सत्यमेव जयते

INVESTIGATION REPORT ON ACCIDENT INVOLVING CESSNA 172 R AIRCRAFT VT-RGC OPERATED BY M/S WINGS AVIATION Pvt. Ltd. AT MOKILA (SHANKARPALLY) – NEAR HYDERABAD ON 21ST NOVEMBER 2018.

Raje Bhatnagar
Investigator -In- charge

Amit Kumar
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 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.

INDEX

FINAL INVESTIGATION REPORT ON ACCIDENT OF M/S WINGS AVIATION PRIVATE LIMITED CESSSNA-172R AIRCRAFT VT-RGC AT MOKILA (SHANKARPALLY) – OUTSKIRTS OF HYDERABAD ON 21ST NOVEMBER 2018.			
1.	Aircraft	Type	CESSNA 172 R
		Nationality	Indian
		Registration	VT-RGC
2.	Owner & Operator		Wings Aviation Private Limited
3.	Pilot		Student Pilot License Holder
	Extent of Injuries		Minor
4.	Co- Pilot		Nil
	Extent of Injuries		Nil
5.	No. of Passengers on board		Nil
6.	Date & Time of Accident		21st November 2018 at 0600 UTC
7.	Place of Accident		Mokila (Shankarpally), outskirts of Hyderabad
8.	Last point of Departure		Begumpet Airport
9.	Intended landing place		Begumpet Airport
10.	Type of Operation		VFR, Flying Training
11.	Phase of operation		Climbing Phase
12.	Type of accident		Forced Landing
13.	Co-ordinates of Accident Site, AMSL		17°25'32.90"N 78°11'52.44"E

(ALL TIMINGS IN THE REPORT ARE IN UTC)

Synopsis.

On 21st Nov, 2018, Cessna 172R aircraft VT-RGC belonging to M/s Wings Aviation Pvt. Ltd. was involved in an accident at Mokila near Hyderabad while operating a solo cross-country training flight from Begumpet airport to Gobur (Karnataka). The aircraft was under the command of a Student Trainee Pilot who was holding a valid student pilot license and who was detailed for solo "Cross country training flight" from Begumpet airport to Gobur (Karnataka).

The Student Trainee Pilot took–off for a "Cross country training flight" from Begumpet airport and take-off was uneventful. After take-off, Shamshabad approach cleared the aircraft to climb 6500 feet. While passing 6300 feet, the engine started vibrating and after 3 to 4 seconds the engine stopped and the propellers also stopped rotating. Student Trainee Pilot tried to level the aircraft and an engine restart was also attempted but the engine didn't start. Thereafter, the engine failure call was given to Shamshabad approach but Student Trainee Pilot didn't get any response. Then he gave "May Day, May Day, May Day" call and declared engine failure.

Shamshabad approach advised Student Trainee Pilot to set course back to Begumpet Airport and simultaneously alerted the Begumpet Airport for emergency. After setting course back to Begumpet Airport, pilot realized that he will not be able to reach Begumpet Airport because aircraft was continuously losing height and the distance to Begumpet Airport was 18NM(Approx.). Hence, a force landing was planned by the pilot and he started searching for a level field to land the aircraft. Shamshabad approach advised him to watch out for buildings, humans and vehicles. After this, pilot lost the communication with Shamshabad approach also.

Aircraft forced landed at 0600 UTC in a paddy field at Mokila (Shankarpally) near Hyderabad. During force landing, the left wing of the Aircraft hit a tree. After forced landing, Student Trainee Pilot himself came out of aircraft from the left door. There was no fire but the aircraft was substantially damaged.

Director General, AAIB appointed Sh. Raje Bhatnagar, Assistant Director as Investigator – In – Charge & Sh. Amit Kumar, Safety Investigation Officer as

Investigator to investigate into the probable cause(s) of the accident vide order No. INV.-11011/8/2018-AAIB dated 22nd Nov 2018 under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017.

The Probable cause of the accident was "Fracture of the crankcase due to breaking of connecting rod caused engine oil loss thereby causing engine seizure*"*.

Cause of breaking of connecting rod could not be established.

1. Factual Information

1.1 History of the Flight

On 21st November 2018, M/s Wings Aviation Pvt. Ltd. Cessna-172 R aircraft, VT-RGC engaged in solo cross-country training flight from Begumpet airport to Gobur (Karnataka), was involved in a forced/crash landing at Mokila (Shankarpally) on the outskirts of Hyderabad.

As per the organization policy, the preflight Daily Inspection Schedule was carried out by the AME. This was the aircraft's and Student Trainee Pilot's first flight of that day. Prior to the flight, the Student Trainee Pilot had undergone Breath Analyzer Test and the result was negative. As per Student Trainee Pilot's statement, the preflight inspection was carried out by the Student Trainee Pilot himself. Startup was taken on RT, thereafter he started engine and carried out after engine startup checks. Thereafter Begumpet ATC gave the departure clearance. ATC cleared the aircraft for line up and there after pilot carried out the required checks before Take-off.

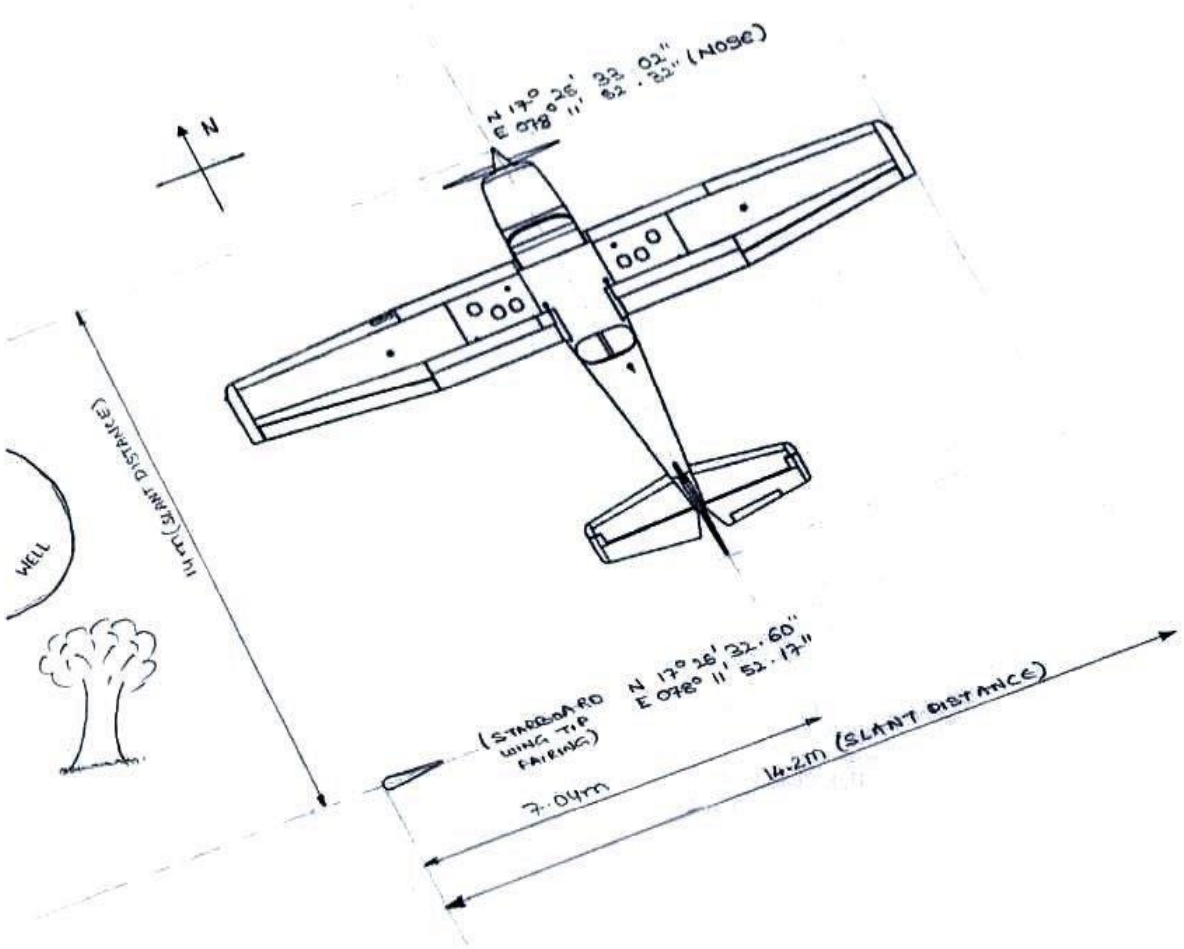
Aircraft took off from Begumpet airport at 0537 UTC. When aircraft was passing 3500 feet enroute to Gobur, Begumpet tower handed over the aircraft controls to Shamshabad approach. At 3600 feet, Student Trainee Pilot checked all engine parameters which were reported normal.

Later Shamshabad approach cleared the aircraft to climb on track to 5500 feet and subsequently to 6500 feet. While passing 6300 feet the engine started vibrating and after 3 to 4 seconds engine stopped and the propellers ceased to rotate. After levelling the aircraft, the Student Trainee Pilot tried to restart the engine but the same was not successful. Then he gave engine failure call to Shamshabad approach but Student

Trainee Pilot didn't get any response. Thereafter, the pilot gave "May Day, May Day, May Day" call and declared engine failure.

Shamshabad approach advised Student Trainee Pilot to set course back to Begumpet Airport and at the same time alerted Begumpet Airport for emergency. After setting course back to Begumpet Airport, Student Trainee Pilot realized that he can't reach Begumpet Airport because aircraft was continuously losing height and the distance to be covered was approximately 18NM. So, he decided to force land the aircraft and started searching for the open field to land the aircraft. Shamshabad approach also advised Trainee Pilot to watch out for buildings, humans and vehicles. After this, Student Trainee Pilot lost the communication with Shamshabad approach.

At 0600 UTC, Aircraft forced landed in a paddy field at Mokila (Shankarpally) near Hyderabad. During landing, the aircraft's left wing hit a tree in the field. After forced landing Student Trainee Pilot came out safely from the left door of the aircraft. There was no fire, however, the aircraft were substantially damaged.



As per eyewitness, propeller blades were not running which indicated that the engine was not running at the time Aircraft hit the ground.

Post-Accident, Student Trainee Pilot was subjected for Breath Analyzer Test in presence of a local Air safety Officer and the test result was found negative. Thereafter, the Student trainee pilot was rushed to the local city hospital for medical treatment.

Due to impact, aircraft's ELT got activated and the same was later switched off by the Wings Aviation Pvt Ltd personnel.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	NIL	NIL	NIL
Serious	NIL	NIL	NIL
Minor/ ~~None~~	01	NIL	NIL

1.3 Damage to aircraft

The aircraft was substantially damaged during the accident. Following are the main damages observed on the aircraft.

Fig: Final resting position

a) The port (left) wing of the aircraft was detached from the forward fuselage attachment fittings & the fuel line connection was found broken. The leading edge from wing root to wing tip was found badly damaged. The Taxi light lamp was detached. The left wing's leading edge was found smashed in the middle. The left aileron was found badly damaged.
b) The pitot tube was found broken.
c) The left side door along with the window was found detached whereas its door frame was found broken.

Fig: Leading edge of the left side

d) The windshield was found separated and damaged.
e) The left side main landing gear attachment bolt was found broken into 3 pieces and was detached along with brake hydraulic line.
f) The rearward windshield was found broken.
g) The baggage compartment's lower & upper skin and door were found badly damaged and the fuselage was buckled toward the right side.
h) ELT & Transponder antennas were found broken and broken part was missing.
i) There were cracks on the dorsal fin & left side of the vertical stabilizer and rudder was found damaged.
j) Horizontal stabilizer, elevator & elevator trim tab were found damaged.
k) The right-side wing tip had separated & navigation light lamp was missing. The right-side aileron was found badly damaged.

l) The right-side door's upper hinge was found broken.

m) There was damage in the fuselage near the bottom side of the right-wing strut.

n) 06 cowl mounts of cowling were found broken.

o) Firewall was found buckled & damaged.

p) The major structural parts of the airframe were found badly damaged.

1.4 Other Damage

Nil.

1.5 Personnel information

Pilot	Student Pilot License Holder.
AGE	22 YRS
License Date of Issue	30/11/2017
License Valid up to	29/11/2022
Category	Aero plane
Class	Single Engine Land
Endorsements as PIC	C-152, C-172
Date of Med. Exam.	30/08/2018
Med. Exam valid upto	29/08/2019
FRTO Licence Date of issue.	16/02/2018
FRTO Licence Valid up to	15/02/2028
Total flying experience	113:20Hrs.
Experience on type	51:05Hrs
Experience as PIC on type	18:40Hrs
Last flown on type	C-172
Total flying experience during last 180 days	46:35Hrs.
Total flying experience during last 90 days	43:35Hrs.
Total flying experience during last 30 days	20:20Hrs.
Total flying experience during last 07 Days	08:05Hrs.
Total flying experience during last 24 Hours	00:40Hrs.

- Two days prior to the accident, the Student Trainee Pilot had undertaken a solo cross-country training flight on the same route

- This was his 5th solo cross-country training flight on the same route.

1.6 Aircraft Information

1.6.1 General description

This Cessna 172R aircraft was manufactured by M/s Cessna Aircraft Company USA in 2006. The aircraft is a four-seater and has a fixed tricycle landing gear. This aircraft is primarily used for flight training. Cessna 172R aircraft is powered with one Avco Lycoming engine, which is a 4 cylinder, IO-360-L2A normally-aspirated, direct drive, air cooled and horizontally opposed, injector equipped engine and uses 100 LL (low lead) fuel. The engine has a Horsepower rating of 160 BHP with engine speed of 2400 RPM. The aircraft is fitted with fixed pitch McCauley Propeller of model No.1C235/LFA7570 with 2 blades. The aircraft is certified for a single pilot operation. There are two doors. The aircraft is fitted with Integral Fuel Tanks having a total fuel capacity of 56 U. S. gallon and usable fuel is 53 U. S. gallon. (1 U. S. gallon = 3.78541 Litres).

The airframe is of metal construction (primarily of 2024-T42 aluminum alloy) with riveted skin. Components such as wingtips and fairings are made from glass-reinforced plastic. The fuselage is a semi-monocoque with vertical bulkheads and frames joined by longerons running across the length of fuselage.
Dual controls are available as optional equipment on the Cessna 172R and almost all 172R have this option installed. During the accident flight the dual controls were not removed from the aircraft.

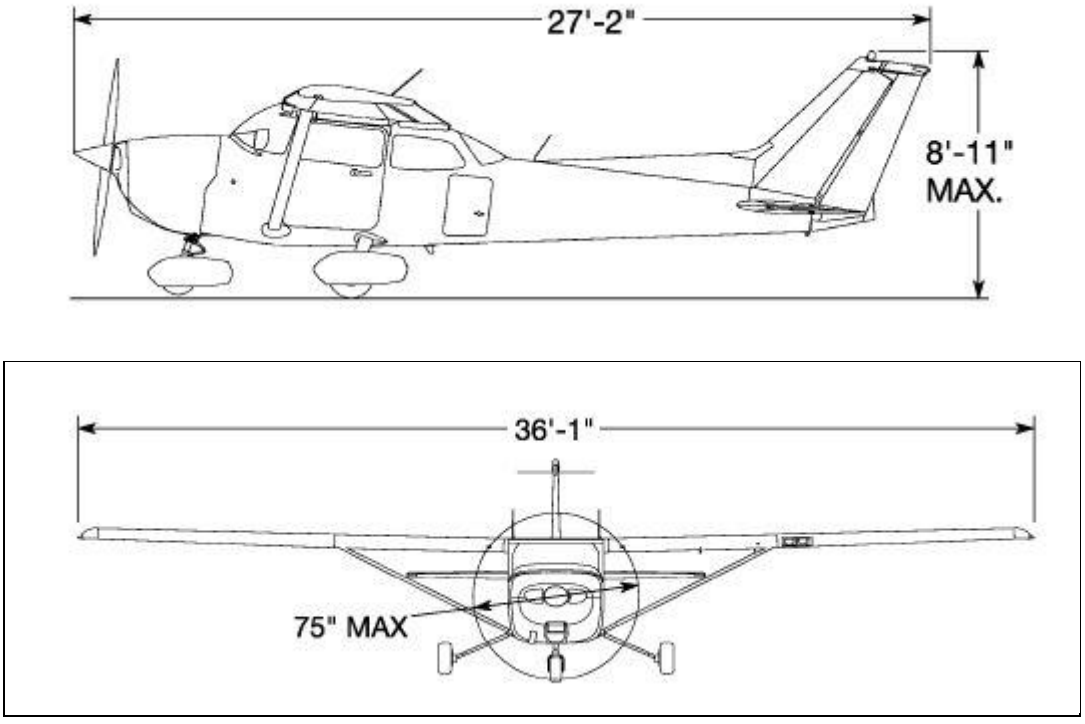
The Cessna 172 is equipped with differential ailerons that move through 21 degrees upwards and 16 degrees downwards. It has single slotted flaps which are electrically operated and deploy to a maximum of 30 degrees. The rudder can move 18º44″ (Measured perpendicular to hinge line) to either side and is fitted with a ground-adjustable tab. The elevators move up through 29 degrees and down through 24 degrees. An adjustable trim tab is installed on the right elevator and is controlled by a small wheel in the center of the control console. The trim tab moves 23 degrees up and 20 degrees down relative to the elevator chord line.

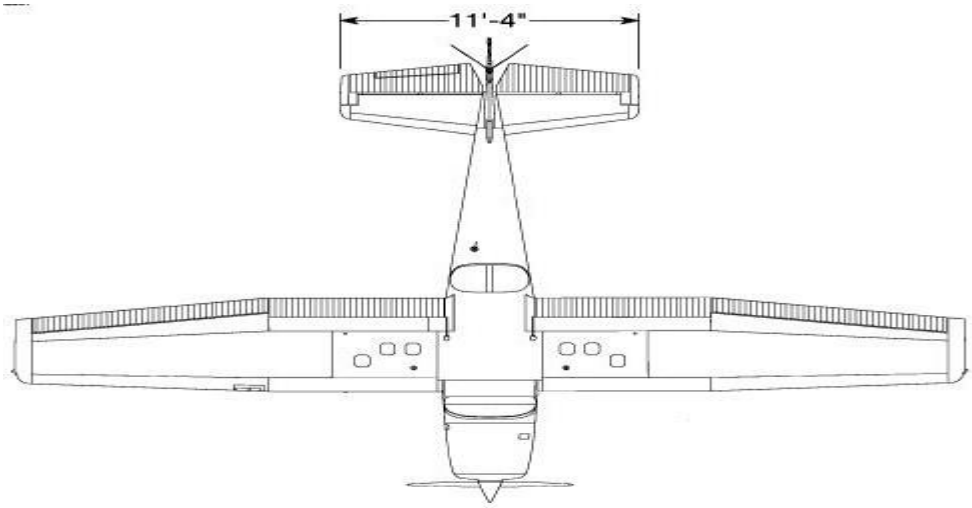
The Cessna 172R is equipped with fixed tricycle landing gear. The main gear has tubular steel legs surrounded by a full-length fairing with a step for access to the cabin. The main gear has a 65 inches wheelbase. The nose wheel is attached to the nose oleo shock strut, and the nose oleo strut dampens and absorb normal operating loads. The nose wheel is steerable through 10 degrees on either side of neutral and can castor under differential braking up to 30 degrees. It is connected to the rudder pedals through a spring linkage.

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

Cessna 172 is also fitted with a parking brake system. It is applied by depressing both toe brakes and then pulling the "Park Brake" lever aft and turn 90º anticlockwise to the pilot's left. The toe brakes are then released but pressure is maintained in the system, thereby, leaving both brakes engaged.

Fig: Three view drawing





1.6.2 Aircraft Technical Information

Aircraft		
1.	Manufacturer	Cessna Aircraft Company, USA
2.	Type	Cessna 172 R
3.	Aircraft Registration	VT-RGC
4.	Constructor Sl. No.	17281348
5.	Year of Manufacturer	2006
6.	Certificate of Registration No.	3514/2
7.	Certificate of Airworthiness No.	2923
8.	C of A renewed on	05.11.2015
9.	C of A valid up to	Lifetime
10.	ARC issued on	05.11.2018
11.	ARC valid up to	04.11.2019
12.	Category of C of A	Normal
13.	Subdivision category of C of A	Passenger
14.	Minimum Crew	01
15.	Aircraft Empty weight	772.0 Kgs.
16.	Maximum All up weight	1111.00 Kgs.
17.	Date of aircraft weighment	17.07.2008 Hyderabad
18.	Last major Inspection	200 Hrs./01 Year

19.	Last major Insp. carried out on	16.11.2018 at 6793:00 Hrs.
20.	Airframe hours Since New	6810:50 Hrs
21.	Airframe Hours since last C of A	2810:40
22.	Aircraft usual station as per C of R	Hyderabad
23.	Aero mobile License No.	A-001/01-RLO(NR)

Engine		
1.	Manufacturer	Textron Lycoming
2.	Type	Lycoming IO-360-L2A
3.	Sl No.	L-33008-51E
4.	Engine hours Since New	6811:05 Hrs
5.	Engine hours Since O/H	1562:10 Hrs
6.	Date of O/H	16.11.2016
7.	Last major Inspection	200 Hrs./01 Year done at 1545:20Hrs.
8.	Last major Inspection carried out on	16.11.2018
9.	Average Fuel consumption as per fuel oil register	28-30 liters / hrs.
10.	Average Oil consumption as per fuel oil register	130-150ml/hr

Propeller		
1.	Manufacturer	McCauley
2.	Type	1C235/LFA7570
3.	SL. No.	ACA48507A
4.	Last major Inspection	200 Hrs./01 Year
5.	Last Major Insp. Carried out	262:35Hrs. on 16.11.2018
6.	Total hours Since Overhaul	280:25 Hrs

Scrutiny of the Tech log revealed that there was no defect reported on the aircraft before the accident flight. The defect register also shows that there were no defects and since it's last major inspection.

Last entry in Fuel & Oil consumption register was found of dated 21st November 2018 for 100Ltrs of fuel and 500 ml of Oil.

AUW of the aircraft and C.G. was within limit at the time of take-off.

1.7 Meteorological Information

At 0530 UTC during take-off, the weather at Begumpet airport was "visibility of 5000 meter in a calm wind condition at a temperature of 29℃ and with visibility likely to be improve 6000m".

The following weather was reported by ATC.

Wind: 100/06 knots
Visibility: 5000 m
Weather: H2
Clouds: Few 1500 Ft,
Temperature: 29 C
Dew Point: 20 C
QNH: 1020 hPa 3012 INS
QFE: 0957 hPa 2826 INS
Trend: Become 6000m.

……..

At 0600 UTC during landing, the weather at Shamshabad airport was, visibility of 6000 meter in a calm wind condition at a temperature of 29℃ and with no significant weather change.

The following weather was reported by ATC.

Wind: 060/05 knots
Visibility: 6000 m
Weather: ----
Clouds: Few 1500 Ft,
Temperature: 29 ℃
Dew pt.: 23 ℃
QNH: 1019 hPa 3009 INS

QFE: 0947 hPa 2965 INS

Trend: No significant weather change.

1.8 Aids to navigation

Cessna Aircraft

VOR, Transponder, ELT, VHF

Aerodrome Aids

Navigation and Landing Aids

PAPI, DVOR, DME, and ILS-RW-27 systems are available.

1.9 Communication

There was always two way communication between the ATC and the aircraft.

1.9.1 Tape Transcript of Asr Frequency 120.25 Mhz on 21st November 2018 Between 0543utc to 0603utc

05:42:43	RADAR	VTRGC2	NAMASKAR, SQUAWKING 2727
05:42:47	VTRGC2	RADAR	IDENTIFIED, CONFIRM LEVEL?
05:42:56	RADAR	VTRGC2	PASSING 3300 FOR 4600
05:43:06	VTRGC2	RADAR	ROGER, STANDBY FOR HIGHER
05:43:06	RADAR	VTRGC2	STANDING BY FOR HIGHER
05:48:38	VTRGC2	RADAR	CLIMB TO 6500FT
05:48:41	RADAR	VTRGC2	CLIMBING TO 6500FT
05:49:53	RADAR	VTRGC2	REQUESTING QNH
05:49:55	VTRGC2	RADAR	QNH 1019
05:49:58	RADAR	VTRGC2	QNH 1019
05:54:39	RADAR	VTRGC2	RADAR VTRGC2
05:54:51	VTRGC2	RADAR	GO-AHEAD
05:54:54	RADAR	VTRGC2	MAYDAY MAYDAY MAYDAY, TWO ENGINES STOPED SIR
05:54:58	VTRGC2	RADAR	ROGER MAYDAY, PROCEED TO “HHY”
05:55:04	RADAR	VTRGC2	PROCEEDING TO “HHY”
05:55:07	VTRGC2	RADAR	MEANWHILE WE ARE INFORMING HYDERABAD TOWER TO TAKE NECESSARY ACTION
05:55:12	RADAR	VTRGC2	AFFIRM SIR
05:55:14	VTRGC2	RADAR	IDENTIFIED, RE-IDENTIFIED, PROCEED “HHY”
05:55:18	RADAR	VTRGC2	PROCEEDING TO “HHY”
05:56:00	VTRGC2	RADAR	YOU PROCEED DIRECT TO “HHY” AND USE RUNWAY 09
05:56:06	RADAR	VTRGC2	PROCEEDING “HHY” DIRECT USE 09
05:56:10	VTRGC2	RADAR	ALREADY INFORMED BEGUMPET ABOUT YOUR EMERGENCY
05:56:13	RADAR	VTRGC2	AFFIRM SIR

05:56:24	VTRGC2	RADAR	YOU CAN DESCEND TO 4600FT
05:56:26	RADAR	VTRGC2	UNABLE SIR, ENGINES STOPPED SIR
05:56:29	VTRGC2	RADAR	SO, WHAT HEIGHT YOU ARE MAINTAINING
05:56:31	RADAR	VTRGC2	PASSING 4800
05:56:36	VTRGC2	RADAR	CONFIRM WHAT LEVEL YOU WILL MAINTAIN
05:56:38	RADAR	VTRGC2	PASSING 4800
05:56:43	VTRGC2	RADAR	ROGER, DESCEND TO 3600FT
05:56:45	RADAR	VTRGC2	UNABLE SIR, NO POWER NO THRUST SIR
05:56:48	VTRGC2	RADAR	CONFIRM YOU WILL MAINTAINING 4800FT
05:56:50	RADAR	VTRGC2	WILL TRY SIR
05:56:52	VTRGC2	RADAR	ROGER
05:56:55	VTRGC2	RADAR	REPORT YOUR INTENTIONS WHEN ABLE
05:58:21	VTRGC2	RADAR	VTRGC2 RADAR
05:58:23	RADAR	VTRGC2	GO-AHEAD SIR
05:58:25	VTRGC2	RADAR	YOU WANT TO MAINTAIN THIS FREQUENCY OR YOU WANT TO CHANGE OVER TO BEGUMPET
05:58:28	RADAR	VTRGC2	THIS FREQUENCY ONLY NOW
05:58:30	VTRGC2	RADAR	ROGER, MAINTAIN THIS FREQUENCY REPORT WHEN YOU WANT TO CHANGEOVER TO BEGUMPET
05:58:35	RADAR	VTRGC2	AFFIRM SIR
05:59:01	RADAR	VTRGC2	UNABLE TO PROCEED TO “HHY” SIR
05:59:15	RADAR	VTRGC2	UNABLE TO PROCEED TO “HHY” 17 MILES
05:59:19	VTRGC2	RADAR	REPORT INTENTION
05:59:23	RADAR	VTRGC2	LANDING STRAIGHT AHEAD
05:59:26	VTRGC2	RADAR	SAY AGAIN
05:59:29	VTRGC2	RADAR	SAY AGAIN PLEASE?
05:59:31	RADAR	VTRGC2	LANDING AT NEARBY FIELDS SIR
05:59:35	VTRGC2	RADAR	ROGER, YOU ARE LANDING AT NEAR BY FILEDS MAINTAIN VISUAL CONTACT AND YOU CAN LAND CONFIRM YOU CAN NOT PROCEED TO “HHY”
05:59:45	RADAR	VTRGC2	UNABLE SIR
05:59:46	VTRGC2	RADAR	ROGER, YOU CAN LAND AT NEARBY FILEDS TAKE ALL PRECAUTIONS LOOK OUT FOR MEN AND AS WELL AS VEHICLES
05:59:54	RADAR	VTRGC2	AFFIRM SIR

05:59:56	VTRGC2	RADAR	REPORT AFTER LANDING IF ABLE
05:59:59	RADAR	VTRGC2	WILCO, WILL CALL AFTER LANDING
06:02:18	VTRGC2	RADAR	VTRGC2 RADAR
06:02:23	VTRGC2	RADAR	RADAR CONTACT LOST
06:02:42	VTRGC2	RADAR	VTRGC2 RADAR

1.10 Aerodrome information

Begumpet Airport, Hyderabad

ICAO Code: VOHY

Co-ordinates: 15°27'22" N, 75°48'23.4" E

Elevation: 1742 Ft

Runway Orientation and Dimension

Orientation- 09/27

Dimension-3230 X 45 Meters

R/W & Taxi Tracks Markings Standard as per ICAO Annex- 14.

RWY.	ILS CAT	PAPI	SAPL	Runway Edge Lights	Runway Center line Lights
09	-	Yes	Simple Approach Light	Yes	No
27	CAT-I	Yes	Simple Approach Light	Yes	No

ATS Communication Facilities

ATIS :126.80 MHz

Tower :122.25 MHz, PRIMARY

132.40 MHz Secondary

1.11 Flight Recorders

Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR) were neither fitted nor mandatory on this aircraft as per Civil Aviation Requirements.

1.12 Wreckage & Impact Information

The aircraft crash landed in a paddy field near Mokila (Shankarpally)which is at outskirts of Hyderabad. Aircraft's LH wing first hit a tree in a paddy field and due to

impact with tree aircraft took almost a 90-degree left turn and finally halted in the paddy field. The nose wheel got stuck in the soft ground.

1.13 Medical & Pathological Information

Student Trainee Pilot Breath Analyzer Test was carried out prior to take-off and after accident. Both results were negative. Post-accident, Student Trainee Pilot was taken to the local city hospital where he was operated for minor injuries and got discharged from the hospital on the same day.

1.14 Fire

There was no pre or post impact fire.

1.15 Survival Aspects

Student Trainee Pilot himself came out of the accident aircraft with a few minor injuries. The accident was survivable.

1.16 Test and Research

1.16.1 Engine Strip Examination Report

ENGINE TYPE	Lyc IO-360-L2A
ENGINE SL #	L-33008-51E
TSN	6811:05 Hrs
TSO	1562:10 Hrs
Date of Incident	21st November 2018
Place of Incident	Shankarpalli, Hyderabad, India.

Strip Examination

Engine strip examination was carried out at M/s Varman Aviation Pvt Ltd, Bengaluru on 2nd January 2019.

GENERAL EXTERNAL CONDITION

a. Crack observed in Crankcase, at the Mounting location of No 4 cylinder, just below Cylinder No. 04.
b. While trying to rotate the crankshaft physically by turning crankshaft flange, Engine could not be rotated by hand.

Visual Inspection to check the external components of the Engine for any abnormalities.

External conditions of all accessories were found satisfactory.

Magneto

- Both Magnetos installed were rig tested and the performance of both was found to be satisfactory.

Starter

- External condition was found to be satisfactory.

Oil Filter

- The filter was cut open and pieces of broken material of copper noticed in the filter.

Engine Disassembly

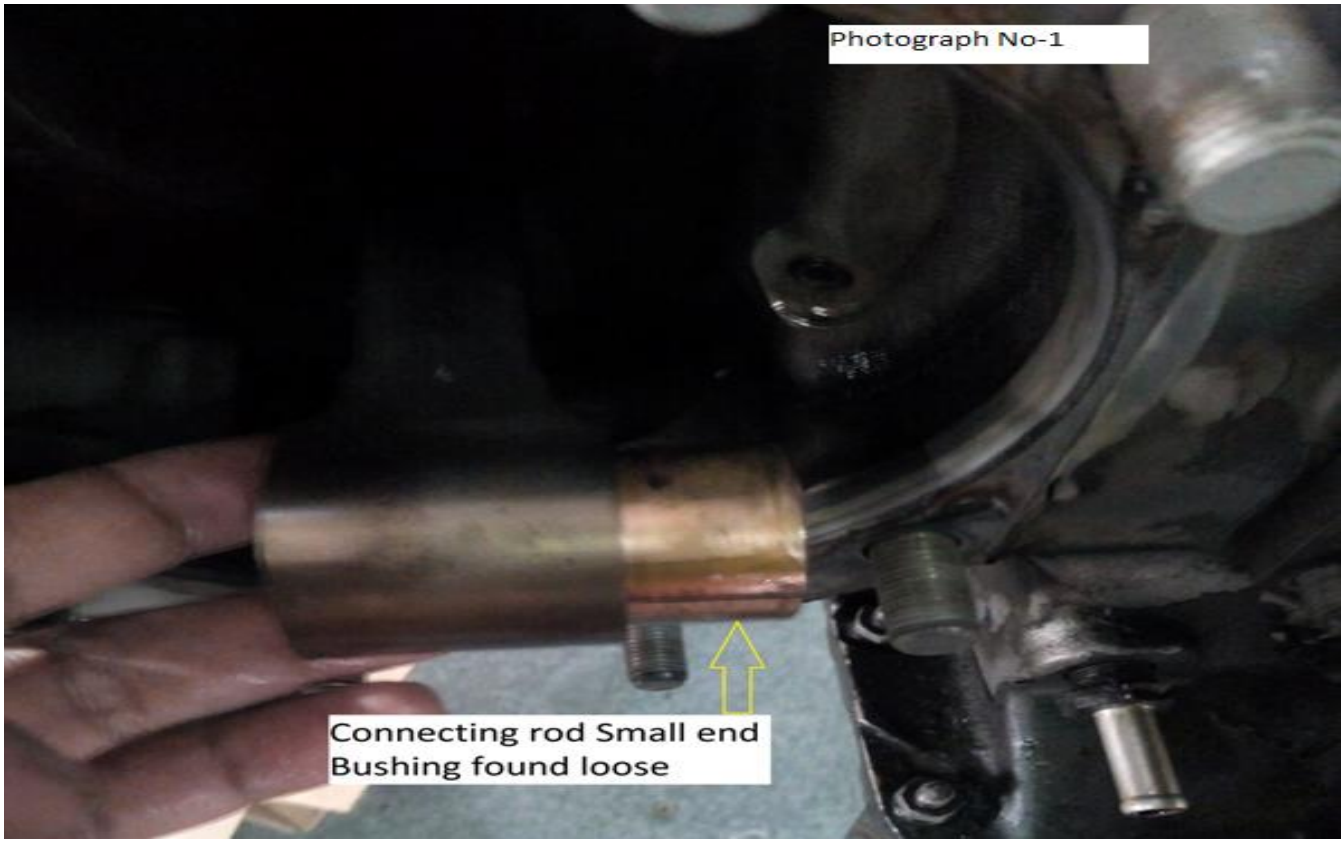
- The Engine was stripped progressively.

Cylinder Assembly No. 01.

- There were no signs of Piston No.01 seizure.
- The Piston could be removed from Cylinder in a normal way.
- The intake and exhaust valves were found normal and no sticking was observed.

Cylinder Assembly No. 02.

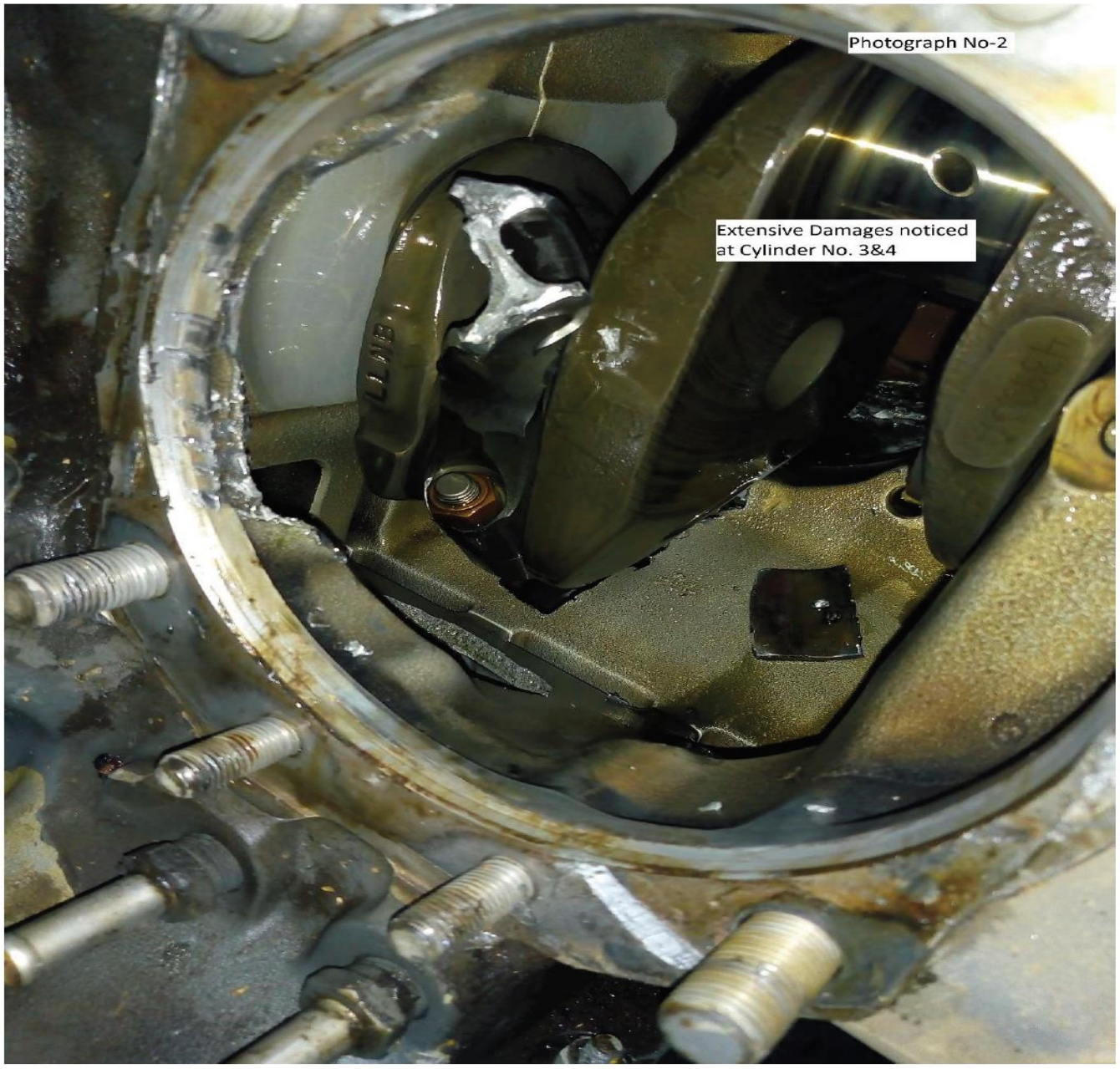
- The bushing at piston end of connecting rod was loose in connecting rod No 2 (Please refer **Photograph No.1).**
- There were no signs of Piston No.02 seizure.
- The Piston could be removed from Cylinder in a normal way.
- The intake and exhaust valves were found normal and no sticking was observed.



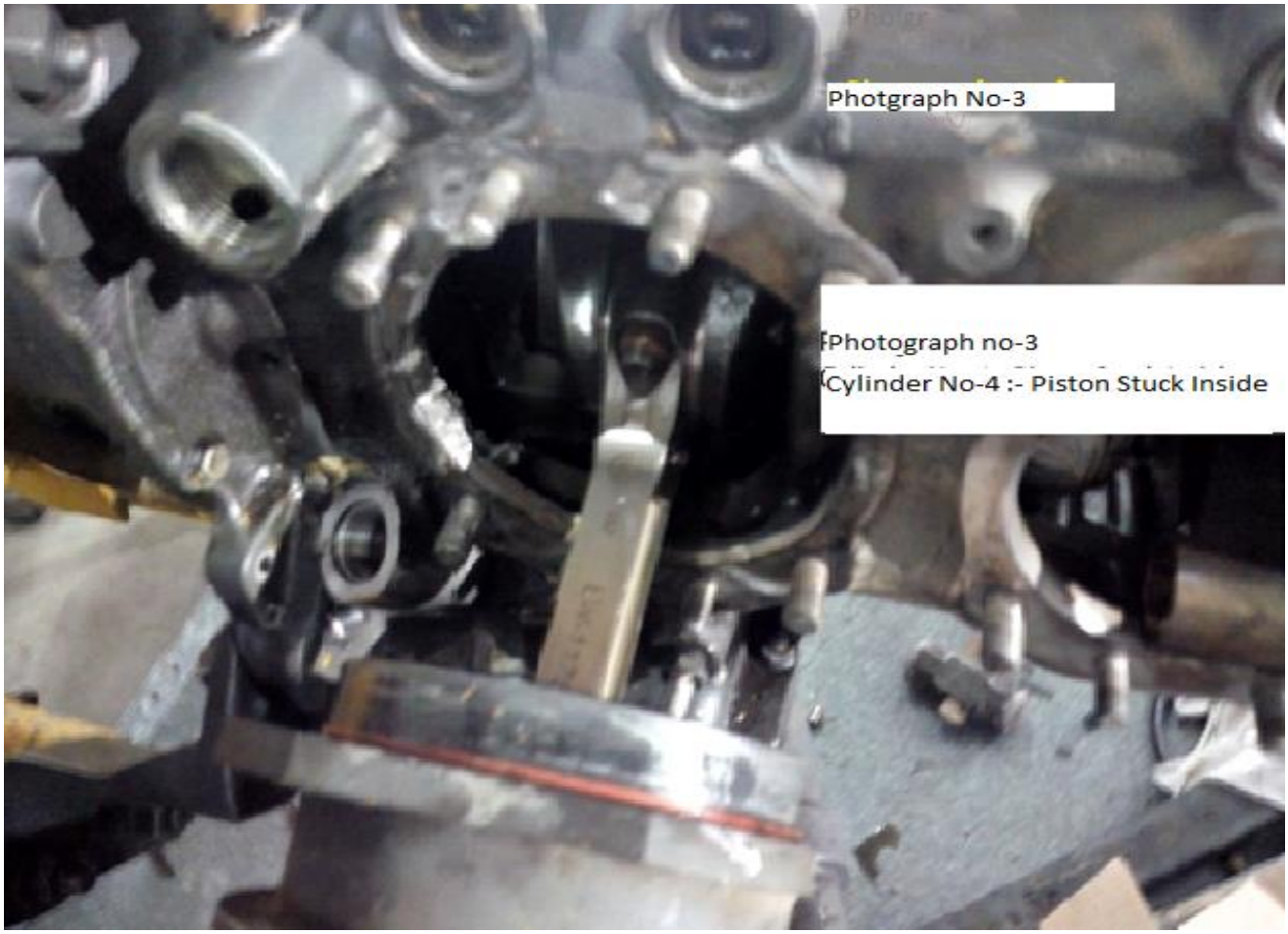
Photograph No. 1

Cylinder Assembly No. 03.

- Extensive Damage was observed to the internal part of the Engine Particularly at cylinders No 3 (Please refer **Photograph No.2**).
- The bushing at piston end of connecting rod was loose in connecting rod No 3 (Please refer **Photograph No.1)**.
- The Piston was stuck at No 3 Cylinder because barrel skirt was deformed. (Please refer **Photograph No.3)**.



Photograph No. 2



Photograph No. 3

- There were no signs of Piston No.03 seizure.
- The Piston "could not" be removed from Cylinder in a normal way and required tapping.
- The reason being that the barrel skirt was found deformed.
- The intake and exhaust valves were found normal and no sticking was observed.

Cylinder Assembly No. 04.

- Extensive Damage observed to the internal part of the Engine Particularly at cylinders No 4 (Please refer Photograph No.2).
- No 4 cylinder could not be removed from the Crankcase as the skirt of the cylinder was flared and was found stuck inside the Crankcase.
- The connecting Rod of No. 4 cylinder was twisted and broken in pieces and connecting rod at piston pin side found lying at the bottom of the Crankcase, with a portion of the broken connecting rod small end dislocated and fused with the connecting rod small end bore (Please refer Photographs No.4a &4b).

Photograph No. 4a

Photograph No. 4b

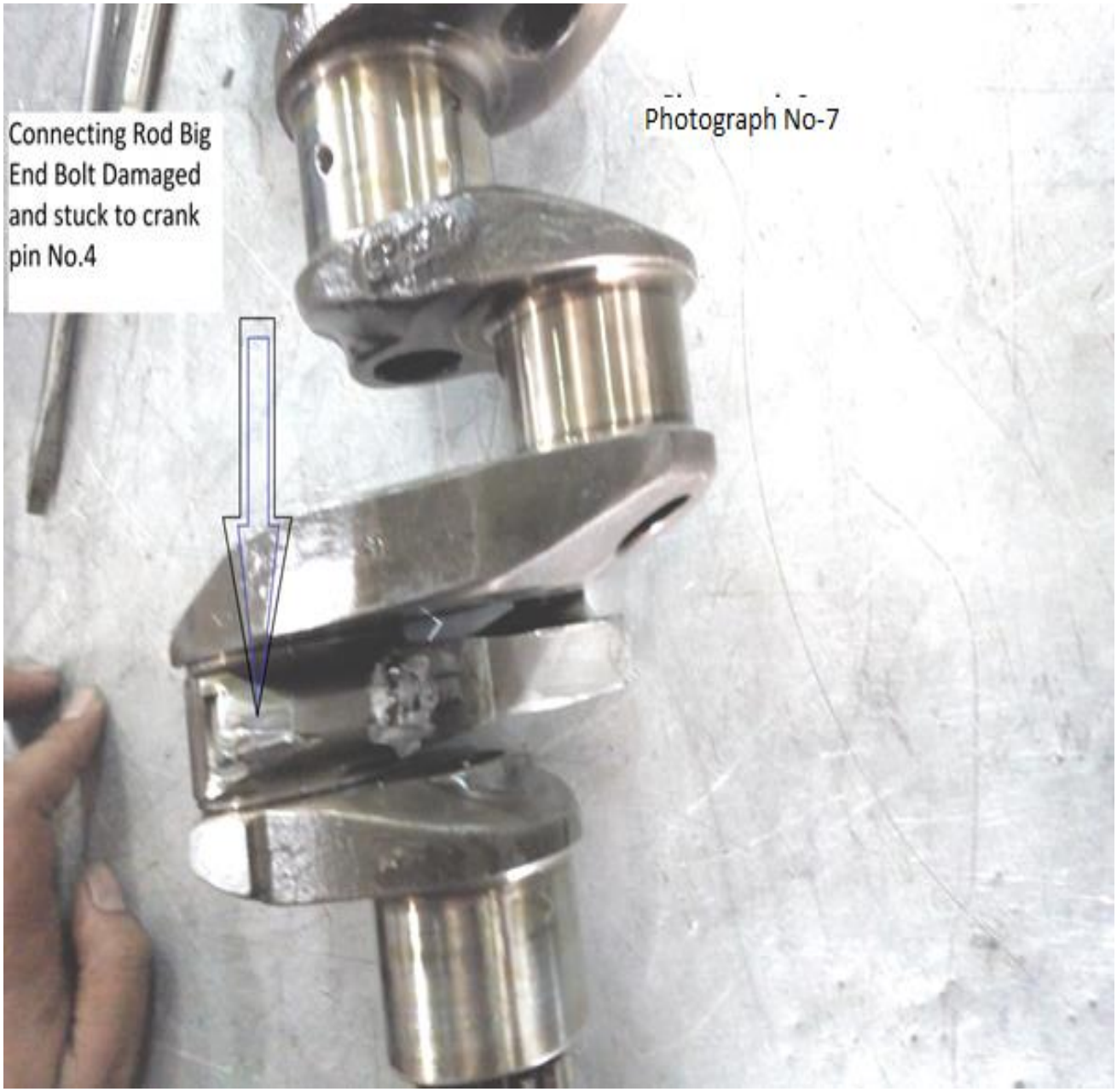
- Connecting rod No. 04 piston end copper bushing was found missing.
- The connecting Rod No. 04 small end copper bushings had broken and was converted in to small particles.
- No. 04 Piston Pin plugs were found intact.
- Traces of copper bushing pieces found mixed in the oil in sump along with the other metal particles (Please refer **Photograph No.5)**.

Photograph No. 5

- No. 04 Piston Pin was full of markings. This might be due to excessive clearance between the connecting rod eye end (small end) and piston pin due to loss of copper bushing (Please refer **Photograph No.6)**.

Photograph No.6

- Connecting Rod No. 04 bolt and nut at crank pin No 4 of Crankshaft were found extensively damaged. Hence, the two halves could not be removed (Please refer **Photograph No.7)**.

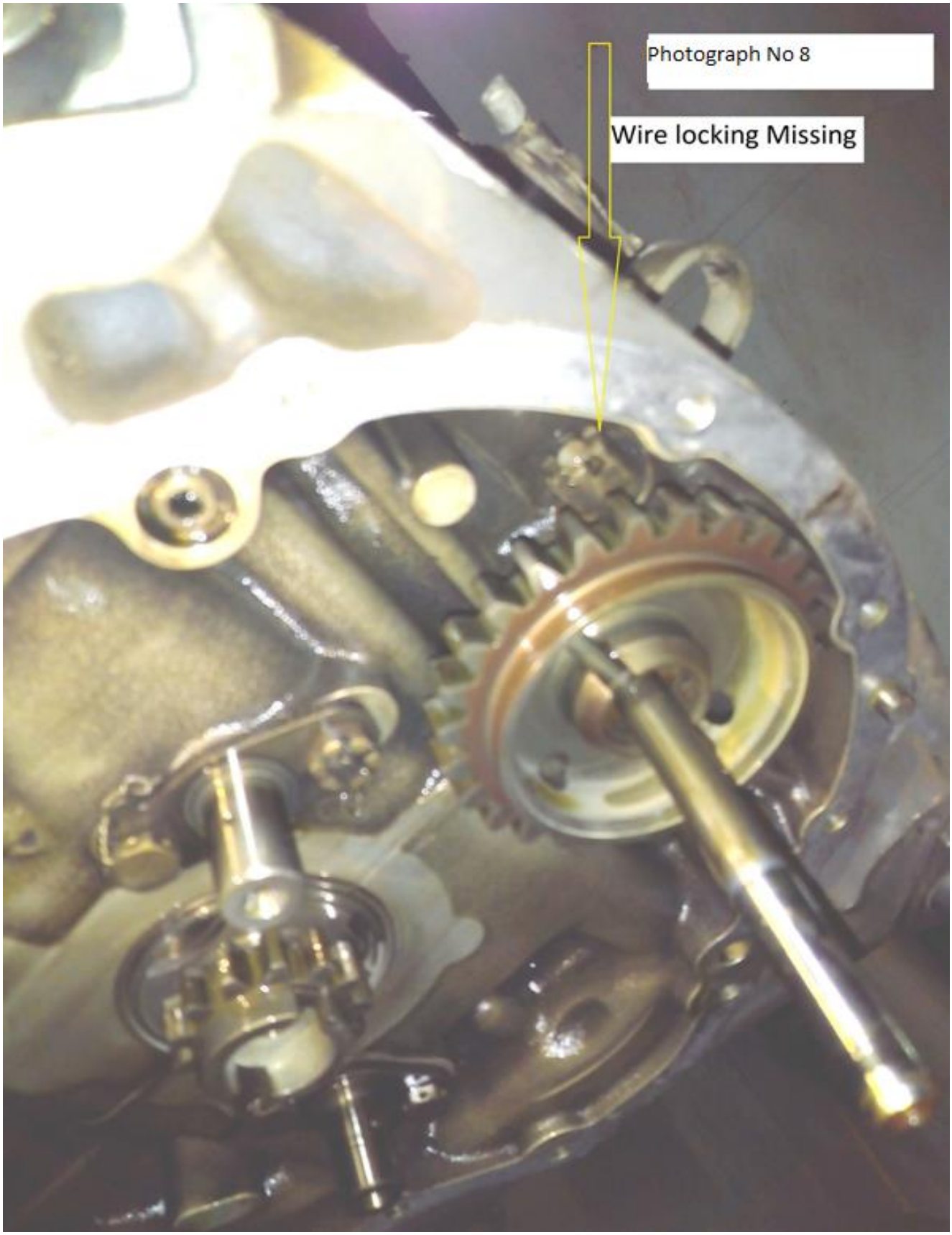


Photograph No. 7

- There were no signs of Piston No.04 seizure
- The intake and exhaust valves were found normal and no sticking was observed.

Rear Crank Case

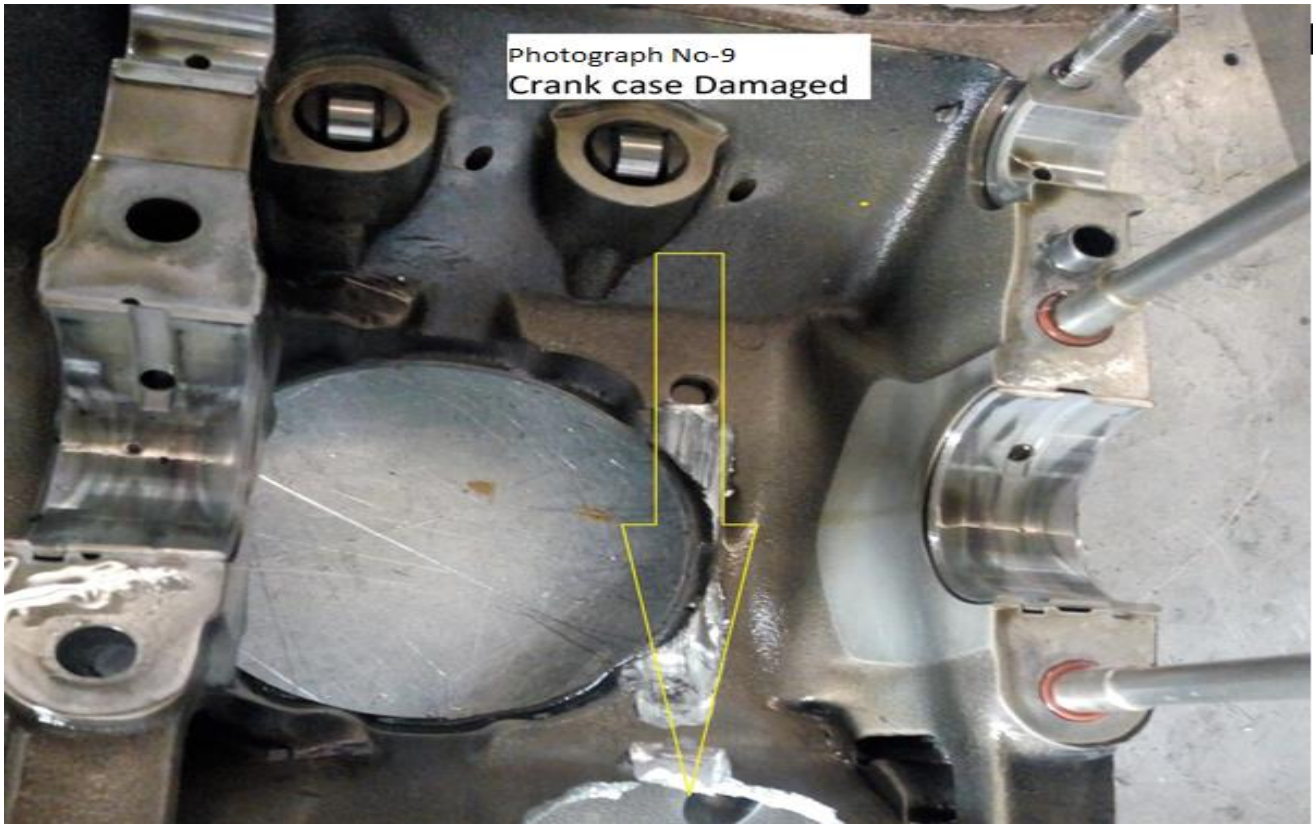
- While splitting the crankcase, there was no locking wire at Crankcase top rear castle nut (Please refer **Photograph No.8)**.



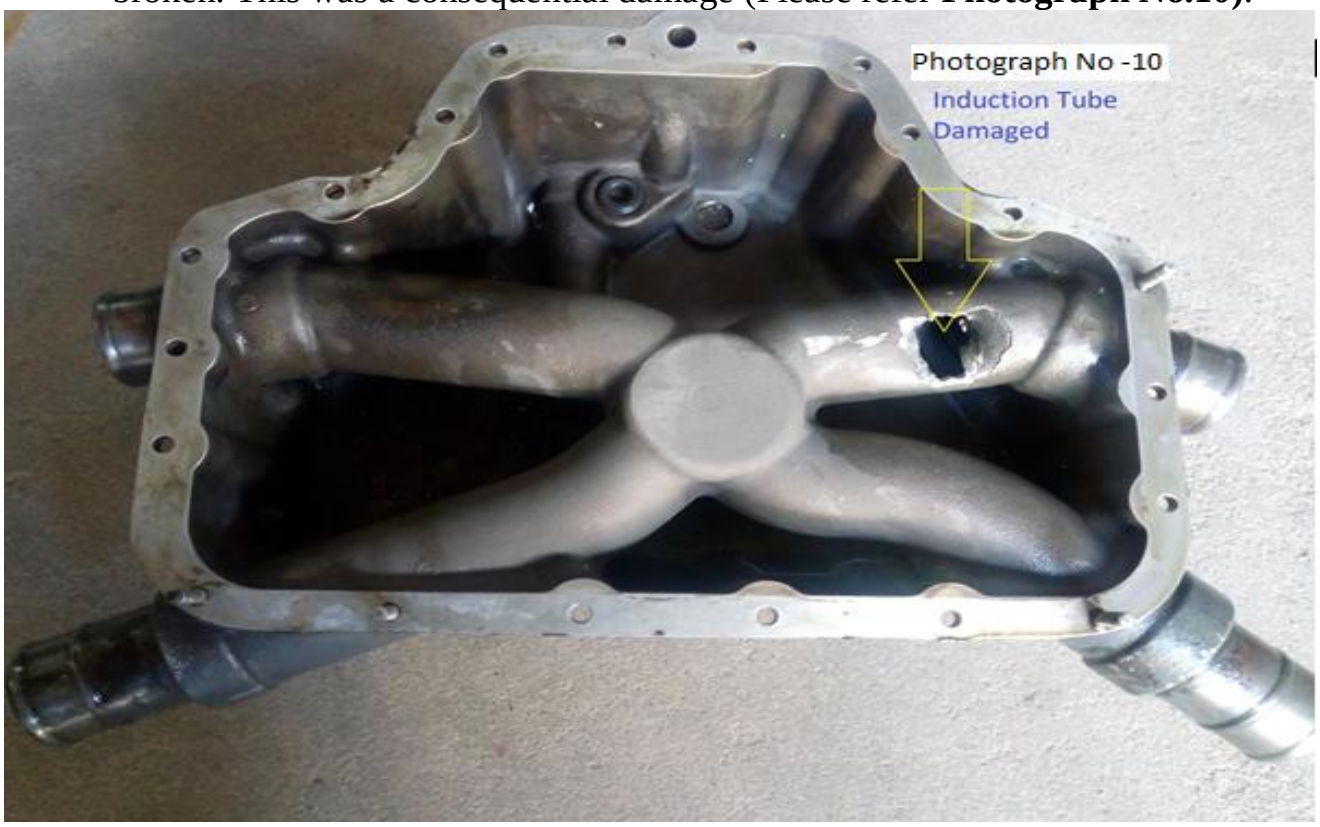
Photograph No. 8

Interior of Crank Case

- Damage and hit marks noticed at many places of Crankcase, particularly at No 3- & 4-cylinder area including the lower portion of the Crankcase (Please refer Photograph No.9).



- The induction tube No 04 of the induction Manifold in the Oil sumps was found broken. This was a consequential damage (Please refer **Photograph No.10)**.



- Probably the broken part of the connecting Rod No 04 had internally hit and damaged induction tube No. 04
- The visual inspection of journal diameter of crankshaft at No 1,2,3 & 4 cylinder connecting rod location was carried out and no deviations were observed.

- The dimensional check of the crankshaft was carried out and dimensions were found within limits.
- The physical condition of camshaft, crankshaft flange, cam lobes appeared to be satisfactory.

Spark Plugs

- All plugs were full of oil.

- There was no loss of Helicoil and the plugs were found intact.
- All Spark plugs were cleaned and bomb tested and were found satisfactory.

1.17 Organizational and management information

M/s Wings Aviation Private Limited is a Flying Training Academy and also had a NSOP. The NSOP was "not valid" at the time of accident. The academy has presently a fleet of Eleven aircraft i.e. five Cessna 152, four Cessna 172R/S, Tecnam P2006T & one P68C. M/s Wings Aviation Private Limited is headed by its Accountable Manager who looks after all training activities of Flying Training Academy. The flying activities are headed by a Chief Flight Instructor. The engineering department is headed by Maintenance Manager. In addition to the CFI, there are 01Flight Instructor and 03 Assistant Flight Instructor (AFI) working with the organization. The M/s Wings Aviation Private Limited has in house maintenance setup approved by DGCA.

1.18 Additional Information

1.18.1 Procedure followed by WAPL for flying training

M/s Wings Aviation Private Limited has DGCA approved Training Procedure Manual (TPM). The procedure followed for landing, in case of engine failure was as per approved TPM.

1.18.2 Authorization of Flight

21/11/2018 VT-RGC
Solo Cross-Country Flight
Begumpet O/F Gobur Begumpet
Departure 11:05 & Force Landed 11:45
00:40 Flight Time
Force Landing 14NM/ R265 HHY

1.18.3 Pilot Operating Handbook (POH)

- As per POH, following procedures are to be followed during Emergency and Forced Landings

Emergency Procedures

Engine Failure During Flight (Restart Procedures).

1. Airspeed - 65 KIAS (best glide speed)
2. Fuel Shutoff Valve - ON (push full in)
3. Fuel Selector Valve - BOTH
4. Fuel Pump Switch - ON
5. Mixture Control - RICH (if restart has not occurred)
6. Magnetos Switch - BOTH (or START if propeller is stopped)

NOTE
If the propeller is wind milling, engine will restart automatically within a few seconds. If propeller has stopped (possible at low speeds), turn MAGNETOS switch to START, advance throttle slowly from idle and lean the mixture from full rich as required to obtain smooth operation.

7. Fuel Pump Switch - OFF

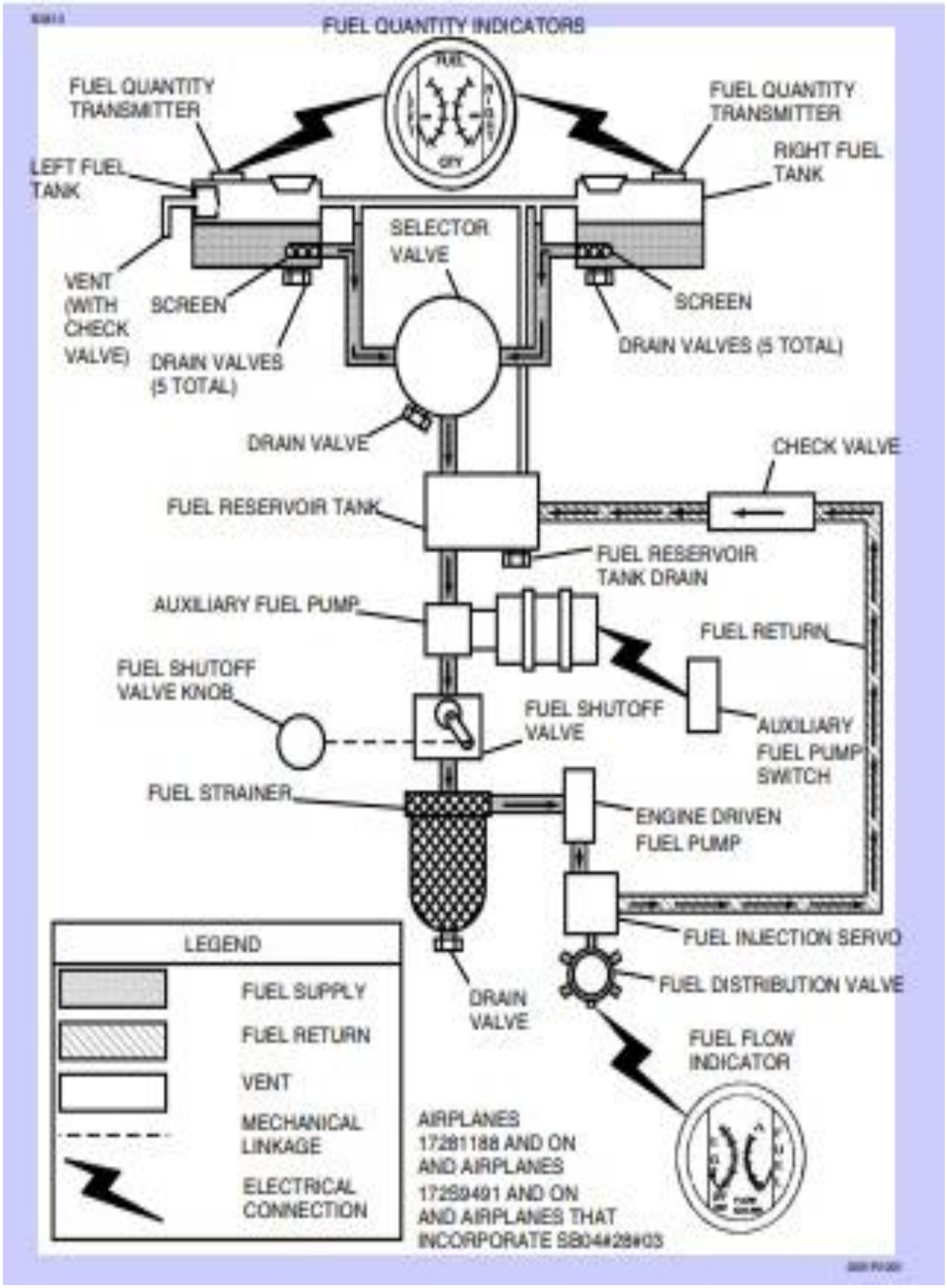
NOTE
If the indicated fuel flow (FFLOW GPH) immediately drops to zero, a sign of failure of the engine-driven fuel pump, return the FUEL PUMP switch to the ON position.

Forced Landings

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed under the "Emergency Landing Without Engine Power". Transmit Mayday message on 121.5 MHz giving location, intentions and squawk 7700.

1.18.4 Fuel System

1. The airplane has a wet wing fuel storage system. The system has two integral fuel tanks (one in each wing), a three-position selector valve, a fuel reservoir tank, an electrically-driven auxiliary fuel pump, a fuel shutoff valve and a fuel strainer.
2. Fuel flows by gravity from the wing tanks to a three-position selector valve, labelled “BOTH, RIGHT and LEFT” and on to the reservoir tank, From the reservoir tank fuel flows through the auxiliary fuel pump, past the fuel shutoff valve, through the fuel strainer to an engine driven fuel pump.
3. From the engine driven fuel pump, fuel is delivered to the fuel/air control unit, where it is metered and directed to a fuel distribution valve (manifold) which distributes it to each cylinder. Fuel flow into each cylinder is continuous, and flow rate is determined by the amount of air passing through the fuel/air control unit.
4. Components forward of the fuel strainer include the engine-driven fuel pump, the fuel injection servo and the fuel distribution valve. These components are part of the powerplant.
5. A schematic diagram of the fuel system is shown for better appreciation of the system.
6. The heart of the injection system is the fuel/air control unit, which occupies the position ordinarily used by the carburetor at the engine intake manifold inlet. The fuel/air control unit comprises an integrated airflow sensing system, a regulator section and a fuel metering section. Operation of the fuel injection system is based on the principle of measuring airflow and using the airflow signal to operate a servo valve. The accurately regulated fuel pressure established by the servo valve, when applied across the fuel control system, makes fuel flow proportional to airflow.


FUEL QUANTITY INDICATORS
FUEL QUANTITY TRANSMITTER
FUEL QUANTITY TRANSMITTER
LEFT FUEL TANK
RIGHT FUEL TANK
SELECTOR VALVE
VENT (WITH CHECK VALVE)
SCREEN
SCREEN
DRAIN VALVES (5 TOTAL)
DRAIN VALVES (5 TOTAL)
DRAIN VALVE
CHECK VALVE
FUEL RESERVOIR TANK
FUEL RESERVOIR TANK DRAIN
AUXILIARY FUEL PUMP
FUEL RETURN
FUEL SHUTOFF VALVE KNOB
FUEL SHUTOFF VALVE
AUXILIARY FUEL PUMP SWITCH
FUEL STRAINER
ENGINE DRIVEN FUEL PUMP
FUEL INJECTION SERVO
FUEL DISTRIBUTION VALVE
DRAIN VALVE
FUEL FLOW INDICATOR
LEGEND
FUEL SUPPLY
FUEL RETURN
VENT
MECHANICAL LINKAGE
ELECTRICAL CONNECTION
AIRPLANES 17281188 AND ON AND AIRPLANES 17289491 AND ON AND AIRPLANES THAT INCORPORATE SB04#28#03

1.19 Useful or Effective Investigation Techniques

NIL

2. Analysis

2.1 Serviceability of Aircraft

- Aircraft VT-RGC (MSN 17281348) had a current Certificate of Airworthiness and the ARC was valid up to 04.11.2019.
- The Aircraft held a valid Aero Mobile License which was valid up to 31st December, 2018.
- The scrutiny of the Airframe Log book revealed that as on 21st of Nov 2018, the aircraft had completed 6810:50 Airframe hours.
- The scrutiny of the Engine Log book revealed that as on 21st of Nov 2018, Engine had logged 1562:10 Hrs. since overhaul.
- Scrutiny of the snag register revealed that there was no snag reported on the aircraft prior to the incident flight.
- For the Accident flight, the aircraft weight & balance was well within the operating limits.
- The aircraft and its Engines were maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as per maintenance program approved by DGCA.
- The last major inspection undertaken on the engine was "Check-IV / 200Hrs / 01Year inspection" and was carried out on 16.11.2018, as per the information available from the log book.
- The aircraft had flown 17:50 hours after the last major inspection till the date of accident.
- Aircraft was released with NIL snags and no active MEL on relevant system or component was made into the tech log of the aircraft on 21st of Nov 2018.
- The engine was overhauled on 16th of Nov 2016 at an DGCA approved engine overhaul facility.

From the above, it is inferred that the aircraft was maintained as per DGCA Approved Maintenance Programme.

2.1.1 Engine Investigation:

The engine was strip examined in detail on 2nd of January 2019 at M/s Varman Aviation Bangalore. This is a DGCA Approved Engine overhaul shop. It was found that the external condition of engine was satisfactory. All engine accessories were intact and all spark plugs were found functioning satisfactory during bomb test. The rear crankcase was found intact without any leak.

Engine Mount & Fire wall was found twisted and had shifted inwards. There were no signs of oil Splash on the fire wall. Thus, it can be inferred that there may not be any oil leak at the time of take-off.

The only damage observed externally was an oval fracture at the bottom of cylinder No 04 through which there was oil leakage.

The induction tube No. 04 of the induction Manifold in the Oil sumps was found broken, which is a case of consequential damage.

The strip examination concluded that the Connecting Rod No. 04 had broken and had caused consequential internal damages. The connecting Rod No. 04 small end copper bushings had broken in to small particles.

At the time of accident, the engine was not running and not delivering any power.

All accessories were found serviceable and in operating condition.

2.2 Crew qualification

At the time of the accident, PIC was holding a valid Student Pilot license, a valid FRTO license and he was having endorsement on the type. He was also medically fit and was having a valid Class - I Medical certificate.

He was having following experiences: -

Total flying experience	113:20Hrs.
Experience on type	51:05Hrs.
Experience as PIC on type	18:40Hrs.

Hence, crew qualification is not considered as a factor to the accident.

2.3 Weather

As per METAR, weather was normal, calm wind condition at a temperature of 29 degree C and with VIS 6000m**.** Hence, weather is not considered a factor to the accident.

2.4 Pilot handling of the aircraft

- The PIC was a Student Trainee Pilot and the SPL was issued by M/s Wings Aviation Pvt. Ltd. The training Flight was authorized by CFI as Cross-Country flight. Two days prior to the accident, the trainee pilot had done a solo cross-country training flight on the same route. This was pilots 5th solo cross-country training flight on the same route.
- Approved Procedures as stipulated in Approved Training Manual were followed by the Student Trainee Pilot after realizing that there is an engine failure and aircraft is losing height.
- At the time of take-off from Begumpet, the Aircraft was not overloaded.

- Aircraft took off from Begumpet at appx. 0537 UTC. While passing 3500 feet enroute to Gobur, Begumpet Tower handed over aircraft controls to Shamshabad approach and at this time pilot checked for all engine parameters, which were found normal.
- Shamshabad approach cleared the aircraft to climb on track 5500 feet and later to climb 6500 feet. While passing 6300 feet, the engine started vibrating and after 3 to 4 seconds engine stopped and propellers also stopped rotating. Pilot tried to level the aircraft and tried to restart the engine but failed to do so. Then he gave engine failure call to Shamshabad approach as he didn't get any response, then pilot gave "May Day, May Day, May Day" call and declared engine failure.
- Pilot force landed the aircraft at 0600 UTC in a paddy field at Mokila (Shankarpally) near Hyderabad. Hence, Pilot handling of the aircraft is not considered a factor to the accident.

2.5 Circumstances leading to the accident

The aircraft was cleared for take-off by Begumpet ATC appx. 0537 UTC for a cross country training flight Begumpet airport to Gobur (Karnataka).

During climb to 6500 feet, while passing 6300 feet, the engine started vibrating and there after the engine stopped. Pilot tried to level the aircraft and also tried to restart the engine but failed to do so. Pilot gave "May Day, May Day, May Day" call and declared engine failure. Soon pilot realized that he will not be able to reach Begumpet Airport because aircraft was continuously losing height. So, he decided to force land the aircraft and started searching for the open field to land the aircraft. Aircraft forced landed at 0600 UTC (approx.) in a paddy field at Mokila (Shankarpally) near Hyderabad. After forced landing, pilot came out of aircraft from left door himself with minor injuries. There was no fire on the aircraft, pre or post landing. The aircraft was substantially damaged.

3. Conclusions

3.1 Findings

1. The Aircraft was registered in the name of Wing Aviation Pvt. Ltd. and was operated by them itself.
2. The aircraft was having valid C of R, C of A & ARC on the day of accident.

3. The ARC was renewed on 05.11.2018 at 6762:55 Hrs.
4. The aircraft and its engine were being maintained as per DGCA approved aircraft maintenance program. No Maintenance/Inspection was due on the aircraft & its engine as on date of accident.
5. Engine was overhauled at DGCA Approved Engine Overhaul Facility.
6. All concerned Airworthiness Directives, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine had been complied with as on date of event with necessary entries in the Log Book.
7. CRS for the 200hrs/one-year inspection was issued by the appropriate company authorization holder AME on 16.11.2019.
8. The aircraft was under maintenance at 6793 Hrs. for 200 hrs. schedule and was released for flight on 16.11.2018.
9. As a part 200Hrs./01-year Inspection schedule, there was oil change and 8.5 Liters of oil was replenished on 16.11.2018.
10. PIC was a SPL holder trainee pilot; SPL was issued by Wing Aviation Pvt. Ltd and had 113.20 Hrs. total of flying.
11. This was the first sortie of the aircraft and first sortie of the PIC.
12. This was pilots 5th solo cross-country training flight on the same route.
13. Student Trainee Pilot had carried out previous flight on 19.11.2018 at 6815:55 Hrs.
14. AME had carried out the preflight inspection at 6820.50 Hrs. and the aircraft was accepted by the Pilot. The aircraft was serviceable and no abnormality was reported by the pilot before under taking the flight. A satisfactory ground run was also carried out by the pilot.
15. The Student trainee pilot was authorized by CFI for the solo cross-country trainee flight.
16. Load and trim sheet of accident flight was prepared and center of gravity was found within limit.
17. Aircraft was not overloaded at the time of take-off from Begumpet Airport.
18. Scrutiny of the Flight Release Book (FRB) revealed that there was no snag pending on the aircraft prior to the accident flight.
19. As per Tech log, at the time of Take-off from Begumpet, there was sufficient fuel in the aircraft.
20. Two separate register were found maintained for same fuel and oil upliftment. The fact was answered by AME stating that to avoid any cutting or over writing, the fuel oil records were first maintained in rough in separate sheet and there after the same was entered in log book and fuel oil register.
21. The fuel & oil up-liftmen register was not up to date and no entries were found after 14th of Nov 2018. However, in a separate folder, fuel oil upliftment records were available till 21st of Nov 2018.

22. Oil consumption records were not properly maintained by the Operator and at many places over writing was observed.
23. At the time of incident weather was reported to be calm wind condition at a temperature of 29°C and with VIS 6000m.
24. At around 18 Nm from the Begumpet airport, at a height of 6300 ft during climbing phase pilot experienced power loss and the engine was shut down. Pilot tried to restart the engine but engine didn't start.
25. After power loss and engine failure, Pilot communicated "MAY DAY" call (3 times) to Shamshabad approach ATC and carried out forced landing in a paddy field.
26. There was two way communication between the ATC and the aircraft. Aircraft's Engine was not running when it hit the ground.
27. Fuel was not found in the wings, same was found spilled over the accident site, which leaked from damaged port side wing. Fuel of starboard wing also went into port side wing through cross feed line.
28. The engine was strip examined at the DGCA approved overhaul shop and following were the observations: -
    a) It was found that crank shaft could not be rotated.
    b) The engine could not be given test run.
    c) All accessories were found intact.
    d) There was internal damage to the engine.
    e) The connecting Rod No. 04 was found broken.
    f) There were consequential damages due to the breaking of Connecting Rod No.04.
    g) The small end connecting rod copper bushings were found loose where as these bushing should be installed with "interference fit" at the time of engine overhaul.
    h) The connecting Rod No. 04 small end copper bushings had broken into small particles.
    i) Fuel strainer was found intact and the fuel filter was very clear.
    j) Metallic chips and engine oil were found in engine air intake.
    k) Crank case had developed an oval crack at the bottom side of Cylinder No. 04.
    l) Copper bushing at the smaller end of connecting Rod No. 04 was found broken.
    m) Aircraft Engine ceased due to metal failure inside the engine.
29. The aircraft landed in a paddy field and LH wing was found disintegrated form root of the wing due to impact.
30. The total duration of flight was 40 minutes after take-off.
31. Due to impact, aircraft's ELT got activated which was later switched off by the Wings Aviation Pvt Ltd personnel.

32. The aircraft was substantially damaged during the accident.
33. The firewall was bent inwards and the engine mount was twisted as a result of impact.
34. The fire wall of the aircraft was clean and had a perfect shine after the accident also. The firewall was free from any splash of oil or any black soot deposit indicating that in flight there might not be any oil leakage from engine.
35. The lower bottom of engine crankcase near lower side of Cylinder No. 04 was found broken. This resulted in oil loss.
36. The propeller blades exhibited Nil bend in inward or outward direction.
37. There was no fire and student pilot suffered minor injury.
38. The aircraft VT-RGC was dismantled and brought back the Wings Aviation Pvt. Ltd. hangar at Begumpet airport on 22-11-2018.

3.2 Probable cause of the incident

"Fracture of the crankcase due to breaking of connecting rod caused engine oil loss thereby causing engine seizure".

Cause of breaking of connecting rod could not be established.

4. Recommendations

Nil.

25/6/19

(Raje Bhatnagar)
Investigator -In- charge

Amit Kumar
25/06/19

(Amit Kumar)
Investigator

Date: 25-06-2019
Place: New Delhi