. Forced landing
4. Instrument Flying

a) Turns rate 1 & 2

b) Climbing & descending turns

5. Stall & recovery
6. Side slips
7. Carried out sustained steep turn through 360^{0} (not less than rate 2^{0} turns) one to the port & one to the starboard in lieu of spinning and recovery exercise.

And the feedback of the check examiner was "*Found not satisfactory as CFI and Designated Examiner*".

Later, in the year 2020, after undergoing performance checks "satisfactorily" and met the DGCA requirements, Instructor was approved as CFI.

1.5.2 Student Pilot

Age	: 28 years
License	: SPL
Date of Issue	: 27.05.2019
Valid up to	: 26.05.2024
Category	: Single Engine Land
Date of Class I Med. Exam.	: 10.12.2019
Class I Medical valid up to	: 09.12.2020
Date of issue FRTOL (R) License	: 19.12.2019
FRTO (R) License Valid up to	: 18.12.2029
Total flying experience	: 17:20 Hrs

Total flying experience during last 1 year	: 17:20 Hrs
Total flying experience during last 6 Months	: 08:10 Hrs
Total flying experience during last 90 days	: 06:10 Hrs
Total flying experience during last 30 days	: 03:30 Hrs
Total flying experience during last 07 Days	: 00:50 Hrs
Total flying experience during last 24 Hours	: NIL

Rest period before flight	: 12 Hrs
Whether involved in Accident/Incident earlier	: No
Date of latest Flight Checks and Ground Classes	: 03.06.2020

As the Student pilot had already completed 17:20 hrs of flying, instructors were mainly concentrating on student pilot's presolo flying exercises. Further, scrutiny of FTPR revealed that Student Pilot was advised to improve approach and

landing performance during most of the debriefings, however, start-up, taxi out and take off performance were satisfactory.

1.6 Aircraft Information

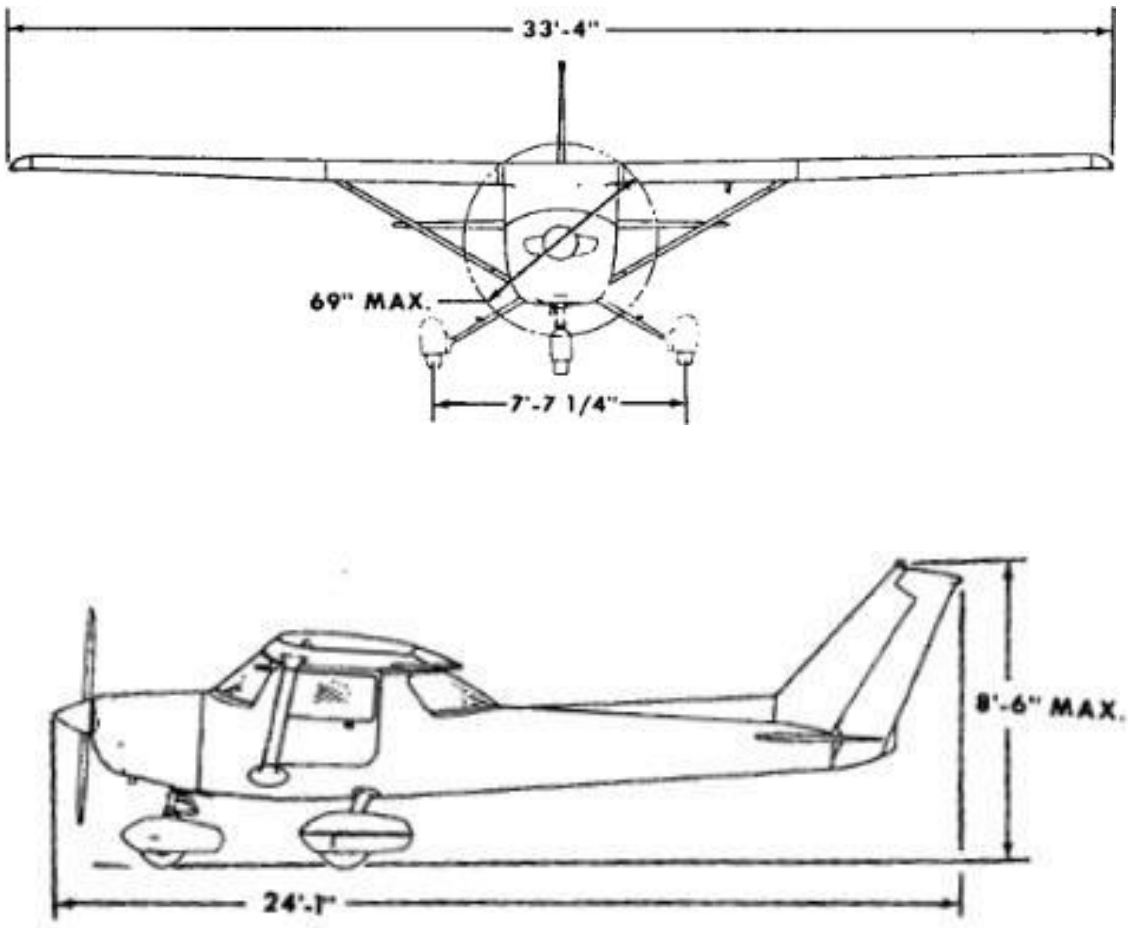
1.6.1 Cessna FA152Aircraft

The airplane is an all-metal, two-place, high wing, single engine airplane equipped with tricycle landing gear and designed for general utility purpose. 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 bulkhead with attaching plates at the base of the forward door posts for the lower attachment of the wing struts. Four engine mounts stringers are also attached to the forward door posts and extend forward to the firewall.

The externally braced wings, containing the 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 fittings and are partial- span spars. Conventional hinged ailerons and single slotted flaps are attached to the trailing edge of the wings. The ailerons are constructed of a forward spar containing balance weights, formed sheet metal ribs and “V” type corrugated aluminium skin joined together at the trailing edge. The flaps are constructed basically the same as the ailerons, with the exception of the balance weights and the addition of a formed sheet metal leading edge section.

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a spar, formed sheet metal ribs and reinforcements, a wrap-around a skin panel, formed leading edge skin and a dorsal. The rudder is constructed of a formed leading-edge

skin containing hinge halves, a wrap-around skin panel and ribs, and a formed trailing edge skin with a ground adjustable trim tab at its base. The top of the rudder incorporates a leading-edge extension which contains a balance weight. The horizontal stabilizer is constructed of a forward spar, main spar, formed sheet metal ribs and stiffeners, a wrap-around skin panel, and formed leading edge skins. The horizontal stabilizer also contains the elevator trim tab actuator. Construction of the elevator consists of a main spar and bell crank, left and right wrap-around skin panels, and a formed trailing edge skin on the left half of the elevator; the entire trailing edge of the right half is hinged and forms the elevator trim tab. The leading edge of both left and right elevator tips incorporate extensions which contain balance weights.



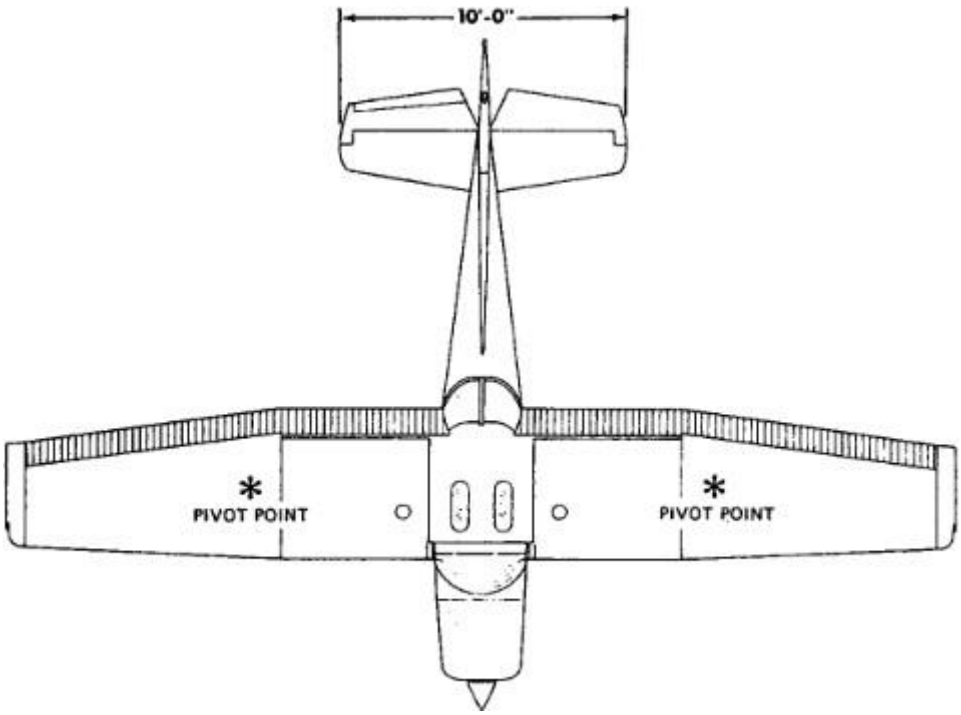


Fig 2: 3-Dimentional Diagram of Cessna FA152 aircraft

AIRCRAFT ENGINE

The airplane is powered by a horizontally-opposed, four-cylinder, overhead-valve, air-cooled, carbureted engine with a wet sump lubrication system. The engine is a Lycoming Model 0-235-N2C and is rated at 108 horsepower at 2550 RPM. Major engine accessories (mounted on the front of the engine) include a starter, a belt-driven alternator, and an oil cooler. Dual magnetos and a full flow oil filter are mounted on the rear of the engine. Provisions are also made for a vacuum pump.

ENGINE CONTROLS

Engine power is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open, and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counter clockwise to decrease it.

The mixture control, mounted above the right corner of the control pedestal, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knob. The rich position is full forward, and full aft is the idle cut-off position. For small adjustments, the control may be moved forward by rotating the knob clockwise, and aft by rotating the knob counter clockwise. For rapid or large adjustments, the knob may be moved forward or aft by depressing the lock button in the end of the control, and then positioning the control as desired.

WING FLAP SYSTEM

The wing flaps are of the single-slot type with a maximum deflection of 30°. They are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down in a slot in the instrument panel that provides mechanical stops at the 10° and 20° positions. For flap settings greater than 10°, move the switch lever to the right to clear the stop and position it as desired. A scale and pointer on the left Side of the switch lever indicates flap travel in degrees. The wing flap system circuit is protected by a 15-ampere circuit breaker, labelled FLAP, near the center of the switch and control panel.

1.6.2 VT-ENF Information

The Cessna FA152 aircraft, VT-ENF was issued a Certificate of Registration by DGCA under ownership of M/s Aero Club of India whereas M/s GATI was the operator of the aircraft. The aircraft was issued Certificate of Airworthiness in "AEROBATIC" Category under sub-division "PASSENGER". The technical details of the aircraft are given below: -

Aircraft Model	: Cessna FA152
Aircraft S. No.	: FA 1520411
Year of Manufacturer	1986
Name of Owner	: Aero Club of India
C of R	: 2366/5 valid upto 31.12.2023

C of A	1837
Category	: Passenger Aerobatic
C of A Validity	: Valid as per regulation
A R C issued on	: 28.12.2019
ARC valid up to	: 01.01.2021
Aircraft Empty Weight	: 538.50 Kg
Maximum Takeoff weight	: 758 Kg
Max Usable Fuel	: 102.60 Kg
Max Payload with full fuel	: 31.90 Kg
Empty Weight C.G	: 86.10 cm aft of datum
Total Aircraft Hours	: 10326:35 Hrs
Last major inspection	:200 Hrs Schedule Inspection on 06.06.2020
List of Repairs carried out after last major inspection	: Nil
Engine Type	: LYCOMING O-235-N2C
Engine Sl. No.	: RL-20311-15
Last major inspection	:200 Hrs Schedule Inspection on 06.06.2020
List of Repairs carried out after last major inspection	: Nil
Total Engine Hours	: 2135:05 Hrs (TSN)
Aeromobile License	: A-021/031-RLO (NR) valid upto 31/12/20
AD, SB, Modification(s)	: Complied

The aircraft remained parked from 21.03.2020 to 23.05.2020 owing to suspension of flying activities by the government during nationwide lockdown to contain COVID-19 pandemic.

During this period, the aircraft was parked at Bhubaneshwar and continuously maintained as per the maintenance schedule. 8 engine ground runs along with aircraft DI schedule were performed on the aircraft.

Training flights resumed at M/s GATI after the issue of DGCA circular dated 20.05.2020 wherein FTOs were permitted to resume training flying subject to strict adherence to mandatory guidelines issued by DGCA. Thereafter, AME carried out pre-flight inspection and aircraft was released for performance check.

During handling flight to check the performance of the aircraft, all parameters were found within the prescribed limits and no other abnormality was recorded.

The last training flight by GATI at Bhubaneshwar airport was operated on 31 May 2020. On this day, the involved aircraft had performed a local sortie at Bhubaneswar for around 01:05 hrs. Consequently, on 01.06.2020, three company aircrafts were positioned to another operational base which is at Birasal, to sustain the training flying at GATI. During positioning flight, the involved aircraft was under the command of a Flight Instructor and the duration of flight was approximately 45 minutes. As per the said Flight Instructor, aircraft did not have any snag/abnormality. Aircraft operated 28 flights at Birasal, before being flown back to Bhubaneshwar on 4th June for 200 hrs scheduled maintenance.

After completion of maintenance task and compliance of DGCA Mod 152/03R1 on the aircraft, CRS was issued when all checks were found satisfactory. Aircraft was again positioned at Birasal and no abnormality was reported during the positioning flight. Prior to the day of accident i.e on 7th June 2020, the aircraft carried out 3 local sorties which accounted for 02:10 hrs. A total of 84 landings were carried out by the aircraft between 1st June to 8th June 2020, before it met with an accident.

The aircraft was maintained as per the approved maintenance schedules and all concerned Airworthiness Directives& Mandatory Service Bulletins, DGCA

Mandatory Modifications on this aircraft and its engine were complied with as on the date of accident.

1.7 Meteorological Information

As per the SOP devised for Birasal, MET information is obtained from IMD website. Further, weather is also assessed on the basis of locally identified landmarks and windsock available at Birasal airfield. Met information is required to be recorded in the Met Register maintained for this purpose. Met information for 8th June 2020 was not recorded in the Register. Further, no record was found in the Met register after 2nd June 2020.

As per the statement of witnesses, student pilots and other instructors wind was calm and visibility was above minima at the time of accident.

1.8 Aids to Navigation

Birasal airfield with Runway orientation 27/09 is a "Visual Approach Runway" and no navigation aid for landing is installed.

1.9 Communications

Handheld R/T device was onboard for communication. However, no emergency call was made by the crew.

1.10 Aerodrome Information

Birasal Airstrip was developed by Government of Odisha. The airport is primarily utilized by GATI to impart flying training to student pilots and flying operations are restricted upto watch hours only as the airfield is not equipped with night operations facility.

The geographical co-ordinates of the airport are 20°59'00.65" N and 85° 40'44.48" E. The elevation of the airport is 81 m (AMSL). The runway is 4000 feet (1219.2 m) in length and 80 feet (24.4 m) in width. The orientation of the runway is 09/27.

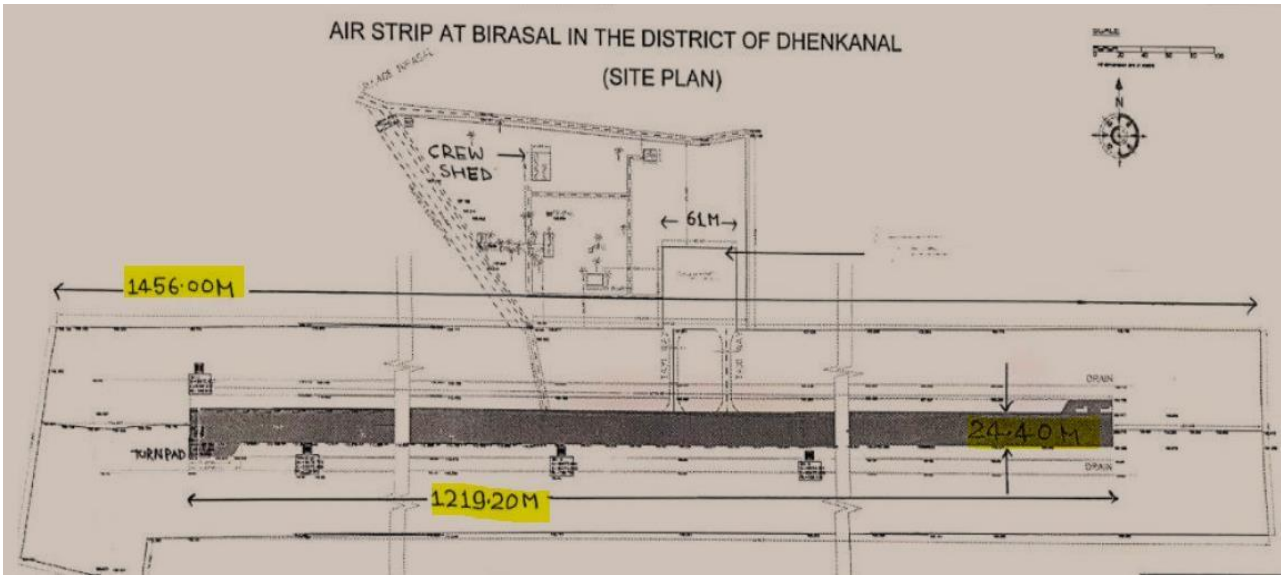


Fig 3: Birasal Airstrip Grid Map

Before operating from Birasal, GATI was imparting training at Bhubaneshwar airport. On 19th June 2018, a NOC was awarded to GATI by Government of Odisha, to conduct flying training at Birasal airstrip, which was valid for a period of three years from the date of issue. However, training flying at Birasal started in year 2019 after DGCA laid down requirements were complied by GATI.

After issue of DGCA circular No. 4/1/2020 dated 20.05.2020, Government of Odisha had allowed GATI to resume their flying training activities as per the instructions contained in the DGCA Circular. The operator had resumed their flying training and finally shifted from Bhubaneshwar to Birasal on 01.06.2020 as permission to operate at Bhubaneshwar airport had already lapsed on 30.04.2020.

1.11 Flight Recorders

Aircraft is not equipped with a DFDR or a CVR recorder as they are not mandatory for aircraft type under DGCA regulations.

1.12 Wreckage and Impact Information

After the accident, investigation team had carried out onsite investigation and recorded all the aircraft damages along with trailing ground marks observed at the crash site.

As per the witness statement, aircraft was rolling significantly on right of runway centreline and after takeoff from runway 27, aircraft made a 180^0 turn. Based on eye witness statement, the path followed by the aircraft for the accident flight is projected on the google map which is shown below.

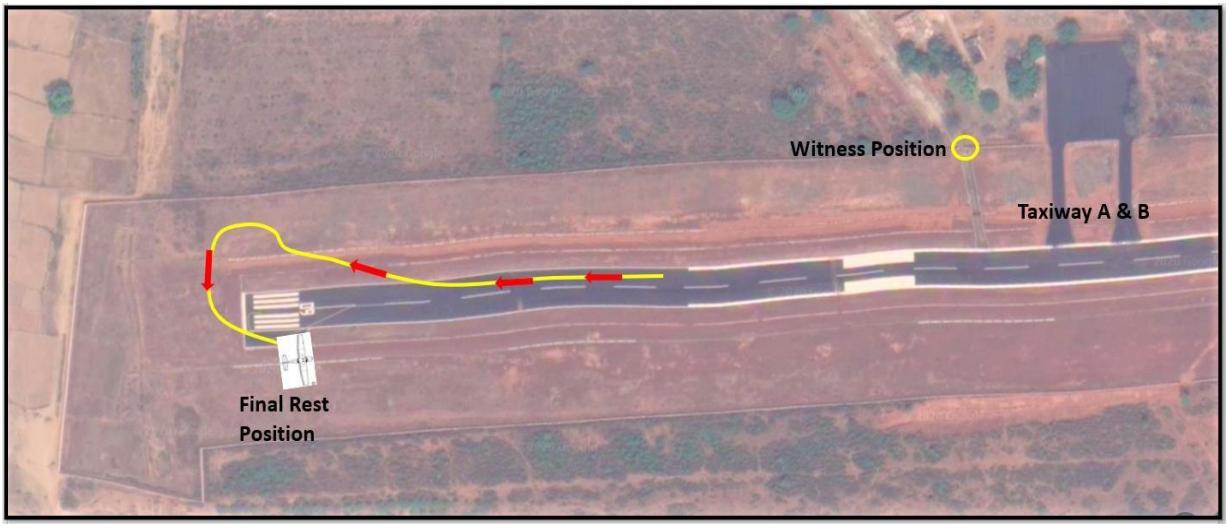


Fig 4: Track followed and final rest position

From the wreckage examination, it was ascertained that duringimpact, aircraft had hit the ground in nose dive condition, consequently propeller blades disintegrated from propeller hub (Ref. Fig 5). A crack was also observed on the head of Engine Crankcase which implies that a very heavy load was transferred to the engine at the time of impact and could be possible only during head on collision. Moreover, rubbing marks were also present on both propeller blades and as well as on the ground which further indicates that engine was producing power at the time of impact.

Fig 5: Rubbing marks on Propeller

Both nose landing gear and left main landing gear got detached from the aircraft and were located at 136 feet & 24 feet respectively from the aircraft wreckage. As the nose landing gear was traced at farther distance from the aircraft wreckage, which clearly indicates that primary impact was experienced by the nose landing gear and aircraft was not in wing level condition while it impacted ground. Further, aircraft empennage was found broken and was hanging towards left. **Aforesaid conditions clearly depict that aircraft was in pitch down as well as left bank condition at the time of impact.**

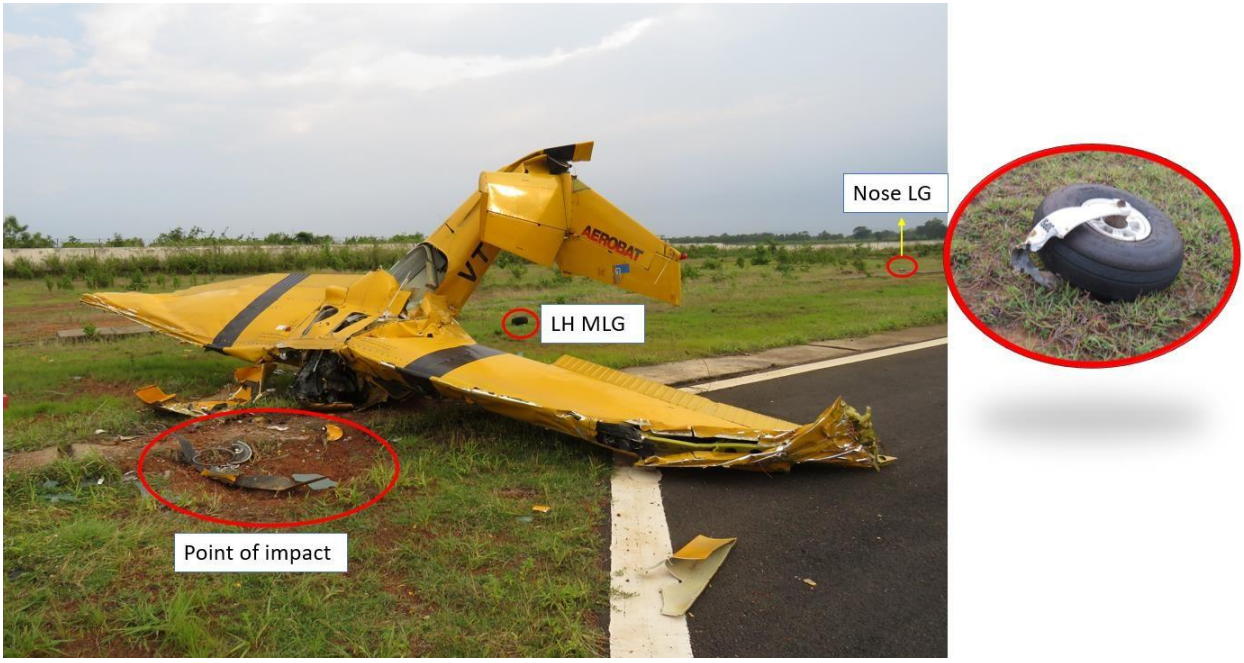


Fig 6: Point of Impact

During wreckage examination, cockpit control positions were also photographed. Wings flap selection lever at the time of accident was set at 0. However, flap lever had shifted slightly down from its original position and had stuck between 0^{0} to 10^{0}. Further, Flap lever was also found bent, which was most apparently due to hard hitting on the lever at the time of impact.

Both, throttle as well as fuel mixture knob were present at fully forward position indicating that aircraft throttle was fully open and fuel mixture was rich at the time aircraft impacted the ground.

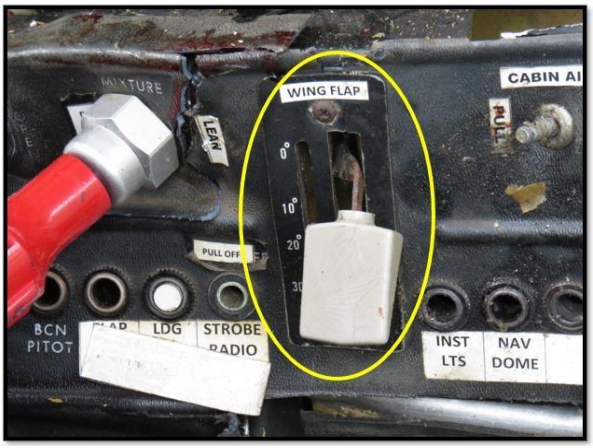


Fig 7: Wing Flap lever position

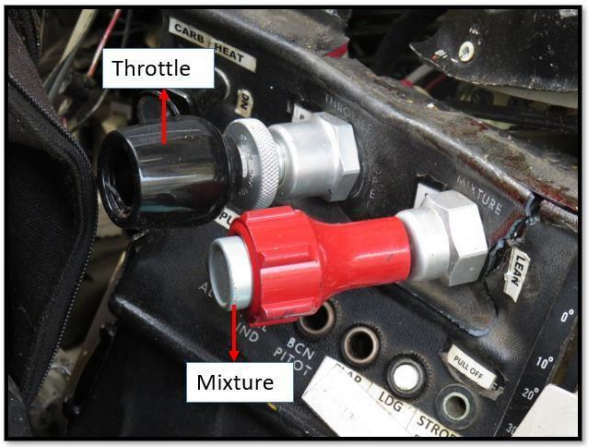


Fig 8: Throttle & Mixture Position

Damage assessment of the aircraft was also carried out to identify major impact bearing areas and resultant damage on the aircraft structure. Aircraft received following damages at different stations which are shown below:

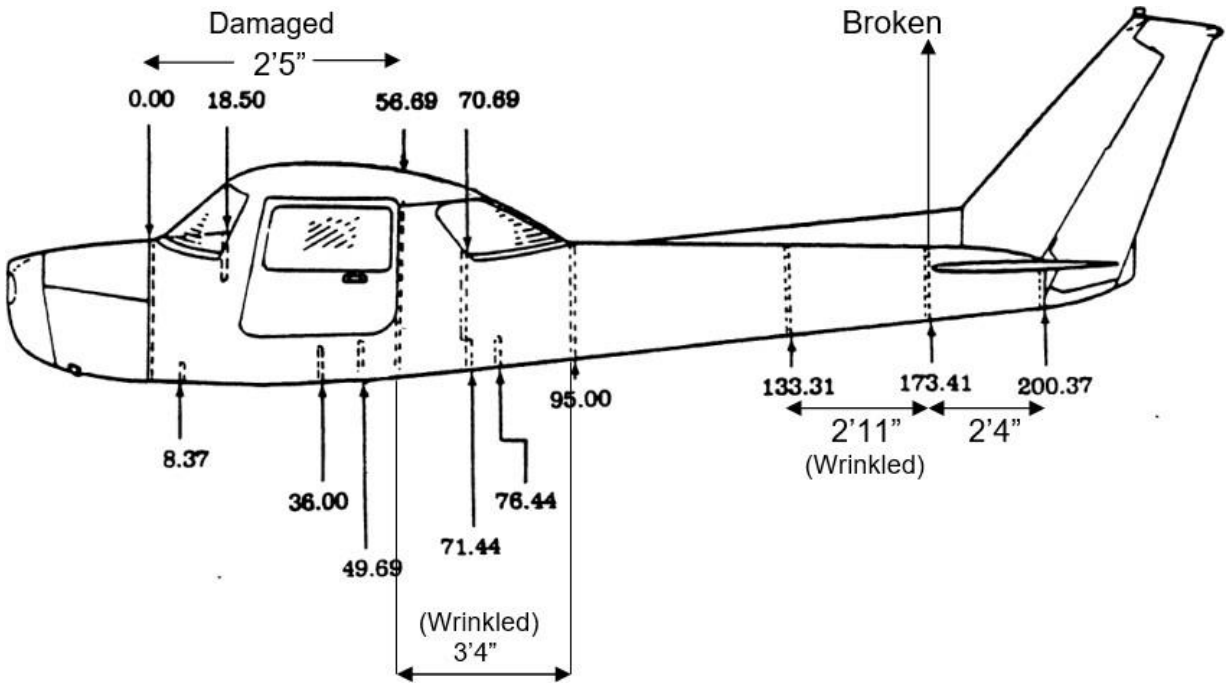


Fig 9: Damages observed at fuselage sections

STRUCTURE WISE DAMAGE ASSESSMENT

1. **Propeller**

(a) Propeller was found separated along with starter ring gear and spinner assembly.

(b) Both blades were found bent & twisted, starter ring gear broken in pieces and spinner crushed.

2. Fuselage

(a) Area behind the crew seats, near the rear wind shield was found excessively wrinkled & crushed along the length.

(b) Skin area beneath the seats was found badly damaged and rivets were sheared off. Outer skin near right side main landing gear attachment found excessively wrinkled and cracked. Outer skin area of left hand side was also found excessively wrinkled.

(c) Front windshield was excessively damaged & found broken in pieces. RH & LH side cabin door was excessively damaged and was found in distorted shape. Rear windshield was completely broken.

3. Tail

Bulkhead area ahead of horizontal stabilizer was found broken and empennage was hanging at one point.

4. Landing Gear

a) Nose landing gear was found extremely damaged and Nose wheel was found at a distance of more than 100 feet.

b) LH main landing gear was found broken at axle and wheel assembly.

Fig 10: LH Main Landing Gear

5. Wing

Fig 11: RH Side Wing

Both upper and lower skin of the right-side wing was found wrinkled. Entire leading edge from root to tip was found crushed. Aileron Assembly was bent and distorted.

Fig 12: LH side Wing

Both upper and lower surface of inboard wing of left-side was found distorted, wrinkled & damaged. Entire leading edge from root to tip was found

crushed and wrinkled. Outboard leading-edge rivets had sheared off and wing tip was found crushed & damaged. Flap and aileron were found excessively damaged and distorted.

6. Firewall

Firewall separated and was found broken & crushed.

7. Instrument Panel

Instrument panel was found crushed & dislocated and radio rack also crushed.

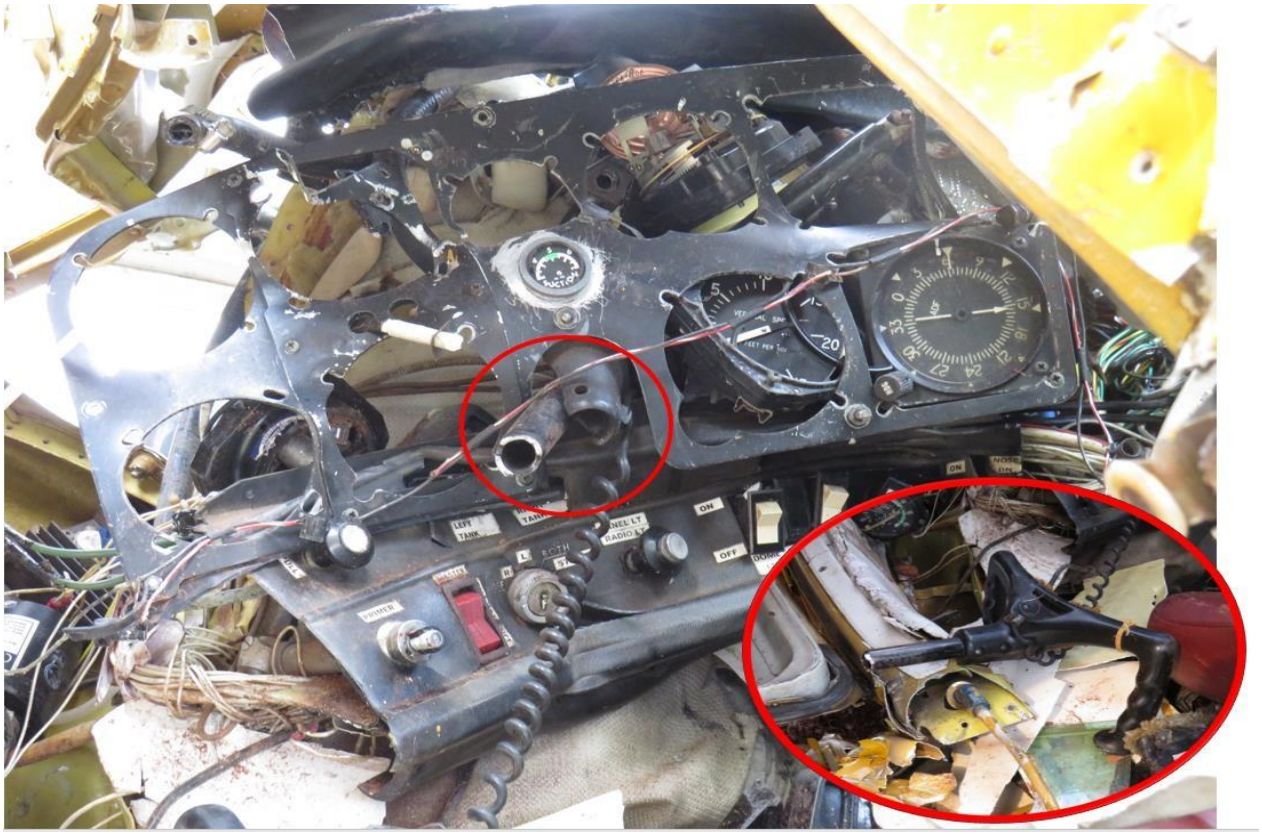


Fig 13: Instrument Panel and Broken Control Column

1.13 Medical and Pathological Information

On the day of accident, both crew did not undergo preflight medical examination which was in accordance with the DGCA Circular applicable on date issued in view of outbreak of COVID 19 pandemic. Besides, they signed the declaration form, as per the DGCA requirement, declaring that they are not under the influence of alcohol or psychoactive substance.

1.14 Fire

There was no pre or post impact fire.

1.15 Survival Aspects

As the aircraft crashed inside the perimeter wall, the site was easily accessible. A loud bang was heard in the operational area and subsequently search and rescue was activated. Personnel from GATI who were present at Birasal airstrip, immediately rushed to the crash site, which was at approximately 555 meters away from the main gate of the airstrip.

During rescue, it was observed that beside seat harness, shoulder harness of both crew were intact and fastened. The safety harness of both crew were immediately opened. Although crew were rushed to the nearest hospital to get the medical assistance, both CFI and Student Pilot had suffered fatal injuries. Hence, the accident was not survivable.

1.16 Tests and Research

1.16.1 Engine Strip Examination

Aircraft was installed with Lycoming LYCO-O-235N2C Engine, P/N.-RENPL-6476 & S/N. RL20311-15. The engine was rebuilt by OEM (Lycoming Engines, 652 Oliver St, Williamsport, PA 17701) on 20-07-2017. Hours completed by different engine components prior to accident:

S/n.	Nomenclature	Part No.	Serial No.	Hours (TSN/TSO)
1	Engine (LYCO-O-235N2C)	RENPL-6476	RL20311-15	2135:00 Hrs. TSN
2	Alternator	C611503-0102RX	3163	203:05 Hrs. TSO
3	Starter	ERB-8012	H-R033351	2135:00 Hrs. TSN
4	Magneto	4381	17050394	1428:20 Hrs. TSN
5	Magneto	4381	17050396	1428:20 Hrs. TSN
6	Carburetor	61A26385	AB2473263	2135:00 Hrs. TSN
7	Vacuum Pump	AA3215CC	09DB12	1539:40 Hrs. TSN

Aircraft engine was strip examined at a DGCA approved facility from 27.08.2020 to 28.08.2020 and the inference drawn from the strip examination is presented below:

"*The inspections, tests and observations executed before, during and after the disassembly indicate that engine was running and delivering required power as per the action of engine controls at the time of accident. The above damages observed were due to the result of heavy impact and abrupt collision with ground*."

1.16.2 Control Cable system of the aircraft

In addition to the Engine Strip Examination and analysis of fuel system, aircraft control cable system was also examined after the accident to establish any failure of controls. All relevant panels of the fuselage were opened and continuity of the control cables along with the pulleys and turnbuckles were checked. Post-accident inspection ascertained that there was no failure in the control system as no part was found missing or damaged.

1.17 Organizational and Management Information

Government Aviation Training Institute (GATI) was set up in 1946 as Orissa Flying Club with its main base at Bhubaneswar. Later it was merged with the Orissa Government Aviation Department in 1974 and Govt. Aviation Training Institute (GATI) came into being. Presently, GATI is run through PPP on LDO model wherein Government of Odisha and M/s Global Avianautics Ltd are in agreement for 20 years. As per the agreement, M/s Global Avianautics Ltd will look after the operational aspect of the Institute along with the recruitment of manpower and maintenance of its two Cessna aircraft.

The Institute provides flying training on Single as well as Multi engine aircraft and it had a fleet consisting of one Cessna 172 R and CESSNA 172S, one Cessna 172-P, two Cessna 152 which are single engine piston aircrafts and one PA34 aircraft which is a twin-engine piston aircraft.

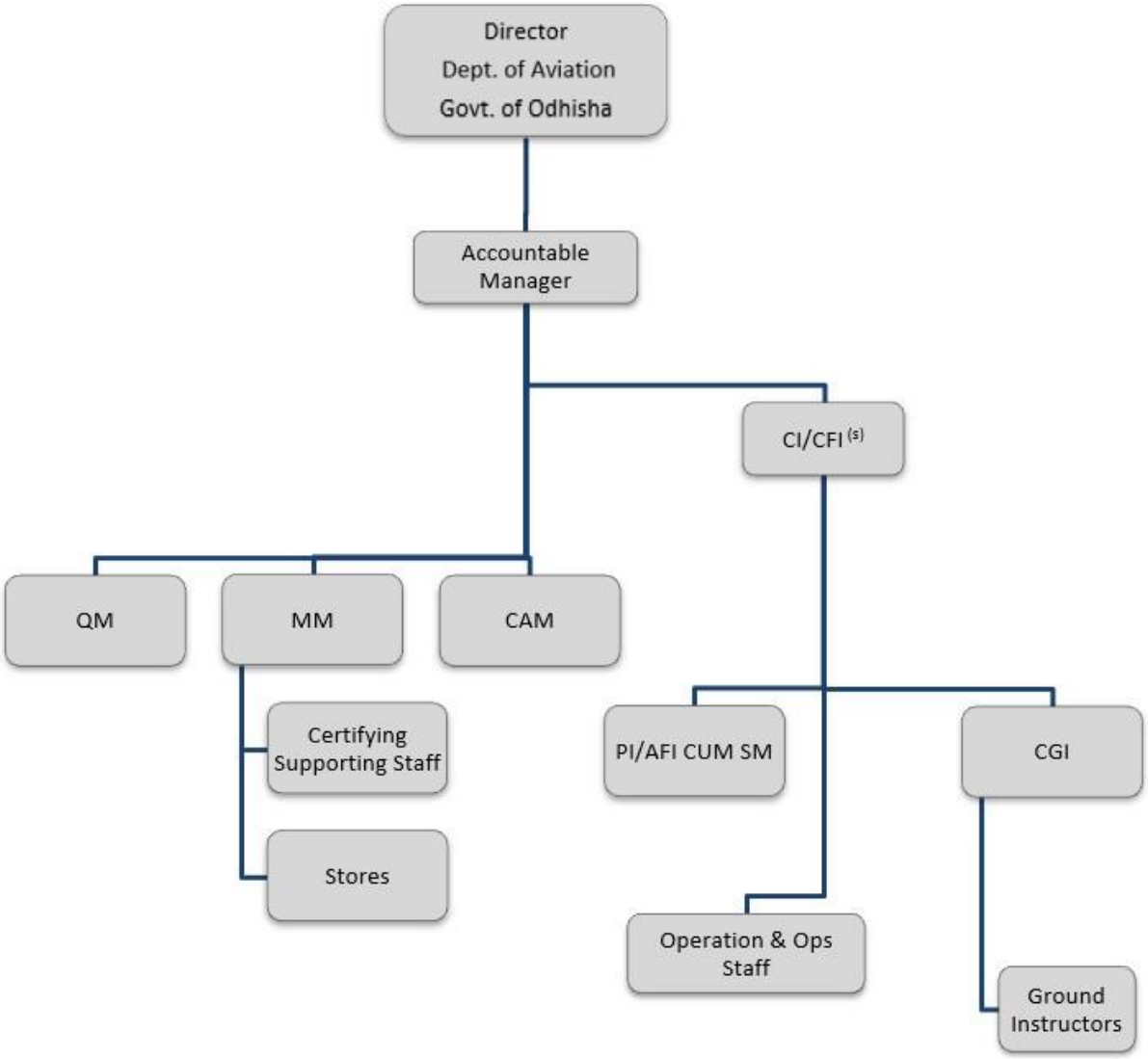


Fig 14: Organisation Chart

The Institute imparts training primarily to provide integrated flying and ground training to students towards obtaining the following Flying Licenses, Ratings and other flying qualifications: -

a. Private Pilots Licenses (Airplane).

b. Commercial Pilots Licenses (Airplane).

c. Instrument Rating (IR) on Single engine aircraft.

d. CPL with Multi Engine IR.

e. Extension of Aircraft Rating on Single engine aircraft.

f. License Renewal & Foreign License conversion training.

g. Patter training for Assistant Flight Instructor Rating (AFIR).

h. Patter training for Flight Instructor Rating (FIR)

GATI operates from Biju Patnaik International Airport Bhubaneswar as its permanent base whereas uncontrolled aerodrome at Birasal is recently added as the Operational Base after approval was granted by DGCA in the year 2019.

1.17.1 Duties & Responsibilities of CFI

TPM contains guidelines on the role and responsibility of company CFI which he has to bear while imparting training to student pilots. As per Chapter 2, Para 2.3(C), Head of Training /CFI/Dy. CFI is directly responsible for flying and ground training, standardization, quality, safety and aircraft requirements. The duties and responsibilities of CFI include the following: -

i. To ensure all flying and ground activities are planned, implemented and monitored while adhering to the rules and regulations stipulated by the DGCA.
ii. To ensure the highest standards of discipline among the staff and student pilots at all time.
iii. To ensure that the standardization of both flying and ground instructors are carried out and maintained through monitoring and training.
iv. To ensure that all aspects of flight safety are planned, implemented, monitored and followed.
v. To ensure that all related flying and ground documents, books, manuals, syllabus and records are available and maintained.
vi. To ensure that those activities are effectively, efficiently and safely implemented and monitored.
vii. To ensure that the flying training activities are implemented in accordance with approved syllabus, approved manuals and related approved documents.
viii. To manage and supervise all flying instructors in their duties and responsibilities in conducting the flying training.
ix. To manage, supervise and monitor all student pilots while undergoing the flying training.

1.17.2 Command of Aircraft

As per Chapter 7, Para 7.6 of the TPM, Command of aircraft rests with the Pilot in Command. The CFI in the flying programme will designate the PIC of a particular flight. During flying test sorties, the Command of the aircraft will remain with the Examiner, however, the trainee pilot will log the flying hours as PIC Under Supervision.

1.17.3 Responsibilities of Pilot-in-Command (Instructor in dual and trainee in solo flights);

As per Chapter 7, Para 7.7 of the TPM, subject to the provisions of clause (b) of sub-rule (2) of rule 140B of Aircraft Rules 1937, the CFI/ Dy CFI shall designate for each flight one pilot as Pilot-in-Command, who shall supervise and direct the other members of the crew in the proper discharge of their duties in the flight operations. In addition to being responsible for the operation and safety of the aircraft during flight time, the Pilot-in-Command shall be responsible for the safety of the passengers (students in this case) and for the maintenance of flight discipline and safety of the members of the crew. The Pilot-in-Command shall have the final authority as to the disposition of the aircraft while he is in command.

1.18 Additional Information

1.18.1 Local Flying Area

GATI has drafted a SOP on Local Flying Area at Birasal under which MoD has permitted the operator to conduct flying training within 6 Nm on a full circle basis and upto a height of 3000 feet, which will be the local area within which regular flying training flights will operate, and will be under the direct control of the GATI operated Birasal ATC. The local flying / general flying will be carried out with 1000 feet separation overhead airfield up to 3000 feet AGL.

TPM which is an approved document also contains the guidelines in Chapter 5, Briefing and Exercises regarding “Circuit leaving and Sector establishing procedure” at Birasal. While operating at Birasal, crew should ensure the following criteria as per the SOP: -

- For all sectors, aircraft will takeoff and turn left/right on heading dependent on sector allotment by ATC, prior to take off as part of departure instructions.
- All pilots will climb to 650 ft on QNH on Takeoff / Runway heading.
- At 2 DME (Ensuring 650 ft on QNH), Pilot will turn Left/ Right for their sector.
- Once established in sector, all aircraft will climb 1000 ft AMSL when within radial/bearing & distance parameter (3- 5 DME) as applicable before commencing any exercise.

1.18.2 Circuit Pattern

Circuits are the exercise where a trainee also learns how to land an aircraft.

There are five basic legs to circuits:

➢ Take-Off Leg
➢ Crosswind Leg
➢ Downwind Leg
➢ Base Leg
➢ Final Leg

The circuit pattern to be followed at Birasal after takeoff from runway 27 is laid down in the company tailored SOP.

As per the SOP, crew must maintain parameters while performing different legs. Conditions laid down for Normal Takeoff and Initial Climb are as follows: -

- Unstick speed : 55 Knots
- Climb speed : 70 Knots

  Flap retraction will be at 150 feet AGL
- Field elevation correction : increase the above speeds by 1 kt/ 1000 feet

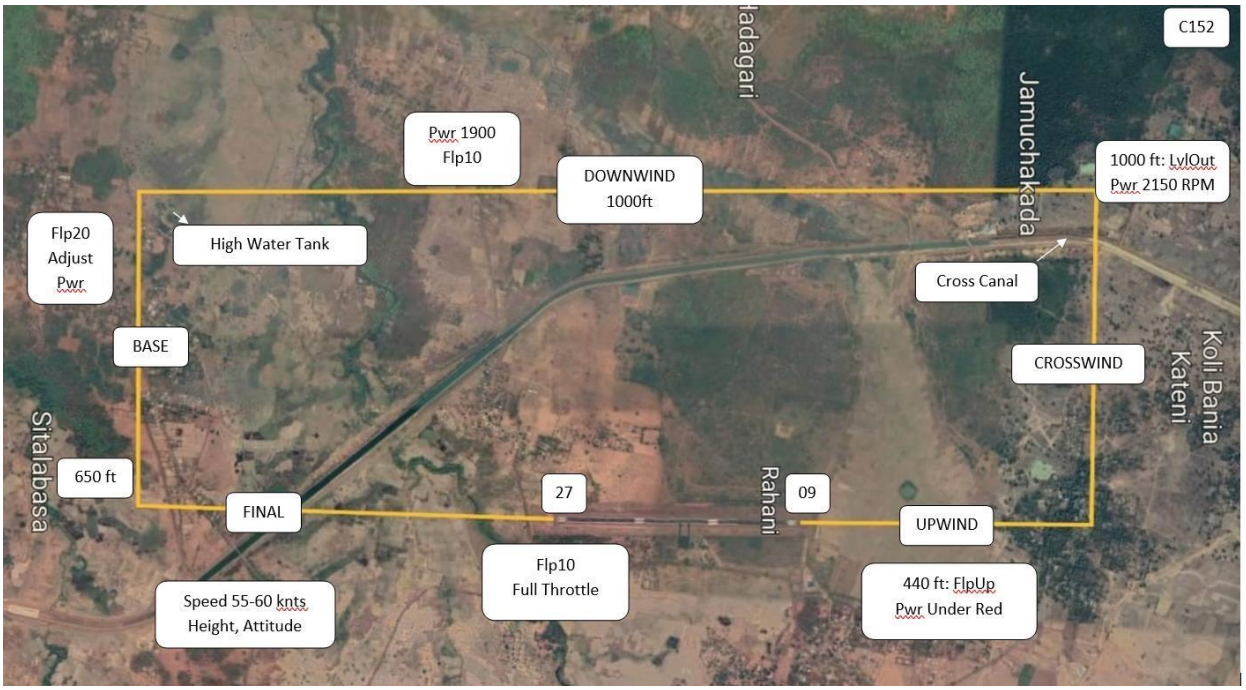


Fig 15: Circuit Pattern at Birasal

Further, while performing standard circuit, crew must adhere to below mentioned conditions:

Circuit altitude	: 800feet AGL
Power	: 2200 rpm
On downwind	: Radio call
Abeam threshold	: Flaps 10
On base leg	: Power 1800
Configuration	: Flaps 20
Turn final	: 550 feet
Establish final	: 450 feet
Short Final	: 200 feet, IAS: 70 Kts
Threshold IAS	: 65 Kts

During training, it is emphasized that other than maintaining these parameters, crew must know all visual landmarks while in circuit.

1.18.3 First Solo

Company SOP contains the guidelines to be followed before the student pilot is released for first solo flying. As per the SOP, the instructor must determine that the consistency level of performance has been obtained by the student pilot. An average trainee takes about 15 hours of flying to reach this stage.

In addition to this, it is also mentioned that prior to releasing the trainee, a couple of flapless landing shall be demonstrated and practiced. Later in the chapter, following points are discussed regarding flapless approach and landing procedure:

- During flapless landing, trainee will note a longer float, hence an increase in the landing distance.
- The trainee should expect a higher nose attitude during the flare.
- The trainee should be aware that with the reduced drag, the chances of ballooning are increased. Back pressure on control wheel should be applied with caution.
- It may be necessary to judge the height by looking from the side window during the flare and the hold off stage of the landing.

1.18.4 Flapless Landing Procedure

The approved TPM of the operator has defined the procedure on flapless landing and the relevant portion is reproduced below: -

“Flap improves view over the nose cowling, and allows to fly at a slower speed safely. Being able to land without flap is an important skill to master for a few reasons such as flaps getting stuck or breaking of the flap motor, or alternator may give up and battery runs flat, so can't use electric flaps. In case, it is very gusty, or there is a strong crosswind, choose to land with no or less flap so aircraft don't get bounced around quite as much.

Flapless, your approach will be flatter. Instead of seeing the runway numbers 1 /3 up your screen, you will have to crane your neck to see the runway edge just under your cowl.

You approach 5 kts faster than your normal approach speed, since you do not have the flap deployed to fly at a lower speed safely.

When you reach the runway, you are already about in the flared position. Be careful not to check back on the control column too much when you close your power to settle on the runway. You have approached at a faster speed with no extra drag, so inertia will carry the aircraft quite far. Checking back more than necessary to remain level is likely to cause a balloon and a re-flare.

Note: No intentional FLAPLESS full stop landing shall be carried out".

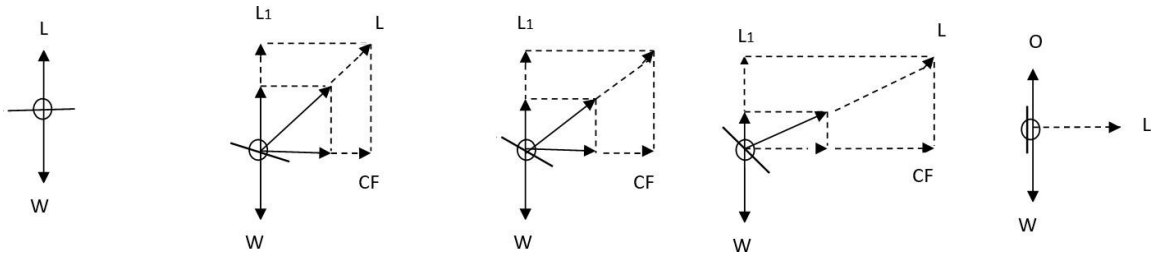
During investigation, another instructor from GATI briefed about the procedure which is followed during flapless landing. As per his statement "*A flapless approach is carried out at higher speed approx. 5 knots on base leg and finals and is engine assisted. The circuit pattern remains the same except the downwind is extended to cater for low drag on finals. Aircraft turn to base leg at 8 O'clock but in case of flapless will go further as appears 7 O'clock turn for base. Then turn for finals, control the descent with throttle, speed by attitude. Then adjust throttle so as to round off just before the dumbbell. There will be change in perspective also. Shallow, low rate of descent, round off height will be low at this height. Gently round off to fly parallel to ground, smoothly close throttle and control sink by changing the attitude, prolonged float period and the higher touchdown speed and landing run will be longer*."

1.18.5 Contributory factors involved during aircraft stall

A SOP is already in place, which was issued on 1st May 2019, wherein all contributory factors are briefly discussed by GATI which can lead to aircraft stall, in case the crew maneuver the aircraft beyond its prescribed limits. Content of the said SOP which is relevant is reproduced below wherein crew are suggested to have their eyes on following factors during the flight: -

1) Steep turns

A turn in which the angle of bank exceeds 30° is classified as an advanced or a steep turn.



W= Aircraft weight L=Actual lift L1=Apparent lift CF= Centripetal force

Fig: 16

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

The g force acts opposite to the actual lift force. Logically therefore, the g force also increases as the angle of bank increases and the overall effect of this is a progressive increment in the aircraft's stalling speed.

Angle of bank	Increase in g (%)	Effect on stall speed (%)
Level	Nil	Nil
30^0	18	8
45^0	**40**	**18 (+)**
60^0	100	40
75^0	400	100
83^0	900	200

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

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

2) Height

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

3) IAS

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

4) Engine Thrust

A prominent landmark or a cardinal heading is selected before commencing the turn. As the bank angle increase, so does the back pressure on the control column and the rudder pressure to coordinate the turn. Passing through 30° bank, full engine thrust must be applied.

5) Angle of Attack

For turns where the bank angle is restricted to 30°, the increased angle of attack is adequate to generate the required lift in order to sustain height. Figure 16 shows that the lift requirement at steeper bank angles is quite significant and the increased

angle of attack is insufficient. Additional IAS, and therefore thrust, must also be increased to generate the required lift.

Corrective Actions:

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

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

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

During the turn the instruments must be scanned in order to ensure that the turn is coordinated and the required IAS is being maintained.

The roll out from a steep turn should commence 15° (being a third of the angle of bank) before the required heading. The angle of attack is quite large during a steep turn and therefore the pitch change during the roll out for level flight is also significant. Insufficient pitch change and maximum thrust will result in the aircraft gaining height, which should be avoided. There are three actions, therefore, that need to be carried out simultaneously during the roll out.

a) Progressive reduction of the bank angle

b) Progressive pitch change to level flight attitude

c) Progressive power reduction to cruise rpm.

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

Further, procedures and crew actions to recover from advanced stall conditions are already elaborated in the SOP. As per the SOP, after establishment of the stall, following techniques are suggested to recover from a stall condition:

Stall Recovery Procedure:-

Any factor that increases the total value of lift will reduce the stalling speed of the aircraft. Flaps extension and increased engine power reduce the stalling speed, these being the two variable factors in the lift formula.

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

1) **Stall recovery with flaps extended**

The recovery is initiated at the first buffet by lowering the aircraft's nose to the correct pitch attitude and simultaneously applying full engine power. The resulting acceleration will be poor if the flaps are fully extended because of excessive drag. The flaps are therefore retracted to establish the short field take-off configuration.

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

configuration. The flaps are fully retracted in stages, once a positive climb rate is established.

2) Power on stall and recovery

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

3) Approach to landing stall and recovery

A point to note is that some propeller driven aircraft have an increased tendency to drop a wing when stalling with power on, or flaps extended. The pilot should try to prevent a wing drop during any stall by the correct use of the flight controls.

4) Stall in a turn

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

The control column is moved forward, simultaneously applying sufficient opposite rudder (to prevent a yaw) and full engine. The ailerons are used to level the wings after the stall warning is cancelled.

1.18.6 Safety Management System

The operator has adopted the guidelines contained in CAR Section 1 Series C Part 1 regarding establishment of a Safety Management System and to comply with the regulations SMS Manual was submitted to DGCA on 02.6.2015. Thereafter, SMS Manual was submitted on 23.01.2017 and a revised manual was resubmitted on 07.05.2018. Later, on 22.01.2020, DGCA asked the operator to submit the SMS Manual to comply the SSP Circular.

As per the SMS manual submitted to DGCA, Chapter 9 contains the Hazard reporting systems and which include the following:-

(i) Mandatory Reporting System – Pilots and AMEs are required to report certain types of events or hazards mainly technical failures.

(ii) Voluntary Reporting System – all maintenance and operations personnel of GATI are encouraged to submit voluntary event or hazard information. For this purpose, 'SUGGESTION BOXES' are placed at the work premises.

(iii) Confidential Reporting System- it protects the identity of the reporter and is ensured that any identifying information about the reporter is known only to few key persons.

In addition to this, CHAPTER 7 of SMS Manual on SAFETY REPORTING AND REMEDIAL ACTIONS suggested following to gather information on actual or potential safety deficiencies

(a) Open sharing of information on all safety issues.

(b) All employees must be encouraged to report significant safety hazard or concerns.

(c) No disciplinary action will be taken against any employee for report on safety hazard, concern or incident. These report forms can be either dropped in the safety suggestion.

(d) Boxes placed at various points in the Institute or handed over to the Quality Manager or forwarded to the Safety Manager / Flight Safety Officer.

Further, Chapter 7, Para 7.3 has clearly mentioned that all personnel of the GATI are to be encouraged to give their suggestions on: -

(a) Incorrect and inadequate procedures

(c) Inadequate training

Scrutiny of the SMS implementation register revealed that from the year 2018 to 2020, only five entries were made. However, all the entries were suggestive in nature and no hazard or deficiency was raised during this period.

1.18.6.1 Statements of Trainee Pilots

After the accident, while investigation team was gathering evidences, it was decided to record the statements of trainee pilots who were present at Birasal on the day of accident. Investigation team had recorded the statements and the facts presented by trainee pilots. It was revealed that standard circuit pattern was not followed on some occasions in the past too. And as per trainee pilots, during flying exercises, the standard circuit pattern was not followed by Flying Instructor's probably to reduce overall flying time and eventually more landing practice could be accommodated in a given slot. Further, as per the statements of trainees, by adopting such practice, more emphasize was given on landing exercise for pre-solo trainee pilots.

1.18.7 Aircraft Performance

The aircraft was certified in the acrobatic category and as per the POH, following maneuvers were approved on the aircraft: -

MANEUVER	RECOMMENDED ENTRY SPEED
Chandelles	105 knots
Lazy Eights	105 knots
Steep Turns	100 knots
Stalls (Except Whip Stalls)	Use Slow Deceleration
Spins	Use Slow Deceleration
Loops	115 Knots
Cuban Eights	130 knots
Immelmanns	130 knots
Aileron Rolls	115 knots
Barrel Rolls	115 knots
Snap Rolls	80 knots
Vertical Reversements	80 knots

However, as per the POH, aircraft maneuvering limits are defined and in accordance to the AD 2009-10-09 issued by the manufacturer, intentional spins and other acrobatic/ aerobatic maneuvers are prohibited.

NOTE: This AD does not prohibit performing intentional stalls.

Furthermore, flap extension limitations are also provided in the POH and it is stated that use of flaps in the execution of approved aerobatic maneuvers is prohibited.

1.18.8 Notification and Investigation of Accidents and Incidents

Chapter-10 of the SMS Manual contains the following guidelines regarding notification and to order an inquiry in case of an accident or incident: -

i. In an eventuality of any accident/incident, while the data for notification to DGCA is being prepared, in parallel, preliminary information is to be given by the Chief Flight Instructor to the Accountable Executive as well as Accountable Manager and Safety Manager / Flight Safety Officer at GATI.
ii. Notification of any accident is to be sent to Director General, DGCA, New Delhi with a copy to Director of Air Safety, Civil Aviation Department, Kolkata Airport, Kolkata. Notification of any incident is to be sent to Director of Air Safety, Civil Aviation Department, Kolkata with a copy to Director Air Safety, DGCA, New Delhi.
iii. Director General, HQ DGCA, will order investigation for any accident. In case of incidents, the Regional Director Air Safety would decide whether GATI Investigating Officer can conduct the investigation and forward the report or an Investigating officer would be sent by DGCA.

Whereas CHAPTER- 15 of the SMS Manual on "EMERGENCY RESPONSE PLAN IN THE EVENT OF INCIDENT/ACCIDENT" again states about occurrence reporting and constitution of a team to conduct an inquiry which is as follows: -

i. A reportable Accident / Incident should be reported to DGCA by the fastest means and in any case not later than 12 hrs. The online Incident / Accident reporting form, as given on the DGCA web site to be used for the same. In such cases mobile / telephone are to be used for the passage of information at the earliest.

ii. The Investigation Team will assemble at the Emergency response Centre, make immediate contact with the airport and other relevant agencies, take custody of all relevant paperwork and will utilize the Relief Team during the investigation. Investigation would be conducted by the PIB and CFSO / FSO would be a member. In a serious incident/accident, the DGCA might order an independent enquiry. In that case the Investigation Team would render all assistance to the state agency conducting the enquiry.

1.18.09 DGCA Circular

DGCA has issued the Circular No. 1 of 2013 dated 28th June 2013 regarding "Installation of real time camera in Flying Training Organisation" which is applicable to all FTO's operating in India. This DGCA Circular clearly states that the objective behind installation of cameras is for better surveillance of flying activities conducted in FTO's. Moreover, installation would also help the students/instructor in analysis of their flying exercise. DGCA Circular 01 of 2013 is attached with this report as Annexure "B".

1.19 Useful or Effective Investigation Techniques

Nil

2. ANALYSIS

2.1 Serviceability of the Aircraft

The aircraft had a valid ARC and a valid Certificate of Registration at the time of accident. The scrutiny of the Aircraft Log book revealed that the aircraft

had completed 10326:35 hrs (TSN) whereas its engine had logged 2135:05 hrs (TSN)as on 8th June 2020.

The last Scheduled Inspection (200 Hrs/ 12 month) was carried out on the aircraft on 06.06.2020. The aircraft including engine did not have any pending snag and it was neither operating under any MEL.

Scrutiny of the aircraft records indicates that all modifications on the aircraft were found to be complied with at the time of accident.

During lockdown period, the aircraft was maintained as per DGCA approved AMM at their maintenance facility at Bhubaneswar Airport. The aircraft was inspected on weekly basis and simultaneously engine ground run was performed during the lockdown period.

Although aircraft was maintained in accordance with DGCA issued Directives, however, before resumption of flights, aircraft's general performance/handling characteristics were checked and was found satisfactory. Thereafter, aircraft commenced its regular training flights and no abnormality of any kind was reported on the aircraft.

"Post-accident engine strip examination" has also concluded that engine was running and delivering full power at the time of accident. The damages observed on the engine as well as propeller were resultant of impact at the time of accident.

From the above, it is inferred that serviceability of the aircraft and aero engine was not a contributory factor to the accident.

2.2 CFI Qualification

Instructor held a valid CPL and was meeting the flying hours requirements laid down by Regulatory Body i.e DGCA in CAR Section 7 Series I Part V to be

appointed as CFI. CFI was also in possession of FIR (A) which is a mandatory rating to discharge the duties of a flying instructor. Although CFI had aforesaid prerequisite and ratings, however, during various Standardisation Checks carried out by DGCA FOI's, CFI performance was mostly marked unsatisfactory.

During the last standardization check where CFI received Non-Satisfactory comments are for broadly these assessments:

1. Medium turn
2. Gliding & Climbing turns

a) Use of bank in a climbing turn

b) Medium gliding turn with flaps up & down

c) Descending turns at given speed and rate of decent.

3. Forced landing
4. Instrument Flying

a) Turns rate 1 & 2

b) Climbing & descending turns

5. Stall & recovery
6. Side slips
7. Carried out sustained steep turn through 360^0 (not less than rate 2^0 turns) one to the port & one to the starboard in lieu of spinning and recovery exercise.

It is observed that the CFI received non-satisfactory comments previously also for aforesaid flying skills while undergoing standardization checks at different FTO's. These Checks were carried out by DGCA nominated FOIs before granting approval to utilize the privileges of Dy. CFI/CFI or DE. It reveals that the Instructor was prone to these flying skills before approval was granted to utilize the privileges of CFI.

Finally, Instructor had cleared the checks required to discharge the duties and responsibility of CFI in the year 2020.

2.3 Weather

The weather was not being recorded into the Met Register maintained at GATI. However, based on statements of witnesses, weather was fine on the day of accident. Hence, it was not a contributory factor.

2.4 Non-adherence to SOPs

2.4.1 Circuit Pattern

As per the SOP approved for Birasal, a well-established circuit pattern must be followed by all flight cadets, irrespective of the type of training they are undergoing except during any emergency experienced during the flight. However, while Instructor was imparting training to the Student Pilot, same was not followed. Based on the statement of eye witness, after takeoff, aircraft gained a height of approx. 150 feet AGL and subsequently approach for runway 09 was executed. During the exercise, aircraft never attained the height specified to perform a standard circuit which is 800 feet AGL.

There were occasions in the past (as stated by other Student Pilots) wherein the full circuit pattern was not performed and 180 turn was made to land on the other end of the runway.

Scrutiny of FTPR showed that student pilot flying performance was found satisfactory except for landing phase. Student Pilot was undergoing pre-solo training as already acquired 17:20 flight hours.

It appears that CFI emphasized more on Student pilot's landing practice taking into account that student pilot will be released for solo flying shortly. Thus, instead of performing standard circuit, aircraft made a 180^{o} turn to land on opposite end of runway so that a greater number of landing exercises could be practiced in the allotted time window.

The same was also followed in the previous sortie wherein the aircraft tookoff from runway 27, crew attempted to land on runway 09, however, aircraft was high on approach and it flared for long resulting into delayed touchdown.

From the above, it is evident that crew did not follow the standard circuit and attempt was made to land on runway 09 without ascertaining safe altitude.

2.4.2 Non-adherence to POH

M/s Cessna issued AD2009-10-09 in 2009 which was applicable to the involved aircraft. AD was already implemented by the operator hence a placard was placed in the aircraft cockpit mentioning that intentional spins and other acrobatic/aerobatic maneuvers are prohibited on the aircraft. Simultaneously, rudder stop was installed on the aircraft to arrest rudder travelling past the travel limit. However, as per the witness statement, it is evident that aircraft was abruptly maneuvered by the crew to approach for landing on runway 09.

2.4.3 Non-adherence to TPM

The TPM of the operator has clearly specified that while operating at Birasal, all pilots will climb to 650 feet on QNH on Takeoff / Runway heading and after sector establishment, aircraft will climb to 1000 feet AMSL when within radial before commencing any exercise. However, it is observed that the SOP laid down in operator's TPM was violated.

2.5 Voluntary Reporting System

The Voluntary Reporting System is in place at GATI, however, scrutiny of records revealed that no significant hazard report was raised at GATI. During recording of statements, a few student pilots revealed to the investigation team that previously also at few occasions the standard circuits were not followed. Notwithstanding such violations during previous training exercises, no voluntary/hazard report was either raised by any trainee student or official staff.

From above, it is established that SMS is not implemented in the organisation in its true spirit.

2.6 Lack of Supervision

2.6.1 SMS Manual Scrutiny

In pursuance to DGCA Guidelines, the SMS Manual was submitted by the operator on number of occasions for acceptance at DGCA. However, it is observed that inspite of acceptance by DGCA, the SMS Manual has various ambiguities regarding rule position on notification of occurrence and obligation to investigate an accident or a serious incident. This reflects that the Aircraft (Investigation of Accidents and Incidents) Rules 2017, which have already been gazetted by the Government of India, are not being promulgated in DGCA on regular basis.

Hence, SMS Manual of the operator is not in line with the Aircraft (Investigation of Accidents and Incidents) Rules 2017.

2.6.2 Installation of Cameras in FTO

DGCA Circular 01 of 2013 states that for oversight, inspection & surveillance of FTOs, cameras should be installed at airfields including uncontrolled. Moreover, as per the circular, installation would also help the students/instructor in analysis of their flying exercise. Furthermore, if cameras are installed in FTOs, they can be utilized as surveillance tool during Annual Audits or Inspections carried out by DGCA.

However, it is observed that aforesaid circular was not complied by most of the FTOs including GATI which operates from uncontrolled airfield, Birasal.

2.7 Pilot Handling of the aircraft

At the time of accident, the student pilot under supervision of CFI was undergoing flying training. As the command of the aircraft rests with the PIC,

during training flights, onboard Instructor assumes the charge of PIC. Therefore, CFI held the responsibility of PIC during the accidented flight.

During second sortie, aircraft takeoff roll was significantly on right of the runway centreline from which it is presumed that CFI had probably planned for 180^{0} turn subsequently after the takeoff so that aircraft could land on runway 09. Therefore, after takeoff from runway 27, CFI deviated from the standard circuit pattern defined in their company SOP and without gaining sufficient height, executed a right turn and subsequently a very steep left turn. However, crew could not carry out a coordinated turn as the aircraft overbanked which eventually led to stall. As the turn was executed at a very low height, there was not sufficient height/time for the crew to affect a recovery. Thereafter, aircraft started losing height significantly and attained a pitch down attitude whereas left wing dropped further.

Flapless landing exercise is a pre-requisite to perform first solo flying which is a part of training module. The flap lever position in the cockpit while examining the wreckage indicates that it was an intentional flapless landing carried out by the CFI as a part of training exercise. However, there is another possibility that as the crew were well aware that to land on runway 09, a 180 steep turn was required, hence, to comply with the operational requirements, flaps were not deployed and before executing the same, aircraft had already encountered stall. Thereafter, crew could not affect the recovery and aircraft hit the unpaved surface near threshold of runway 09.

3 CONCLUSION

3.1 Findings

AIRCRAFT

1) Aircraft was certified in ‘Aerobatic’ category.

2) Aircraft held a valid Certificate of Airworthiness and was maintained in

accordance with the approved maintenance schedule**.**

3) After the last Scheduled Maintenance Inspection at Bhubaneswar, aircraft had completed 03:20 hrs of flying before it met with the accident.
4) AD's and other regulatory Modifications were complied on the aircraft and no snag was pending on the aircraft.
5) The aircraft engine was generating power at the time of the accident.

CREW

1) Student pilot was undergoing pre-solo checks on the day of accident.
2) The CFI held a valid Commercial Pilot Licence (CPL) endorsed in FIR (A) and had acquired the flying hours to meet the regulatory requirements for CFI nomination.
3) Self-declaration forms regarding non consumption of alcohol were submitted by both crew before operating the training flight.
4) On the day of accident, Medical certificate of the CFI was expired, however, in accordance to DGCA Circular issued in response to outbreak of Covid pandemic, privileges of CPL licence were utilized.
5) While undergoing Standardisation Checks for different positions at various FTOs, CFI performance was recorded non satisfactory and was found prone to some basic flying skills.
6) Flying Instructor got the rating of CFI after meeting the prerequisite of DGCA on 30.01.2020.
7) Both crew received fatal injuries during the accident.
8) During the training exercise, Crew did not adhere to the SOPs.

OPERATIONS

1) Flight was operated under VFR.
2) On the day of accident, training flying was started before the ATC/ADM officer of the organisation reported at Birasal airfield.
3) During the sortie, aircraft took off from runway 27 and when the aircraft was at a height of around 150 feet, crew performed a 180º turn in an attempt to

land from other end of the runway i.e 09.

4) Crew action to steeply turn the aircraft resulted into higher bank angle eventually leading to inadvertent aircraft stall.
5) As the turn was executed at a very low height, there was not sufficient height/time for the crew to affect a recovery.

ORGANISATION

1) Non adherence to standard circuit pattern during training flights was never reported under voluntary/hazard reporting system implemented in the organisation.
2) SMS Manual and other documents are not in line with the Aircraft (Investigation of Accidents and Incidents) Rules, 2017.
3) Weather information was not being updated in the Met register on regular basis.

DGCA

1) DGCA has no clear guidelines with regard to Circular No. 1 of 2013 issued on 28th June 2013 as this Circular exist on their website, however, not implemented by most of the FTOs.
2) Aircraft (Investigation of Accidents and Incidents) Rules 2017, which have already been gazetted by the Government of India, are not being promulgated in DGCA on regular basis.

3.2 Probable Cause of the Accident

The accident was caused as crew did not adhere to the standard SOP and overbanked the aircraft while landing. As the aircraft was low in height, there was insufficient height/time for the crew to affect the recovery and to overcome stall, which eventually resulted into aircraft hitting the unpaved surface in nose dive attitude.

4. Safety Recommendations

4.1. DGCA may reiterate the Circular No. 1 of 2013 which makes it mandatory to install cameras at uncontrolled airfields in order to monitor activities on runway and to record lapses, if any, where direct surveillance by other agencies cannot be undertaken.

4.2 DGCA may apprise its officials to ensure that all manuals approved /accepted by DGCA are in line with the current Aircraft (Investigation of Accidents and Incidents) Rules.

4.3 DGCA may direct all the FTOs to update their documents/manuals in pursuant to current Aircraft (Investigation of Accidents and Incidents) Rules, to rectify any ambiguity existing therein.

4.4 DGCA may monitor the voluntary/ hazard reports on periodic basis from all the FTOs operating in India to ascertain if significant reports are being generated or not.

Amit Kumar
Investigator

Dinesh Kumar
Investigator-in-Charge

Date:29.06.2021
Place: New Delhi

Annexure "A"

Engine Strip Examination Report

Aircraft engine was strip examined at a DGCA approved facility from 27.08.2020 to 28.08.2020. Before engine was dismantled, external visual inspection was carried out and following was observed: -

a. A portion of crankshaft flange was found bent & sheared off at the flange base.
b. Crankcase at the nose lower section of the both half was found broken.
c. Bottom surface of oil sump near drain point was found bent & cracked. Right side of sump wall had deep dent & found cracked. All four carburetor attaching stud were found sheared off.
d. Rocker cover box of Cylinder number1,2,3 & 4 was found with multiple dents.
e. Cooling fins of cylinder number 1,2,3 & 4 were found with multiple cracks, broken and bent.
f. Magneto (LH) were found installed on engine with cracked mounting flange.
g. Vacuum pump inlet & outlet bend fitting was found sheared off.
h. Ignition lead was found broken & damaged.
i. External spin-on oil filter mounting adopter was found cracked with dent on oil filter.
j. Push rod and shroud of cylinder no. 1&3 were found damaged & bent.
k. Induction tube of cylinder no.1,2 & 4 were found damaged & bent whereas Induction tube of cylinder no.3 was found missing.
l. Oil return line from Rocker Box of cylinder no.2 & 3 to crankcase was found with dent & broken at their elbow.
m. Ignition harness leads were found broken &top spark plug of cylinder no.1 & Bottom spark plug of cylinder no. 2 found broken. Bottom spark plug of cylinder no.3 & 4 were found bent.

After visual inspection by an approved AME, engine dismantling was carried out and following was noted: -

Engine Fuel System:

a. Fuel filter assembly was found badly damaged, broken, crushed.
b. Fuel supply hose to carburetor was found satisfactory.
c. Carburetor & assembly were found broken in to pieces & crushed.

Conclusion: -The condition of carburetor & induction air box assembly shows that accidental impact had caused such damages.

I. ENGINE REAR ACCESSORIES CASE

Accessories case was found in good condition (internally & externally) along with its gear arrangement except the following: -

1) Both magneto flanges were found broken.
2) Oil filter adopter was found cracked.
3) Vacuum pump inlet and outlet vents were sheared off.
4) Elbow of oil transfer hose was found broken.

Magneto-Functional test has confirmed that both magnetos were working satisfactorily, however, flanges were broken.

Oil Filter & its Adapter-Filter element of oil filter was removed, inspected and no metal particles, debris or any objectionable particles were found into oil filter. Hence, it confirms that there was no internal engine component (partial or full) failure and engine was operational.

Vacuum pump & its adopter- Vacuum pump was functioning, however, its mounting adopter & both inlet & outlet were found damaged.

Broken elbow- Oil hose connecting elbow was found sheared off at the accessories case due to pounding of some external things.

Conclusion- This inspection has revealed that these components & parts got damaged due to impact load & heavy striking.

Different parts of the engine were analysed during the strip examination and a brief on their condition is presented below: -

I. CRANKCASE

Lower front nose section of crankcase was found broken. However, rest of crankcase condition (externally and internally) was satisfactory. Inspection revels that the nose of the crankcase got damaged due to very heavy impact load**.**

Crankcase main, central & rear Bearings, various matting surfaces, crankcase halves attaching studs, camshaft & crankshaft support bearing surfaces main oil galleries etc. were found in satisfactory condition**.**

All four lugs of crankcase which are for attachment with engine mount were Inspected for general condition, elongations/deformation/crack of bolt holes & found satisfactory.

Conclusion- This inspection & examination is revealing that crankcase is in satisfactory condition except its broken nose section. Hence it may be mentioned that crankcase was performing its function properly when engine was operational.

II. OIL SUMP

The engine is equipped with wet sump oil lubricating system. The crankcase lower extended portion is its oil sump.

OBSERVATIONS:

(a) Inspection of the sump after its removal confirmed multiple cracks at its base which could have happened due to heavy impact of external things. Therefore, entire engine oil drained out & engine was received with no oil.

(b) Bottom center portion of sump is designed to attaché carburetor & air box with induction air filter. During inspection, 04studs attaching carburetor were found sheared off. Also, badly broken carburetor, crushed air box & induction air filter were found.

III. CRANKSHAFT-

(a) The propeller mounting flange of crankshaft was found bent and sheared off. The damage shows that sudden impact and complex load was very high in magnitude at the moment of collision.

(b) There is no other visual surface damage and corrosion on the crankshaft.

(c) The bending & shearing of the propeller flange has been found at 6 O'clock position (Bottom side) of engine & this evidence confirms that this section had rammed the ground first at the time of collision.

(d) This distorted flange had hit the front lower nose section of the crankcase thus caused damage to the crankcase nose too, otherwise entire crankcase found satisfactory.

(e) The distorted and sheared flange of crankshaft is an evidence of primary damage under severe impact load developed during accident.

(f) The crankshaft was subjected with **Magnetic Particle Inspection (Non Destructive Test)** to find out secondary damage if any, due to transfer of load and stress which had caused the primary damage. The test result confirms that the secondary damage has appeared as crack (**MPI Test**) at about half the circumference area of the forward thrust collar just behind the distorted and sheared crankshaft flange.

Conclusion- The inspection and test revealed that the crankshaft was functioning properly and damages found in it are due to accident.

IV. CONNECTING RODS

(a) Both big & small ends of connecting rods were found satisfactory.

(b) No bend, corrosion & other damage was found in any of the connecting rod.

(c) Both big & small end bearing surfaces were found in good conditions.

(d) **MPI (Non-Distractive Test)** reveals that no superficial or subsurface crack on any of the connecting rod.

Conclusion- Inspection and test indicates that connecting rods were in position to perform their function.

V. CAMSHAFT

(a) Visually inspected camshaft for cracks, scoring, galling, corrosion, pitting or other damage and found satisfactory.

(b) All bearing surfaces, bearing journal were found satisfactory.

(c) Cam lobe, apex has no evidence of surface irregularity or feathering at the age of lobe.

(d) The result of **MPI (Non-Destructive Test)** on camshaft confirms its integrity.

Conclusion- Inspection and test shows that the camshaft was in the position to perform its intended function.

a) TAPPETS

All tappets were removed from their cavities & inspected for condition and no signs of spalling or pitting, discoloration were found on the face of tappet.

The entire body of the tappet was inspected for wear pattern, corrosion and found satisfactory**.**

Conclusion- Inspection and test reveals that the tappets were in the position to perform their intended function.

b) VALVE PUSHROD& SHROUDS

Pushrods & shrouds of cylinder no.1 & 3 were found bent & damaged due to external impact.

Pushrods & shrouds of cylinder no.2 & 4 were found satisfactory.

Conclusion- The inspection and test revealed that valve operating mechanism which includes camshaft, valve tappet, pushrod & shroud, rocker arm, rocker pin, valves (intake & exhaust) were working satisfactory before the deformation & bending of pushrods.

VI. ENGINE LUBRICATION SYSTEM

This system includes oil sump with oil, engine driven gear type oil pump, oil filter adopter, oil filter, oil by-pass valve, oil pressure relief valve, oil pressure & suction hose, oil cooler etc.

Inspection & condition revealed that before the damage of a few components, engine lubricating system was working satisfactorily.

a. OIL COOLER & HOSE

1. Received oil cooler assembly with oil hoses in damaged conditions. Both oil hoses were, however, in good condition.
2. Oil cooler was found crushed & hose connecting elbow broken.

b. Engine Driven Oil Pump

1. Inspected and functioning was found satisfactory.

c. Oil pressure relief valve

1. Inspected and found satisfactory.

Conclusion- Inspection and test indicates that engine lubrication system was functioning properly before the damage to a few components of lubrication system occurred.
There is no evidence anywhere in engine system and component to confirm that there was starvation of lubricating oil during engine operation.
This confirms engine oil lubrication system was functioning satisfactorily before the accident.

OPINION

a. Power generation system-

Observed and recorded condition of the crankcase (accessory case, oil sump, crankshaft, camshaft, intake & exhaust valve operating mechanism, pistons &

connecting rods, all four cylinders) reflect that this system was generating adequate power during engine operation.

Damages received in different parts and components of power generation system were the result of accident/collision.

b. Engine lubrication system-

Result of inspection and test on different components of lubrication system (oil sump, wire mesh oil filter, oil filter, oil suction tube, oil transfer hoses, oil cooler, oil pressure relief valve, engine driven oil pump, etc.) indicate that engine lubrication system was functional during engine operation. Additionally, there was no evidence of abnormal wear or overheating on the engine components/parts.

Damages found on different component of this system were a result of accident/collision.

c. Engine cooling system-

Result of inspection and test of engine cooling system (inter cylinder baffles, cylinder cooling fins and oil lubrication system as it serves to cool components also) show that engine cooling system was functional and effective. Also, there is no evidence of overheating on engine components and parts.

Damages found on different component of this system were a result of accident/collision.

d. Ignition system-

Inspection and test of engine ignition system (magneto, ignition harness & spark plug) confirms that both magnetos were functional with other component of ignition system during the engine operation.

Damages found on different component of this system were a result of accident/collision.

e. Electrical power generation system-

Electrical power generation system (alternator, necessary wiring, regulator unit and control switch) was functioning properly because the alternator is engine driven unit.

Damages found on different component of this system were a result of accident/collision.

f. Engine starting system-

Engine starting system (starter, electrical cables and control switch) was functional because engine was cranked and started for flying before the accident.

Damages found on different component of this system were a result of accident/collision.

g. Induction & carburation system-

Induction & carburation system (induction air filter, induction air box, carburetor, intake manifold, intake tubes) were functional at the time of engine operation. This can be confirmed by analyzing the damages of components and parts of this system are result accident/collision.

<u>Photographs-Engine Strip Examination</u>

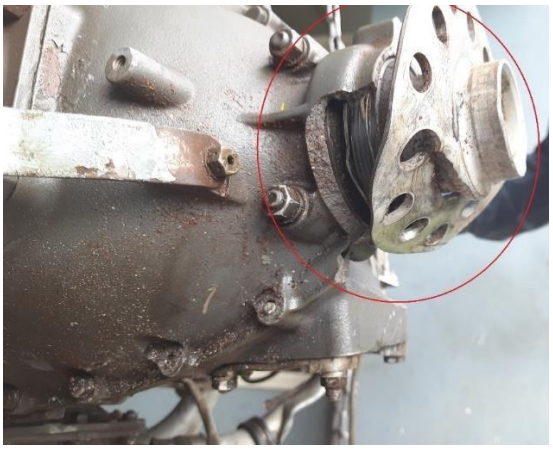


Figure: 1 Crankshaft flange

Figure: 2 Oil sump

Figure: 3 Magneto (LH)

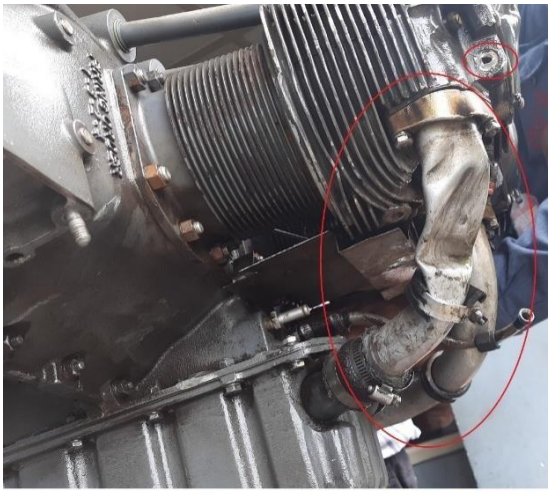


Figure: 4 Induction tube (Cylinder 2 & 4) and sheared rocker box oil elbow.

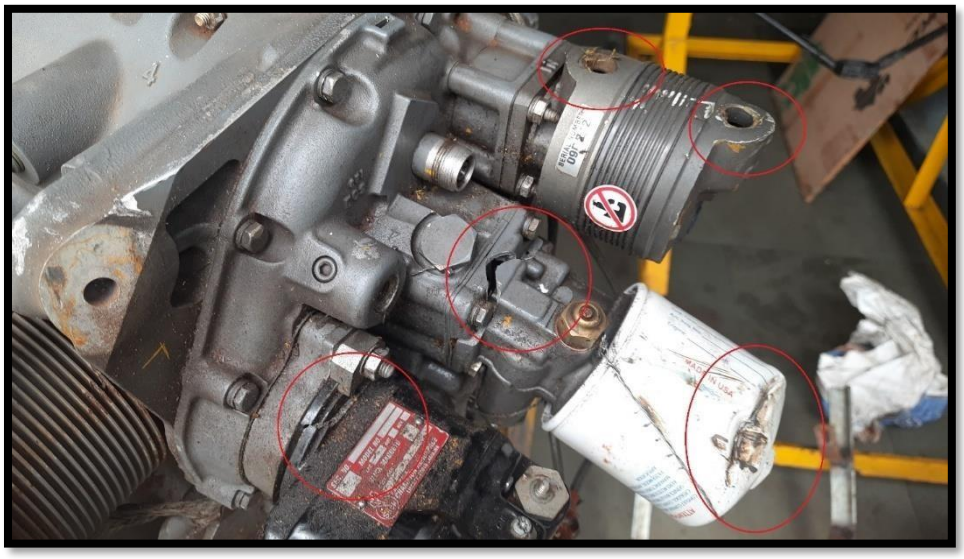


Figure: 5 Magneto (LH), Oil filter adapter, oil filter & Vacuum pump.

Figure: 6 Ignition leads

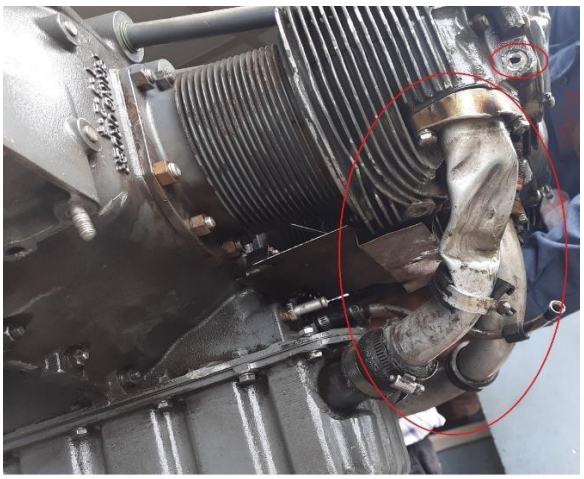


Figure: 7 Induction tube (Cylinder 2 & 4) and sheared rocker box oil elbow

Figure: 8 Induction tube (Cylinder no. 1) and broken mounting flange with missing tube

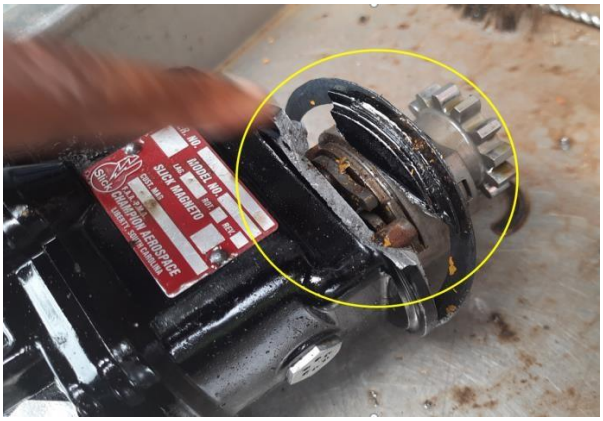


Figure: 9 Magneto (LH)

Figure: 10 Starter

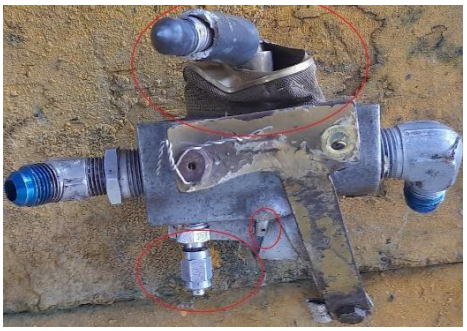


Figure: 11 Fuel filter assembly

Figure: 12 Spark plugs

Figure: 13 Push rod, shroud, rocker arm, rocker pin & camshaft

Figure: 14 Cylinders

Figure: 15 Connecting rods & pistons

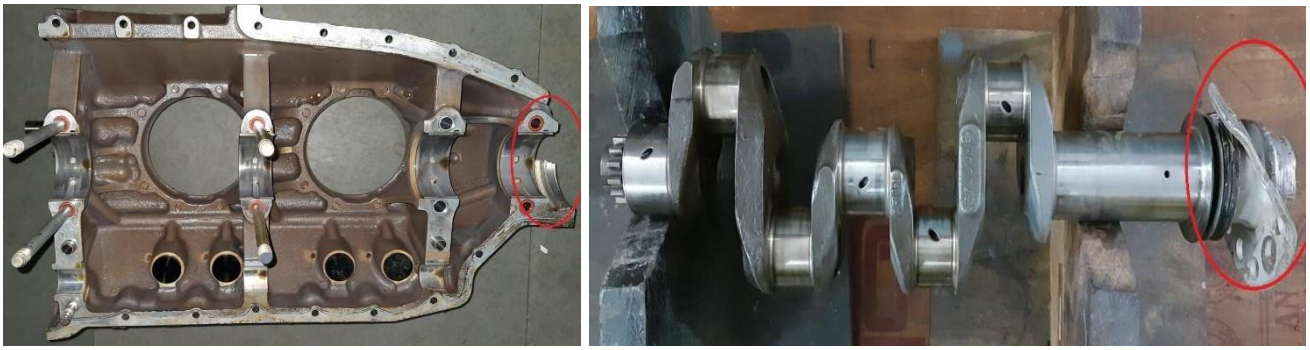


Figure 16: Crankcase and crankshaft

Annexure "B"

FLYING TRAINING ADVISORY CIRCULAR No. 1 of 2013

Subject: Installation of real time camera in Flying Training Organisation

1. INTRODUCTION

The Flying Training Organisations are operating from various airfield including uncontrolled. The surveillance oversight inspection of these flying training organisations are carried out on annual basis. There have been a number of cases in past of false and fraudulent entry by Instructors and Trainee Pilots of various Flying Training Organisation. In order to increase and improve surveillance over Flying activities, FTOs are directed to install cameras to provide real time view through internet.

2. Applicability

This circular is applicable to all flying training organizations (FTO) with immediate effect.

3. Objective

The installation of cameras shall enable better surveillance of flying activities conducted in FTOs and will help in controlling the false and fraudulent log book entries. The installation would also help the students/instructor in analysis of the flying exercise.

4. INSTALLATION

(i) The camera's should be installed to cover the following view: -

- Approach of both ends of the runway (In case of uncontrolled airfield)
- Apron area (In case of uncontrolled airfield)
- Classrooms
- Examination Room

(ii) The camera installed should be of high resolution to ensure proper visibility.

1. MONITORING

I. The FTO should ensure that the surveillance cameras are functional while flying activities are carried out.

II. In case the camera is non-functional then FTO should intimate DGCA immediately and take action to make it functional within fortnight.

III. The FTO should provide real time view of the surveillance cameras through internet.

IV. The FTO should retain the data for a period of atleast 1 year.
