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**Final Investigation Report**  
**on**  
**Accident to M/S Pinnacle Air Pvt. Ltd,**  
**P-68 Observer 2 Aircraft, VT-TAA**  
**on 27 March 2021**

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**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/Incident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of the above said rules shall be separate from any judicial or administrative proceedings to apportion blame or liability.*

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

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## GLOSSARY

AAIB	Aircraft Accident Investigation Bureau, India
AFM	Aircraft Flight Manual
AME	Aircraft Maintenance Engineer
APD	Airport Director
ARC	Airworthiness Review Certificate
ASDA	Accelerate Stop Distance Available
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
AUW	All Up Weight
CAM	Continuous Airworthiness Manager
CG	Center of Gravity
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CAR	Civil Aviation Requirements
CPL	Commercial Pilot License
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
DFDR	Digital Flight data Recorder
DGCA	Directorate General of Civil Aviation
FDTL	Flight Duty Time Limitations
FRTOL	Flight Radio Telephone Operators License
Hrs	Hours
IST	Indian Standard Time
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
KIAS	Knots-Indicated Air Speed
Kts	Knots
LDA	Localiser type Directional Aid
LH	Left Hand
MEL	Minimum Equipment List
MLG	Main Landing Gear
MTOW	Maximum Take-off Weight
NDB	Non-Directional Beacon
NLG	Nose Landing Gear
NM	Nautical Miles
NO SIG	No Significance
NSOP	Non Schedule Operator permit
PDR	Pilot Defect Register
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
QFE	Field Elevation
QNH	Nautical height

QRH	Quick Reference Handbook
RA	Radio Altitude
RESA	Runway End Safety Area
RH	Right Hand
RPM	Revolutions Per Minute
SARPs	Standard and Recommended Practices
SB	Service Bulletin
SEP	Safety and Emergency Procedures Manual
SOP	Standard Operating Procedure
TODA	Take off Distance Available
TORA	Take off Run Available
TWR	Tower
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni directional Range
UTC	Coordinated Universal Time

<b>Aircraft and Accident details of P-68 Observer 2 Aircraft VT-TAA on 27 March 2021</b>			
<b>1</b>	<b>Aircraft</b>	<b>Type</b>	<b>P-68 Observer 2</b>
		<b>Nationality</b>	<b>Indian</b>
		<b>Registration</b>	<b>VT – TAA</b>
<b>2</b>	<b>Owner</b>	<b>M/s Pinnacle Air Pvt Ltd</b>	
<b>3</b>	<b>Operator</b>	<b>M/s Pinnacle Air Pvt Ltd</b>	
<b>4</b>	<b>Pilot – in –Command</b>	<b>CPL holder</b>	
	<b>Extent of injuries</b>	<b>Serious Injury</b>	
<b>5</b>	<b>Co-Pilot</b>	<b>CPL Holder</b>	
	<b>Extent of injuries</b>	<b>Minor</b>	
<b>6</b>	<b>Passengers on Board</b>	<b>01</b>	
<b>7</b>	<b>Place of Accident</b>	<b>Agriculture field near Bhopal Airport</b>	
<b>8</b>	<b>Date &amp; Time of Accident</b>	<b>27 March 2021 10:05 Hrs UTC</b>	
<b>9</b>	<b>Last point of Departure</b>	<b>Bhopal Airport Madhya Pradesh</b>	
<b>10</b>	<b>Point of intended landing</b>	<b>Guna Airstrip, Madhya Pradesh</b>	
<b>11</b>	<b>Latitude/Longitude of accident site</b>	<b>N 23° 19' 13.66", E 77° 22' 19.2"</b>	
<b>12</b>	<b>Type of operation</b>	<b>Non Scheduled Operation</b>	
<b>13</b>	<b>Phase of Operation</b>	<b>Landing</b>	
<b>14</b>	<b>Type of Accident</b>	<b>System/Component Failure or Malfunction(Power plant)(SCF-PP)</b>	

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

## SYNOPSIS

On 27 Mar 2021, a P-68 Observer 2 aircraft VT-TAA, operated by M/s Pinnacle Air Pvt Ltd (PAPL), met with an accident while operating a non-scheduled flight from Bhopal airport to Guna Airfield, MP.

Aircraft was under the command of a CPL holder Pilot-In- Command (PIC), who was Pilot Flying (PF). PIC was assisted by a CPL holder Co-Pilot, who was pilot monitoring (PM). One passenger (Director of Operations M/s PAPL) was also onboard.

The aircraft took off from Bhopal airport uneventfully. After take-off, at about 20 NM, the crew observed abnormal noise followed by low oil pressure and high oil temperature indication on aircraft's LH engine. Crew assessed the situation and decided to turn back to Bhopal. The crew however, reported to ATC Bhopal that they are returning back due to wind and turbulence. While returning, crew shutdown the LH engine. Post LH engine shut down, crew gave a call to ATC, Bhopal requested to land the aircraft on the taxiway (disuse runway). ATC did not agree to the request, as there was no cross runway at Bhopal. The ATC was also not made aware of the prevailing emergency situation by the crew. When ATC declined the request, the crew informed ATC, that they might be doing force landing. ATC Bhopal immediately responded and asked the crew to land on Runway 12. However, the crew carried out a force landing in an agriculture field approximately 3NM from Bhopal airport. During the force landing, the PIC received serious injury and the co-pilot and passenger received minor injuries. The aircraft sustained substantial damages.

Director General, Aircraft Accident Investigation Bureau vide order No. INV.11011/2/2021-AAIB dated 30 March 2021 and corrigendum dated 12 Jan 2022 nominated Shri Amit Kumar, Safety Investigation Officer, AAIB as Investigator-In-Charge (IIC) and Gp Capt K U S Phani (Retd), Consultant, AAIB as investigator to investigate and determine the probable cause(s) and contributory factor(s) leading to the accident.

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

## **1. FACTUAL INFORMATION**

### **1.1 History of the Flight**

On 23 March 2021, the aircraft was released to service after completion of 100 Hrs/12 month inspection and lubrication checks.

On 25 March 2021, two days prior to the accident, aircraft VT-TAA, was planned to operate from Guna airfield to Nanded airport for carrying out aerial survey *enroute* (under M/s PAPL's non-scheduled operation permit). Aircraft took off from Guna airfield at 0105 UTC for Nanded airport with three persons on board, consisting of Pilot-In-Command (PIC), Co-pilot and one passenger (Director of Operations, M/s PAPL).

As per plan at 0203 UTC, crew confirmed ATC Bhopal that they were heading towards Nanded and ETA at Nanded would be 0415 UTC. At 0241 UTC, the crew gave a call to Bhopal ATC that they were 40 NM ahead of Bhopal and were returning back to Guna due to unfavorable winds for survey. At 0246 UTC, when ATC Bhopal asked ETA, the crew confirmed that the ETA at Guna would be 0350 UTC. Again, at 0259 UTC, the crew intimated Bhopal ATC that they were overhead Bhopal and as Guna airfield was not available, they might be landing at Bhopal airport. ATC Bhopal requested Crew to confirm the reason for not going to Guna. Crew replied that "we depart probably tomorrow as winds are not favorable for survey". The aircraft couldn't carry out the intended flight and landed at Bhopal airport at 0306 UTC. Also, as per the statement of ATCO, the crew did not follow the standard circuit and cut short the landing approach. The aircraft had flown for approximately 02 hours on that day till landing at Bhopal airport. No snag was reported by the crew. The aircraft was parked overnight on 25 March 2021 and the crew planned to proceed to Nanded airport next day after refueling.

The operations manager of M/s PAPL had written to APD Bhopal, requesting entry of some maintenance equipment and technicians. The ground handling agency was also approached for refueling support and for entry of technicians. Although, the mentioned equipment and technicians had entered the airport, the refueling was not carried out, as the fuel truck did not arrive on 26 Mar 2021. The aircraft remained on ground at Bhopal airport on 26 March 2021.

On 27 March 2021, at around 0827 UTC, technicians along with equipment and vehicle with fuel barrel came to aircraft parking bay. As per statements of crew and technicians, approximately 200 liters of fuel was uplifted in the aircraft. However, the same was not recorded in the aircraft techlog book. As per the statement of one of the technicians, 1 liter of engine oil each was also uplifted on both engines. Subsequently, the PIC had carried out pre-flight inspection and no abnormalities were recorded in the techlog book. When the PIC asked clearance from ATC Tower for engine startup, ATC enquired "all operations normal?" to which PIC had replied "all normal". The PIC then followed the ATC taxi instructions and the aircraft took off from runway 30 uneventfully at 0931 UTC.

As per PIC, after taking off, aircraft climbed to approximately 4000 ft altitude and was approximately 20 NM away from Bhopal airport when the crew heard unusual sound in cockpit. Initially, crew couldn't identify the source of sound. Later, they realized that the sound was emanating from left engine and was increasing continuously. The crew scanned the cockpit instruments and found that the LH engine oil pressure was dropping with simultaneous rise in oil



temp with drop in engine RPM. Thereafter, at 0947 UTC, crew reported ATC that *"We are approximately 22 miles 25 miles out, setting course back to Bhopal"*. On enquiring the reason for the same, crew replied *"standby due to winds"* and when ATC confirmed the reason the crew stated *"Affirm sir, due turbulence"*. However, the crew did not inform ATC Bhopal about the observed LH engine malfunction.

The crew initiated action for returning to Bhopal. At 0952 UTC, ATC asked VT-TAA to report position when runway in sight, and also asked any preference of runway for landing. VT-TAA responded by saying she can land on any runway (here also crew did not inform ATC Bhopal about the engine malfunction). ATC advised VT-TAA to expect runway 30 for landing, which was accepted by the crew. Further at 0955 UTC, once again ATC Bhopal asked VT-TAA, whether any assistance was required for landing, to which VT-TAA replied in negative. At 0958 UTC, crew confirmed to ATC that 7 on DME and runway was in site.

As per crew statement, as the aircraft was unable to maintain height, PIC reduced power on left engine. However, the LH engine oil pressure still remained low, oil temp was still rising and aircraft was still losing height, subsequently crew shutdown the LH engine.

At 1001UTC, VT-TAA reported position 3 NM from Bhopal airport. At this juncture also, crew did not inform ATC Bhopal about the prevailing emergency condition(LH engine failure). At 1001 approx. UTC ATC asked VT-TAA to join right hand downwind runway 30 and also intimated prevailing traffic information over Bhopal airport. Then the crew replied *"Copied Sir, might be calling final for cross runway"*. ATC did not agree to the request, as the cross runway referred by the pilot was actually a taxiway and also ATC was not apprised of the actual emergency situation. Accordingly, ATC responded *"VAA Bhopal tower cross runway is not approved report standard right hand downwind runway 30"*. As per statement of crew, at this juncture, the aircraft descended to approximately 400 to 500 ft altitude.

At 1000-0130 UTC, PIC responded to ATC *"in that case stand by sir, we might be doing a force landing"*. Immediately, ATC Bhopal responded by giving a call to VT-TAA *"VAA Bhopal roger report on final runway 12 Break Break"* considering the runway 12 to be the nearest for the aircraft to land. ATC Bhopal cleared other traffic to facilitate VT-TAA. VT-TAA neither acknowledged nor responded to ATC calls.

ATC Bhopal made several blind calls to establish contact with VT-TAA on main, standby, emergency VHF channels, and also tried to contact through relay via other aircraft which were in air. However, VT-TAA didn't respond. Though ATC Bhopal had accorded blind landing clearance to VT-TAA to land on any convenient runway, there was no response from the aircraft.

In the meanwhile, crew realized that they will not be able to reach Bhopal airport and decided to carry out a forced landing. The crew executed the same and force landed in an agriculture field approximately 3NM from Bhopal airport at around 1005 UTC. The aircraft sustained substantial damage during the forced landing. PIC received serious injuries while co-pilot & passenger received minor injuries.

After force landing, the director operation came out of the aircraft and informed his organization about the accident. The ATC, Bhopal, received information about the accident at 1008 UTC from local area police control room.

## 1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	01	Nil	Nil
Minor/ <del>None</del>	01	01	Nil

## 1.3 Damage to Aircraft

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

## 1.4 Other Damage

Nil

## 1.5 Personnel Information

### 1.5.1 Pilot - In – Command (PIC)

Age	41 Years
License & Validity	CPL, valid till 29/09/2024
Class	Multi Engine Aeroplane
Endorsements as PIC	Cessna 172, P-68 C
FRTTO License Date of Issue/ Validity	30/09/2009 valid till 29/09/2024
Date of Med. Exam & validity	28/07/2020 valid till 02/08/2021
Total flying experience	772:25 Hrs
Total Experience on type	472 Hrs
Total Experience as PIC on type	292:25 Hrs
Last flown on type	25/03/ 2021
Rest period before the flight	48 Hrs
Total Flying experience during last one year	270 Hrs
Total Flying experience during last Six Months	170 Hrs
Total Flying experience during last 30 days	77 Hrs
Total Flying experience during last 7 days	06:30 Hrs
Date of last Refresher/Simulator	IR/PCC 06/07/2020 & PCC 26/12/2020

PIC had adequate rest before the sortie and was authorized to carrying out Pre-Flight inspection on 27 Mar 2021.

### 1.5.2 Co-Pilot

Age	36 years
License & Validity	CPL, valid till 19/07/2025
Class	Aero plane

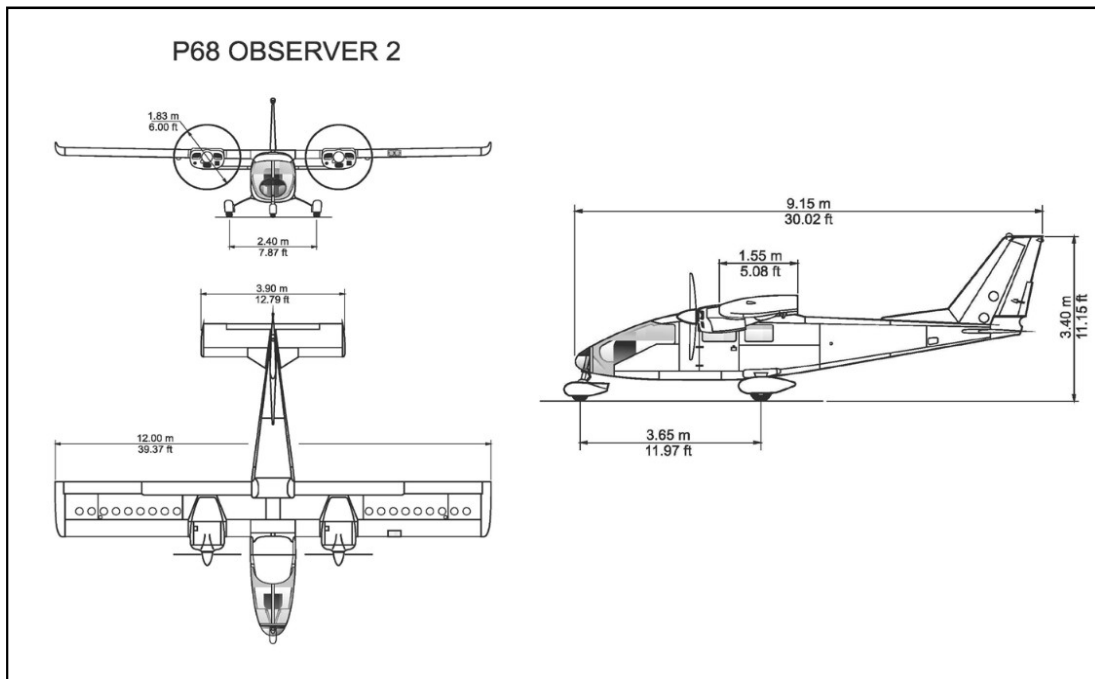
Endorsement as PIC	C-172, P-68C
FRT0 License (date of Issue/ Validity)	20/07/2015, valid till 19/07/2025
Date of Med. Exam & validity	23/06/2020 to 22/06/2021
Total flying experience	458:50 Hrs
Total Experience on type	220 Hrs
Total Experience as PIC on type	40 Hrs
Last flown on type	25/03/2021
Rest period before the flight	48 Hrs
Total Flying experience during last one year	133 Hrs
Total Flying experience during last Six months	115 Hrs
Total Flying experience during last 30 days	32 Hrs
Total Flying experience during last 7 days	06:30 hrs
Date of last Refresher/Simulator	PPC -05 Sep 2020, IR/PPC 22/12/2020

Co-Pilot had adequate rest before the sortie on 27 Mar 2021 morning.

## 1.6 Aircraft Information

### 1.6.1 General Information

Partenevia P-68 Observer 2 aircraft is a high wing aircraft installed with twin engines and having capability to carry 6 passengers that include the crew and having a light weight Plexi Glass nose, suitable for Airborne Surveillance work. Three views of the aircraft have been shown in Fig 1.



**Fig 1: Three Dimensional Views of Aircraft**

### 1.6.2 Aircraft VT-TAA Specific Information

Aircraft Model	P-68 Observer 2
Aircraft S. No.	NC-398-07

Year of Manufacturer	1994
Name of Owner	M/s PAPL
C of R	2590/5
C of A(Category / Sub Category)	NORMAL / (Passenger/Aerial Work)
C of A Validity	Valid
ARC	Issued on 05.01.2021/ Valid up to 01.12.2021
Air Operator Permit for NSOP	Valid upto 02.10.2023
Aircraft Station License	Issued on 14.11.2013 / Valid up to 31.10.2022
Aircraft Empty Weight	1434.2 Kg
Maximum Take-off Weight (MTOW)	2084 Kg
Date of Aircraft weighment	07.10.2020
Max Usable Fuel	375.44 Kg
Max Pay load with full fuel	104.36 Kg
Empty Weight CG	0.439 Meters aft of datum (CG=28.32% MAC)
Next Weighing due	06.10.2025
Total Aircraft Hours	2835:30
Last major inspection on the aircraft	100 Hr /12 months inspection & lubrication on 23.03.2021
List of Repairs carried out after last major inspection till date of accident	Nil
Engine Type	LYCO IO-360 A1 B6
Date of Manufacture LH	14 Apr 2010
Engine Sl. No. LH	RL-35141-51E
Last major inspection (LH)	100 H/12 months inspection & lubrication on 23.03.2021
List of Repairs carried out after last major inspection till date of incidence	Nil
Total Engine Hours LH	784:24
Date of Manufacture RH	29 Jan 1993
Engine Sl. No. RH	L-26122-51A
Last major inspection (RH)	100 Hr /12 months inspection & lubrication on 23.03.2021
List of Repairs carried out after last major inspection till date of accident	Nil
Total Engine Hours RH	2835:30
Aeromobile License	A-002/279/RLO(NR)
AD, SB, Modification complied	All applicable complied

As per crew statement, the Pre-flight inspection (PFI) was carried out by the PIC as per the preflight task card prior to the accident flight. The items mentioned in serial no. E.3 and E.4 of preflight task card pertain to engine oil level and oil leak. No defect or snag was recorded in the aircraft Technical

Log Book. As per aircraft log book entry, the last DGCA Mandatory Modification (DGCA /NEW /MISC /236) was carried out on 21 Jan 2021.

Scrutiny of the Technical Log Book and Pilot Defect Report (PDR) register showed that no snag was pending or deferred for maintenance on the aircraft prior to the accident flight. The last PDR entry made in PDR register was of 20 Mar 21 pertaining RH wheel tyre. The corresponding rectification was carried out and C.R.S no. 604 was issued on 24 Mar 2021. Aircraft load and trim was prepared for the accident flight and center of gravity (CG) was found within limits.

### **1.6.3 Engine Information**

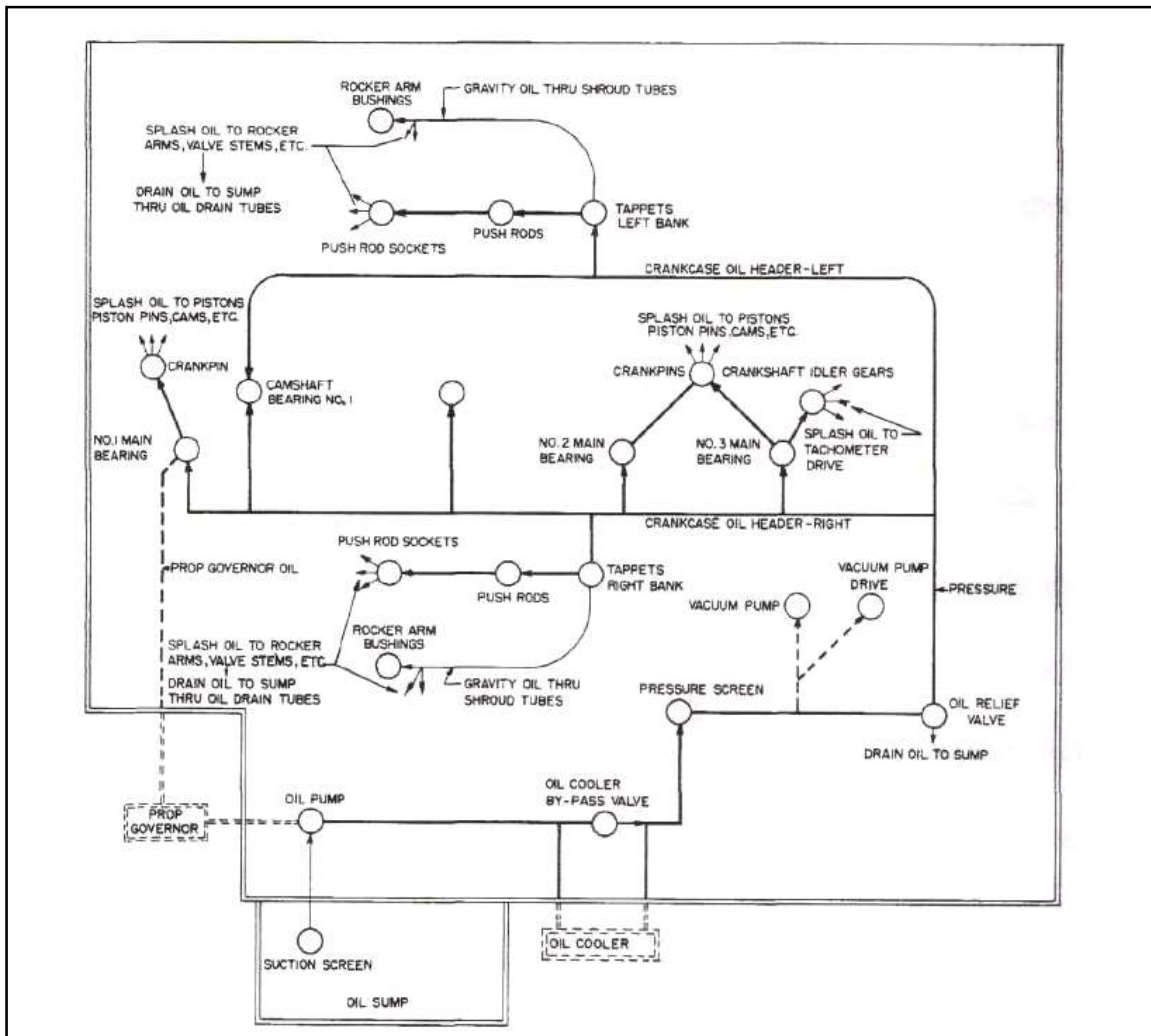
The IO-360 Series engines are air cooled, having four cylinders horizontally opposed, inclined overhead valve cylinders. The IO-360 A1B6 series engines have compression ratio of 8.7 to 1. The IO-360 series engines are fuel injected and naturally aspirated. These have a doweled six bolt hole configuration propeller flange. A mounting pad is provided for a governor which provides control for a hydraulically operated constant speed propeller.

LH side, the aircraft was fitted with TAE Lycoming IO-360 A1B6 engine serial number RL 35141-51E. The aircraft engine had logged 784:24 Hrs since new. Last scheduled inspection carried out on the engine was oil change and oil filter replacement at 2833:40 airframe hours on 23 Mar 2021.

RH side, the aircraft was fitted with TAE Lycoming IO-360 A1B6 engine serial number L 26127-51A. The aircraft engine had logged 2835:30Hrs since new and 457:34 Hrs since last overhaul. Last scheduled inspection carried out on the engine was oil change and oil filter replacement at 2833:40 airframe hours on 23 Mar 2021.

As per 100 Hrs / 12 months inspection procedure sheet, engine oil was changed on both engines on 23 Mar 2021. The oil suction screen was removed, inspected and cleaned thoroughly as per the procedure sheet of 50 Hrs/ 4 month inspection schedule. Ground run was given as per procedure sheet of 50 Hrs/ 4 month inspection schedule and no abnormality was recorded in the ibid procedure sheet.

### **1.6.4 Engine Lubrication System**



**Fig 2: Engine Lubrication System**

The oil for lubricating the engine and its friction components is contained in a wet sump attached to the bottom of the crank case housing. A conventional dipstick through oil Filler Tube is provided for determining the oil quantity available in the sump. When the crankshaft is turning, oil is drawn through a suction screen and pick up tube which extends from the sump to a port in the crankcase. A baffle and flapper valve assembly located in the oil sump retains oil around the pick-up tube during variable attitude flight operations to prevent oil starvation. Oil then passes to the inlet of the gear-type, engine-driven oil pump and is forced under pressure through the pump outlet. A pressure relief valve prevents excessive oil pressure by allowing excess oil to be returned to the sump. After exiting the pump, the oil (now under pressure) enters a full-flow filter and is passed on to the oil cooler. If the filter element becomes blocked, a bypass relief valve will open to permit unfiltered oil to flow to the engine. As the oil enters the oil cooler, it will flow in one of two directions:

(a) When the oil is cold, an oil temperature control unit will open and most of the oil will bypass the cooler. Some oil always flows through the cooler to help prevent congealing in cold weather.

(b) As the oil warms, the oil temperature control unit actuates to close off the cooler bypass forcing the oil flow through the cooler core. In operation, the oil temperature control unit modulates to maintain oil temperature in the normal range of approximately 170°F.

(c) After leaving the cooler, the oil enters the crankcase where the various channels and passageways direct it to all bearing surfaces and other areas requiring lubrication and cooling.

(d) The propeller governor boosts engine oil pressure for operation of the propeller. It controls oil pressure going to the propeller hub to maintain or change propeller blade angles. This oil flows through the propeller shaft to reach the hub.

(e) Other areas within the engine receiving oil include the valve lifters, inner domes and lower cylinder walls. The oil within the engine drains back into the sump by gravity.

Pilots observed sudden drop in oil pressure and rise in oil temperature on the left engine. Pilots responded by feathering the left engine. The sudden rise in oil temperature and drop in oil pressure indicate malfunctioning in engine lubrication system.

Accordingly, the left engine was inducted for Strip Examination at the DGCA authorized MRO (Maintenance Repair and Overhaul) shop. During the strip examination, the number four piston link rod bearing was found missing. In addition, broken metal pieces were found in No. 4 Cylinder head and the oil sump. The suction screen in the oil sump was found clogged with metal pieces.

The scrutiny of oil consumption records of LH engine for last three calendar months i.e., January, February and March 2021 prior to the accident did not indicate any abrupt/huge oil quantity consumption and it shows oil consumption rate of 0.1 Quarts/hr. On 25 Mar 21, 0.5 quarts oil was uplifted in both engine prior to departure from Guna Airfield.

### 1.7 Meteorological Information

(i) The METAR issued between 0200 UTC to 0330 UTC by Bhopal ATC on 25 Mar 2021

Time	Visibility	Wind	Temp	Dew Point	QNH	QFE	Trend
0200 UTC	6 Km	050/02 kt	21	13	1016	955	No Sig
0230 UTC	6 Km	030/03 kt	22	13	1016	955	No Sig
0300 UTC	6 Km	020/03 kt	24	13	1017	955	No Sig
0330 UTC	6 Km	010/09 kt	25	13	1017	956	No Sig

(ii) The METAR issued between 0900 UTC to 1030 UTC by Bhopal ATC on 27 Mar 21

Time	Visibility	Wind	Temp	Dew Point	QNH	QFE	Trend
0900 UTC	8 Km	320/04 kt	36	06	1011	950	No Sig
0930 UTC	8 Km	290/11 kt	36	06	1010	949	No Sig
1000 UTC	8 Km	020/02 kt	36	06	1010	949	No Sig
1030 UTC	8 Km	290/06 kt	36	08	1010	949	No Sig

### 1.8 Aids to Navigation

All navigational aids available at Bhopal airport were serviceable. The aircraft was equipped with standard navigational aids and there was no recorded defect with any of the navigational aids during the flight.

## 1.9 Communications

The aircraft was given take-off clearance by Bhopal TWR (118.05MHz) at 09:30:25UTC. There was no communication failure. The aircraft was in contact with ATC Bhopal. However, the crew did not respond to the calls made by the ATC, Bhopal after they made a call out that they might be doing force landing.

**1.9.1** Transcript of the relevant communication is appended below:

TIME (UTC) HHMMSS- MMSS	UNIT	TRANSCRIPT
093025	TOWER	CLEARED TO UNCONTROLLED GUNA, AFTER DEPARTURE RUNWAY 30 TURN RIGHT ESTABLISH 001 RADIAL BPL CLIMB TO 4000 FT SQUAK 1126
	VT-TAA	UNDERSTAND BHOPAL CLEARS VAA FLIGHT PLAN ROUTE TO UNCONTROLLED AIRFIELD GUNA, DEPARTURE INSTRUCTIONS AFTER TAKE OFF RUNWAY 30 TURN RIGHT CLIMB ON TRACK ESTABLISH 001 RADIAL CLIMB TO 4000 FT DEPARTURE SQUAK 1126, VAA. READY TO GO.
093422-38	TOWER	VT-TAA AIRBORNE 0931, REPORT WHEN ESTABLISH 001 RADIAL BPL
	VT-TAA	AIRBORNE 0931, ESTABLISH RADIAL, ETA WILL BE GUNA1010
094723-4801	TOWER	VAA BHOPAL TOWER
	VT-TAA	ROGER SIR WE ARE APPROXIMATELY 22 MILES 25 MILES OUT SETTING COURSE BACK FOR BHOPAL
094822-4858	TOWER	VAA BHOPAL TOWER, REQUEST REASON FOR RETURN BACK
	TOWER	VAA BHOPAL TOWER
	VT-TAA	VAA GO AHEAD SIR
	<b>TOWER</b>	<b>VAA REQUEST REASON FOR RETURN BACK</b>
	<b>VT-TAA</b>	<b>STANDBY DUE TO WINDS, VAA</b>
	TOWER	VAA, CONFIRM DUE TO WIND YOU WANT TO RETURN BACK TO BHOPAL
	<b>VT-TAA</b>	<b>AFFIRM SIR, DUE TURBULENCE VAA</b>
	TOWER	VAA ROGER, MAINTAIN 4000 FT, AND STANDBY FOR REJOIN
095129-5146	TOWER	VAA BHOPAL TOWER REPORT WHEN RWY IN SIGHT
	VT-TAA	WILCO SIR, VAA
	<b>TOWER</b>	<b>VAA, CONFIRM ANY PREFERENCE OF RWY</b>
	<b>VT-TAA</b>	<b>ANY RWY SIR 12, 30</b>
	<b>TOWER</b>	<b>ROGER, EXPECT RWY 30</b>
095223-39	TOWER	VAA, REPORT YOUR ETA RETURN BACK TO BHOPAL
	VT-TAA	ETA BHOPAL 1002 VAA
095517-25	VT-TAA	BHOPAL VAA, 15 MILES, 4000 FT.
	TOWER	VAA ROGER, REPORT RWY IN SIGHT
	<b>TOWER</b>	<b>VAA CONFIRM ANY ASSISTANCE REQUIRED</b>
	<b>VT-TAA</b>	<b>NEGATIVE SIR, VAA</b>
095816-5845	TOWER	VAA, REPORT DME
	VT-TAA	VAA 7 ON THE DME
	TOWER	VAA ROGER. REPORT RWY IN SIGHT
	VT-TAA	ROGER RWY IN SIGHT, VAA
	TOWER	VAA, ROGER DESCEND TO CIRCUIT ALTITUDE AT YOUR OWN DISCRETION QNH 1010 HPA. REPORT RIGHT HAND DOWN WIND RWY 300
	VT-TAA	ROGER SIR RIGHT HAND DOWN WIND CONFIRM 30
	TOWER	AFFIRM RWY 30 RIGHT DOWN WIND
	VT-TAA	COPIED SIR



TIME (UTC) HHMMSS- MMSS	UNIT	TRANSCRIPT
100048-0130	TOWER	VAA REPORT POSITION
	VT-TAA	<b>VAA IS 3 MILES SIR.</b>
	TOWER	VAA ROGER REPORT JOIN RIGHT HAND DOWN WIND RWY 30 AND TRAFFIC VAL CESSNA 172 ON LEFT BASE RWY 30 FOR LANDING
	VT-TAA	<b>COPIED SIR, WE MIGHT BE CALLING FINAL FOR CROSS RWY</b>
	TOWER	<b>VAA BHOPAL TOWER CROSS RWY IS NOT APPROVED REPORT STANDARD RIGHT SIR HAND DOWN WIND RWY 30</b>
	VT-TAA	<b>IN THAT CASE STANDBY SIR WE MIGHT BE DOING FORCED LANDING</b>
	TOWER	VAA BHOPAL TOWER ROGER REPORT ON FINAL RWY 12 BREAK BREAK
100340-48	TOWER	VT-TAA BHOPAL TOWER.
	TOWER	VAA BHOPAL TOWER REPORT POSITION.
	TOWER	VAA BHOPAL TOWER REPORT POSITION.
100433-58	TOWER	VAL REPORT POSITION AND RELAY VAA
	VT-CAL	VAL MAINTAINING 25
	TOWER	SET COURSE OUTBOUND ON 248 RADIAL CLIMB TO 4000 FT. IN SIGHT
100504-08	TOWER	VAA BHOPAL TOWER REPORT POSITION
100525-43	TOWER	VAL RELAY POSITION AND TAKE POSITION OF VAA AND ADVISE
	VT-CAL	VAA THIS IS VAL, RELAY YOUR POSITION.
100551-0602	TOWER	VAA BHOPAL TOWER
	TOWER	VAA IF YOU READ ANY RWY IS AVAILABLE FOR YOUR LANDING REPORT.
100613-15	TOWER	VTTAA BHOPAL TOWER HOW DO YOU READ
100647-53	TOWER	VAA BHOPAL TOWER
100708	TOWER	VAA BHOPAL TOWER
100722	TOWER	VAA BHOPAL TOWER
100745	TOWER	VAA BHOPAL TOWER
100812	TOWER	VAA BHOPAL TOWER

### 1.9.2 Communication SOP as per DGCA CAR

The “Distress and urgency radiotelephony communication procedures” as stipulated in DGCA CAR Section 9, Series D Part III, Para5.3 dated 18 Nov 2016 are quoted below:

*“Distress and urgency traffic shall comprise all radio telephony messages relative to the distress and urgency conditions respectively. Distress and urgency conditions are defined as:*

*a) **Distress:** a condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.*

*b) **Urgency:** a condition concerning the safety of an aircraft or other vehicle, or of some person on board or within sight, but which does not require immediate assistance.*

*(i) The radiotelephony distress signal MAYDAY and the radiotelephony urgency signal PAN PAN shall be used at the commencement of the first distress and urgency communication respectively.*

*(ii) At the commencement of any subsequent communication in distress and urgency traffic, it shall be permissible to use the radiotelephony distress and urgency signals.*

*(b) The originator of messages addressed to an aircraft in distress or urgency condition shall restrict to the minimum the number and volume and content of such messages as required by the condition.*

*(c) If no acknowledgement of the distress or urgency message is made by the station addressed by the aircraft, other stations shall render assistance, as prescribed in (a) & (b) above respectively.”*

#### **1.10 Aerodrome Information**

Raja Bhoj Airport, also known as Bhopal airport is the primary airport for the state of Madhya Pradesh, India. It is being operated & managed by Airport Authority of India (AAI). The airport does not have Radarsurveillance facility i.e., the air traffic control at Bhopal airport is procedural control.

The IATA Location Identifier Code is BHO and ICAO Location Indicator Code is VABP. The airport coordinates are 231713 N, 0772013 E. Airport elevation is 1721 ft. Category 7 Rescue and Fire Fighting Services are available at Bhopal airport. As per AAI, Bhopal records, only one runway strip is available at Bhopal airport and no cross runway exists on the date of accident. The cross runway requested by the pilot was actually a disuse runway and presently used as a taxiway. The details of runway distances are given below:

<b>Runway</b>	<b>TORA(m)</b>	<b>TODA (m)</b>	<b>ASDA (m)</b>	<b>LDA (m)</b>	<b>RESA</b>
12	2744	2744	2744	2744	90mX 90m
30	2744	2744	2744	2744	90m X90m

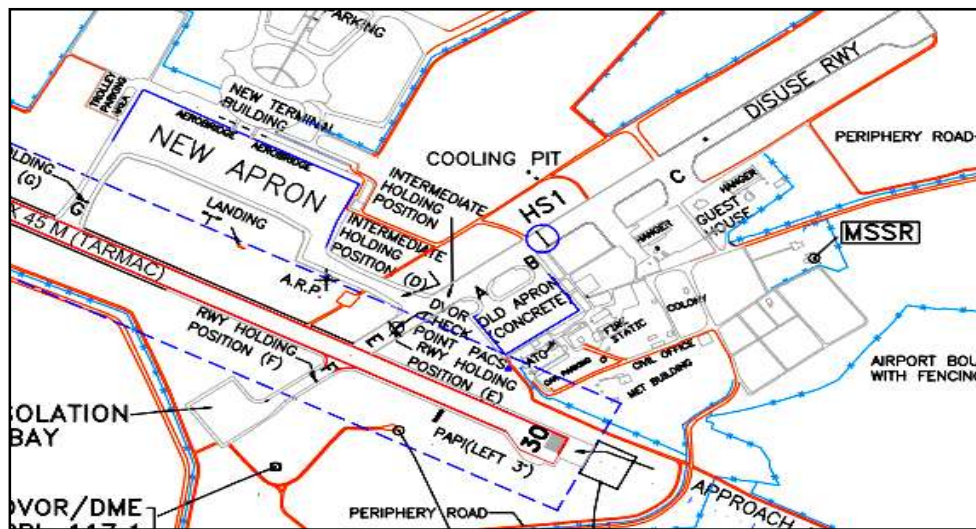
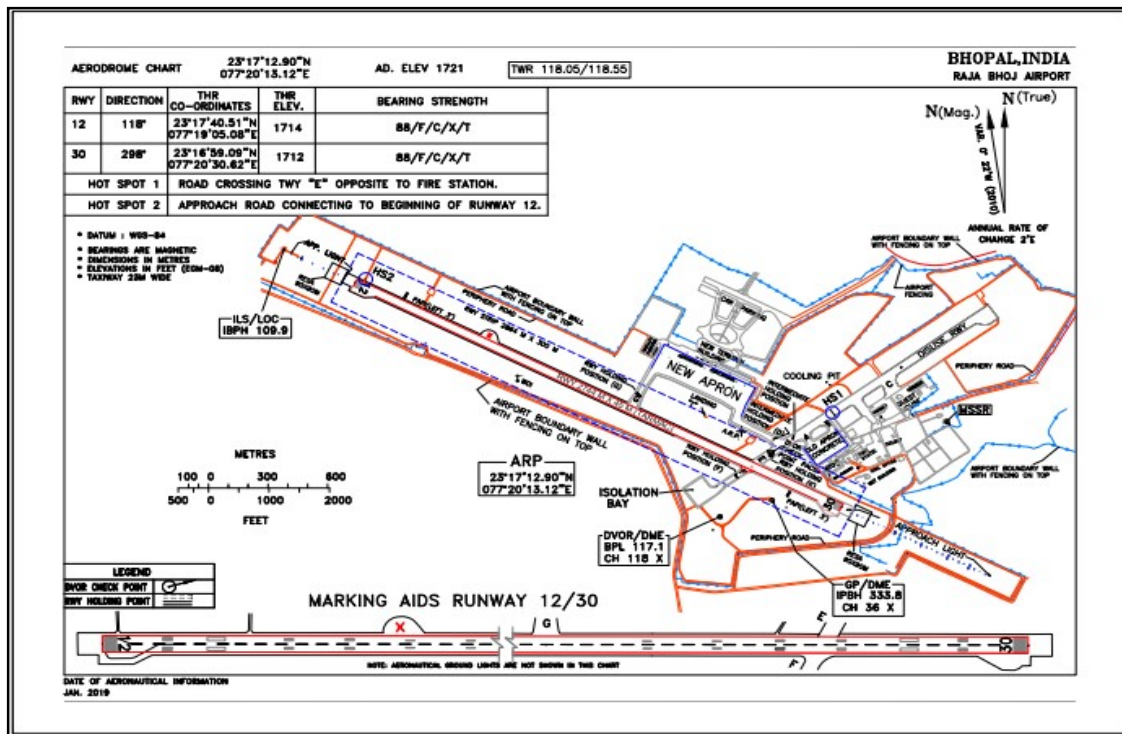


Fig 3: Aerodrome Layout (Pic Courtesy: AAI)

### 1.11 Flight Recorders

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

### 1.12 Wreckage and Impact Information

Crew took the decision to force landing the aircraft in nearby agriculture field and started searching for suitable vacant area. Subsequently, crew had identified a vacant agriculture field and carried out force landing. Aircraft rolled out in the field for approximately 263 feet after touchdown. The wheels

had come off the landing gear due to impact with a barge on the field before coming to rest. In the bargain the aircraft had suffered the following damages:

- (a) The front fuselage or the nose section of the aircraft was found severely damaged.
- (b) Aircraft's belly skin from nose section to baggage section was found damaged.
- (c) The front glass canopy was found broken into pieces.
- (d) The passenger cabin got detached from the top attachment points.
- (e) The port door was found damaged and buckled under the wing.
- (f) Wing fuselage rear spar attachment was found broken.
- (g) LH wing front spar attachment with fuselage was found broken. Streak of oil stains were found on the left wing. The left Aileron was found in down position and The Right aileron was found in Up position.
- (h) Both flaps were found in Up position, however, the Flap selector switch was found in between Up & Down position. The flap position indicator was found in  $35^\circ$ .
- (i) The instrument panel was intact with its mounting. Both rudder pedals and control column were found damaged.

The damages sustained by the aircraft during the accident are depicted below:



**Fig 4: Wheel Track Marks on field**



**Fig 5: Dislodged wheel on field**



**Fig 6: Final resting position of the aircraft**



**Fig 7: Front View of Badly Damaged Aircraft**



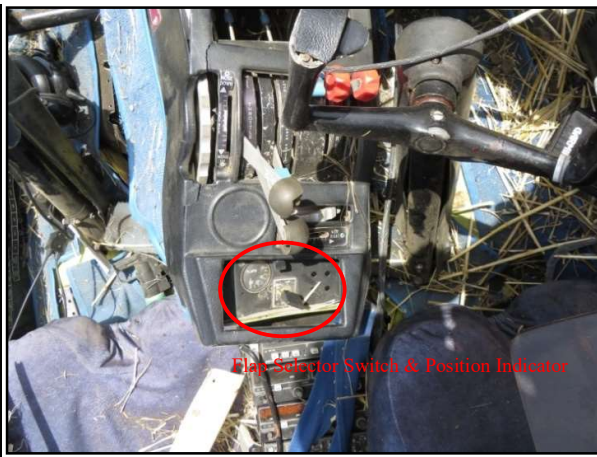
**Fig 8: Right Side Door & Flap (up)**



**Fig 9: Front View of Badly Damaged Cockpit**



**Fig 10: View of Cockpit Instrument Panel**



**Fig 11: View of Cockpit Instrument Panel**



**Fig 12: Left Engine Propeller**



**Fig 13: Right Engine Propeller**

The left engine propeller (Fig 12) is not having any damages indicating engine was shut down at the time of impact. The right engine propeller was found bent rearwards, indicating engine was on power at the time of impact.



Fig14:View of Left Wing



Fig15:View of separated Fuselage



Fig16:View of Left rear of Aircraft



Fig17:View of Right side of Aircraft



Fig18:View of Left Engine & Left Flap in Up



Fig19:View of Right Engine & Right Flap in Up

### 1.13 Medical and Pathological Information

Both Pilots had undergone Breath Analyzer (B.A) test before accident flight and result was found satisfactory. Post accident medical investigation report of the PIC reflects presence of alcohol to the

amount of 12.8 mg/ml, which was above the permissible limit. The reason for presence of alcohol in blood as stated by a Doctor was attributed to the medicine administered to the PIC immediately after the accident. Post accident medical investigation report of the first officer was found to be satisfactory.

#### **1.14 Fire**

There was no fire pre or post accident.

#### **1.15 Survival aspects**

Post force landing, both crew and the passenger came out of the aircraft on their own. Both pilots and passenger have sustained injuries, the aircraft was damaged substantially and all persons on board survived the accident. Therefore, the accident was survivable.

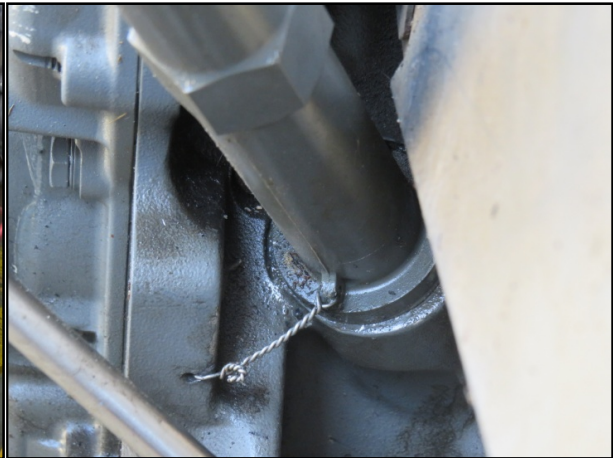
#### **1.16 Tests and Research**

**1.16.1** The oil and fuel samples collected from the crashed aircraft were sent to oil and fuel lab for specification tests. As per result received from the oil and fuel lab both the samples have passed the specifications test.

**1.16.2** The left engine of the crashed aircraft was subjected to strip examination in the presence of Investigation team, by a DGCA approved CAR 145 organization. Photograph taken during the strip examination are shown below:



**Fig 20: Engine Number 1**



**Fig 21: Oil Splash around Oil Gauge Tube**



**Fig 22: Oil Filler tube wire lock position**



**Fig 23: Shift in Oil Filler tube wire lock position**



**Fig 24: Metal Particles inside no 4 Piston**



**Fig 25: No 4 Piston Connecting rod without Bearing**



**Fig 26: Broken metal pieces in Oil Sump**



**Fig 27: Metal pieces collected from Oil Sump**





**Fig 28: Abrasion marks on No 4 Crank Shaft**



**Fig 29: Scoring marks on Main bearing**



**Fig 30: Suction Screen filled with Metal pieces**



**Fig 31: Suction Screen & Metal pieces**

During the LH engine strip examination, the following observations were made by the investigation team:

- (a) Propeller governor hub was found jammed.
- (b) Oil filling tube was found not secured positively i.e., though it was secured by the means of locking wire. However, it was free to rotate by 45 degree approximately and nearby area was found wet with traces of oil.
- (c) Oil pump was dismantled and was found having metal particles.
- (d) The number four piston link rod bearing was found missing.
- (e) Metal pieces were found in the oil suction screen and inside the oil sump.

### **1.17 Organizational and Management Information**

M/s PAPL is a DGCA approved Non-Scheduled Operator (NSOP) having Air Operator Permit 25/2008. M/s PAPL is approved to carry out Non-Scheduled operation under sub categories Passengers and Aerial Work as per scope of approval for the respective aircraft. M/s PAPL has a fleet of total 10 aircraft comprising of 02 Bell 407 helicopters, one Cessna Citation CJ2 aircraft, one

Cessna 525A aircraft, one Cessna Caravan 208B aircraft, one Piaggio P-180 Avanti II aircraft, one EMB 500 (Phenom 100) aircraft, one P-68 Observer-2 aircraft, one Premier 1A aircraft and one DC-3C aircraft for carrying out its day-to-day Non Scheduled operations.

Accountable Manager reports to the Board of Directors and is responsible for management and operation of organization related activities. He is assisted by a team of professionals comprising Director of Operations, Chief of Flight Safety, Director SMS, Continuing Airworthiness Manager and Quality Manager.

The Operations Manual of M/s PAPL depicts the Organization Chart with Director of Operations as an approved appointment responsible for Flight Operations. However, there is no specific charter of duties and responsibilities assigned to this appointment.

The aircraft VT-TAA was approved for Aerial Work in its Certificate of Airworthiness. However, the Operations Manual of M/s PAPL does not contain any approved procedure / SOP for the nature and conduct of aerial work.

#### **1.17.1 Maintenance practices of Organization**

As per established standard maintenance practice CAMO is responsible and initiates any maintenance activity that is required to be undertaken on the aircraft. However, during the investigation, the investigation team observed the following:

(a) Operation Manager of M/s PAPL had written a letter to the Airport Director (APD) Bhopal, seeking permission for entry of tools, equipment and maintenance personnel inside the Bhopal airport to undertake maintenance activity on the aircraft VT-TAA on 26 Mar 2021. The equipment mentioned in the ibid letter includes oil filter, oil filter body and few common tools.

(b) The requested permission was granted by the competent authorities functioning at of Bhopal airport. All requested tools; equipment and maintenance personnel went inside the airport to perform certain maintenance task on the aircraft VT-TAA in the presence of Director Operations who was onboard aircraft as a passenger and both crew on 26 Mar 2021.

(c) During the investigation Operation Manager of M/s PAPL, who had written the letter to the APD, Bhopal citing the maintenance activity has accepted that the above said letter was written by him. However, he couldn't provide the reason and requirement for writing such letter.

(d) During the interview with M/s PAPL's Continuing Airworthiness Manager (CAM), CAM revealed that he was unaware of any such maintenance requirement or any such letter written by M/s PAPL's operation manager to APD Bhopal.

#### **1.18 Additional Information**

##### **1.18.1 Partenavia P68 Observer 2 Flight Manual, Section 3, Emergency Procedures**

The recommended procedures for various types of emergencies and critical situations are specified in Section 3 of Partenavia P-68 Observer 2 Flight Manual under Emergency Procedures. The relevant extract of the procedures to handle emergencies are quoted below:

##### **(a) In-flight Engine Securing Procedure**

(i) Throttle	CLOSE
(ii) Propeller	FEATHER
(iii) Mixture	IDLE CUT OFF
(iv) Fuel Selector Valve	ENG SHUT OFF
(v) Alternator Switch	OFF
(vi) Auxiliary Fuel Pump	OFF
(vii) Magneto Switch	OFF
(viii) Electrical Load	REDUCE
(ix) Cross feed	AS REQUIRED

**(b) Engine failure after rotation speed**

(i) Air speed	CHECK 71 KIAS min. At max take-off weight
(ii) Directional control	MAINTAIN (5 deg bank toward operative engine, rudder as required for heading control)
(iii) Mixtures	FULL RICH
(iv) Propellers	FULL FORWARD
(v) Throttles	FULL FORWARD
(vi) Air speed	ESTABLISH 80 KIAS

When clear of obstacles

(vii) Inoperative engine Throttles Propeller Mixture	CLOSE FEATHER IDLE CUT-OFF
(viii) Climb	STRAIGHT FORWARD
(ix) Flaps	UP at a safe height
(x) Trims	AS REQUIRED
(xi) Inoperative engine	SECURE
(xii) As soon as practical	LAND

**(c) Engine failure in flight**

(i) Directional control	MAINTAIN (Retard power on operative engine, if necessary to maintain control).
(ii) Air speed	ATTAIN 92 KIAS min.
(iii) Trims	ADJUST
(iv) Inoperative engine	IDENTIFY and VERIFY
(v) Engine air start	ATTEMPT
(vi) If air start is unsuccessful -Engine securing procedure -As soon as practical	COMPLETE LAND

**(d) Single engine approach and landing**

(i) Inoperative Engine	SECURE
(ii) Operative Engine	FEATHER
Fuel Selector	ON
Mixture	FULL RICH
Propeller	FORWARD
Auxiliary Fuel Pump	ON
(iii) Flaps	APPROACH (15°)

(iii) Air speed	92 KIAS min
(iv) Flaps (when landing assured)	FULL DOWN
(ix) Air speed	78 KIAS MIN (At max landing weight)
(vi) Brakes	AS REQUIRED

**(e) Single engine Go - Around**

(i) Power	2700 RPM – FULL THROTTLE
(ii) Flaps	15 deg
(iii) Air speed	80 KIAS until clear of obstacles THEN 92 KIAS
(iv) Flaps	Up at safe height
(v) Trims	ADJUST

**1.19 Useful or effective investigation techniques**

Nil

**2. ANALYSIS**

**2.1 Serviceability of the Aircraft**

On 23 March 2021, 100 Hrs /12 months inspection, 50 Hrs/ 6 months inspection & lubrication check was carried out on the aircraft VT-TAA. Both engines were also inspected as per procedure sheet and the engine oil and oil filter were also replaced at 2833:40 airframe hours on 23 Mar 2021. There were no defects reported or observed on the aircraft, engines and its associated systems during the inspection. Post satisfactory inspection the aircraft was released to service with C.R.S603 on 23 Mar 2021 by a company authorized AME.

On 25 March 2021, the aircraft had flown for approximately 2hrs while flying from Guna airfield to Bhopal airport. No snag was reported by the crew to ATC Bhopal while returning and also no snag entry was found in the aircraft techlog book. Thereafter, the aircraft was parked on the Bhopal airport tarmac waiting for refueling till 27 March 2021 afternoon.

The refueling was carried out on 27 March 2021 at 0900 UTC. The pre-flight inspection was carried out by the PIC and no abnormalities were found or recorded in the aircraft records. As per aircraft records, there were no abnormalities reported on the oil consumption of the engines. The scrutiny of Techlog book for January, February and March months prior to the accident reveal oil consumption rate of 0.1 quarts/hr. Further, the aircraft took off at 09:31 UTC and the crew force landed the aircraft in an agriculture field at approximately at 10:05 UTC.

There were signs of oil splash over the left wing and left fuselage (Refer Fig 18), indicating oil leak from the left engine which resulted in drop in oil pressure and sudden rise in oil temperature. Due to the low oil pressure and reduced oil supply to the propeller governor, the blade angles have come to feathered angle and the aircraft started losing height. The left engine was shut down by the pilots and they attempted returning back to base.

**2.1.1 Serviceability of Engines**

During the accidental flight, the sudden rise in LH engine oil temperature and drop in oil pressure could be inferred as a malfunction in LH engine lubrication system. During the strip examination of the LH engine, the no 4 link rod bearing on the crank shaft broke into pieces and got accumulated in the suction screen of the oil sump leading to LH engine failure. The LH engine failure could be due to

either a massive oil leak leading to lubrication starvation and subsequent no 4 link rod bearing failure or could be due to a blockage in the lubrication system leading to starvation of lubrication resulting in the no 4 link rod bearing failure.

**(a) Oil Leak from LH engine as a causative factor**

- i. There was a massive oil leak during flight as oil splash signs were available on LH engine and LH wing (Fig 18 refers).
- ii. The oil gauge tube was found to be secured and wire locked with the engine body, however, the oil tube could be rotated by approximately 45° with the wire lock intact. After removing the wire lock, the oil gauge tube could be rotated one full turn in order to positively secure it with the body. The gap created between the oil gage tube and the body due to the improper wire locking of the assembly could be a possible source of leak. However, it is very unlikely that this could generate the quantum of oil splashes that were observed on the left Wing.
- iii. The oil splashes observed on the left wing indicate oil leak under pressure. As per the engine lubrication system functioning, during engine operation the oil filter would be under pressure as the oil pump sucks the oil from oil sump and supplies pressurised oil through the oil filter to other accessories of the engine.
- iv. If the oil filter was not secured positively during maintenance, there could be a possibility of heavy oil leak under pressure resulting in oil splashes as observed on LH wing.
- v. Since, the symptoms associated with oil pressure drop and oil temperature rise started approximately 20 min after take-off, it is possible that the oil filter become unsecure due to vibrations and resulting oil leak under pressure creating the oil splashes on the left wing as observed.
- vi. The investigation team had examined M/s PAPL's letter to APD Bhopal Airport requesting for entry of equipment & technicians for maintenance of VT-TAA aircraft. The list of the equipment mentioned in the letter included an oil filter and oil filter body which further supports the above mentioned possibility.
- vii. However, the investigation team could not corroborate conclusively from the available evidence to conclude that maintenance was indeed undertaken on the aircraft during the intervening period between aircraft landing on 25 March 2021 till the take-off on 27 March 2021.

**(b) Blockage in lubrication system as a causative factor**

- i. As per aircraft maintenance records, the aircraft VT-TAA had undergone 100 Hr /12 months inspection, 50 Hr /06 months inspection & lubrication check on 23 Mar 2021 during which both LH & RH engines were inspected.
- ii. During the inspections, engine oil & oil filter were replaced. As per the procedure sheet signed by AME, the suction screen was also removed and inspected.
- iii. After the servicing, the aircraft had flown for only approximately 2Hrson 25 March2021prior to the accident flight. During this flight, the aircraft was diverted to Bhopal due to non-conductive weather for intended mission i.e., Aerial survey as stated by the Crew. The crew had not observed any abnormality or recorded any defect in the tech logbook for maintenance actions.

- iv. During the strip examination broken metal chips/pieces were found in the LH engine oil sump and the oil suction screen was found filled with metal chips/pieces.
- v. On further dismantling, the no. 4 piston connecting rod bearing was found missing. The oil pump was dismantled, and deep marks were found on the internal body.
- vi. Therefore, it is highly improbable that, within 20min of flying on 27 March 21, the no 4 link rod bearing on the cam shaft failed, leading to clogging of suction screen further resulting in sudden starvation of lubrication caused by massive oil leak in flight on 27 March 21.
- vii. Technically, bearing failure is an after effect of lack of lubrication on the bearing. Once the bearing was broken, it would circulate with the oil in the lubrication circuit till the suction screen and get accumulated near the suction screen. This would further create lubrication starvation on the frictional parts.

### **(c) Inference**

From the above, the following can be summarized:

- i. There was a substantial oil leak from left engine in air, resulting in sudden drop in oil pressure and rise in oil temperature on left engine.
- ii. Oil pressure drop led to oil starvation on no. 4 piston link rod bearing, which further resulted in No. 4 bearing breaking in to pieces.
- iii. The broken bearing pieces got accumulated in oil sump and blocked the oil suction screen in the oil sump clogging the lubrication system.
- iv. The only evidence that indicates the source of oil leak on the engine is the loose assembly of oil filler tube.
- v. However, it is highly improbable that the gap created by the loose assembly of the oil filler tube could cause such kind of massive oil leak resulting in engine seizure or bearing failure.
- vi. The fact remains that there was a massive oil leak from the LH engine during the flight on 27 Mar 2021, that too within less than 20 min of flying and 2 Hrs of flying after undergoing the scheduled maintenance.
- vii. Though the exact source of oil leak could not be established conclusively, the oil leak lead to lubrication starvation resulting in the failure of no. 4 piston link rod bearing. The broken metal pieces of no 4 link rod bearing clogging the oil suction screen in the oil sump is an after effect of the oil leak.

Thus, the serviceability of the aircraft LH engine was a major contributory factor to the accident.

## **2.2 Weather**

On 25 Mar 21, during the aerial survey flight, at 0200 UTC, the visibility reported was 6 Km and the winds reported were 050 degree and 02 kts. However, the crew had reported to ATC that they were returning due to unfavorable weather for aerial survey.

On 27 Mar 21, during the accident flight, at 1000 UTC, the visibility reported was 8 Km and the winds reported were 020 degree and 02 kts. The crew had reported to ATC that they were returning due to winds and turbulence, however the actual reasons for returning back to Bhopal was malfunctioning of LH engine as stated by the crew during the investigation.

Therefore, it is concluded that the weather was clear, calm with no significant trend and was not a contributory factor to the accident.

### **2.3 Crew qualification and handling of the Aircraft**

#### **2.3.1 Crew qualification**

Both crew were appropriately licensed, qualified and authorized as per prevailing DGCA civil Aviation Requirement (CAR) to undertake the flight.

#### **2.3.2 Crew handling of the aircraft**

Post LH engine shutdown, the aircraft was losing height rapidly. Crew tried to maintain the altitude. As per Partenevia P-68 Observer 2 Flight Manual (AFM), aircraft is capable of single engine landing. The flight manual specifies emergency procedures as enumerated below:

- a. Para 3.4, Section 3 of Flight manual "Engine failure after rotation speed" mentions the airspeed to be minimum 71 KIAS and to maintain directional control, 5 deg bank toward operative engine has to be given. It further mentions to switch off the inoperative engine and land as soon as practical.
- b. Para 3.5 of Section 3 of Flight manual "Engine Failure during Flight" mentions to maintain directional control by retarding the power on operative engine if necessary to maintain control. It further states to attain 92 KIAS by adjusting the trims, secure the inoperative engine and land as soon as practical.
- c. Para 3.8 of Section 3 of Flight manual "Single Engine Approach and Landing" states to secure the inoperative engine, select the fuel selector on, mixture full rich, propeller to forward and auxiliary fuel pump to on. The Flaps are to be selected **fully down** when landing is assured.

However, as the aircraft descended to approximately 400 to 500 feet altitude approximately 3-4 NM from the Bhopal Airport, crew had realized that they could not reach Bhopal airport in the prevailing situation. Therefore, Pilots decided to force land in the agricultural field.

Though the Flap selector switch in the cockpit was in between Up & Down position, both the flaps physically were in up or neutral position indicating the crew had not selected flaps **fully down** as mentioned in the emergency procedures given at Para 3.8 of Section 3 of Flight Manual. This could be a possible reason for the rapid descent of the aircraft even though one engine was running.

The investigation team was unable to corroborate the facts and actual crew actions during the situation due to non-availability of onboard flight recorders. However, it is clearly evident that the Crew did not adhere to the emergency procedures for single engine operation.

#### **2.3.3 Crew actions during emergency**

- (a) When crew noticed LH engine snag and took the decision of returning back, crew did not announce the emergency to ATC Bhopal as required by DGCA CAR Section 9, Series D, Part III.
- (b) At 0955 UTC, when ATC Bhopal enquired/asked from VT-TAA, that any assistance required for landing to which crew confirmed that negative assistance required.
- (c) Further, when the crew had shut down the LH engine, then also crew did not raise any alarm such as "PAN PAN" nor apprised the ATC Bhopal about their precarious condition.

(d) While returning back when aircraft was not able to maintain assigned altitude, crew requested ATC Bhopal for landing on cross runway. Actually, the requested runway is a disused runway used as a taxi way and no landings can be permitted on a taxiway in a normal condition. Therefore, the request was turned down by the ATC.

Therefore, it is evident that the Pilots did not communicate the actual reasons to ATC, clearly, for returning back. Despite the failure of LH Engine, they did not declare emergency. The crew did not adhere to the requirements laid down in DGCA CAR Section 9, Series D, Part III for communicating with ATC while handling an emergency situation, which was the major contributory factor to the accident.

#### **2.4 Organizational Practices**

On 25 Mar 2021, after take-off from Guna Airfield crew decided to return back to Guna stating unfavorable conditions for aerial survey and informed the same to ATC Bhopal. Later crew informed ATC Bhopal that the Guna Airfield was not available hence they were diverting to Bhopal. The aircraft was parked on Bhopal airport tarmac, waiting for fuel replenishment. The Operations Manager of M/s PAPL had written a letter to the Airport Director Bhopal, seeking permission for entry of tools, equipment and maintenance personnel inside the Bhopal airport to undertake maintenance activity on VT-TAA aircraft on 26 Mar 2021.

The equipment mentioned in the *ibid* letter includes Oil Filter, Oil Filter Body and few common tools. The required permission was granted by the competent authorities functioning at Bhopal Airport. All requested tools, equipment and two maintenance personnel went inside the airport to perform certain maintenance task on the aircraft VT-TAA in the presence of Director Operations on 26 March 2021.

The tools and spares mentioned in the *ibid* letter were not required for refueling, but indicates requirement of some kind of unscheduled maintenance on engine lubrication system. However, the nature of maintenance task undertaken if any (except cleaning and refueling), was not recorded in the techlog book or defect register as required and thus, was not verifiable by the investigation team. Though one of the witness stated that oil was also replenished on both engines, there was no evidence corroborating the same. Further, CAM was completely unaware of such maintenance requirement and the reason for the operations department writing such letter.

On 27 March 2021, after the refueling was completed, the aircraft had flown for approximately 20 mins, when the crew heard abnormal sound from the left engine. On confirmation of the LH engine malfunction, the crew requested Bhopal ATC for returning to Bhopal, explicitly saying “**Standby**” before giving the reason for returning as “**Due to winds**” in the presence of Director Operations of M/s PAPL who was onboard the aircraft during the accident as well as on 25 Mar 2021 flight. Both pilots could not justify why they did not announce the engine failure to Bhopal ATC.

Writing of letter by the Operations Manager projecting requirement of spares & tools for maintenance without the knowledge of CAM indicate lack of coordination between internal departments as stipulated in Para 1.17 (iii), Part A of M/s PAPL Operations Manual. The above indicate overlapping of duties & responsibilities of the post holders, reflecting unhealthy maintenance practices and poor safety culture prevailing in the organization.



From the above discussions, it can be concluded that the non-standard practices adopted by the organization, reflects un-healthy organization practices.

## **2.5 Circumstances leading to the Accident**

- (a) After take-off at 0931 UTC, at around 4000 ft altitude, approximately 20 nautical miles away from Bhopal airport, the crew heard unusual sound in cockpit. Subsequently, they realized that the sound was emanating from left engine, which was increasing continuously.
- (b) The crew scanned the cockpit instruments and found LH engine oil pressure dropping with simultaneous rise in oil temp and drop in RPM. Then the crew reduced the power of LH engine. However, the situation didn't improve, so the crew took the decision and informed ATC Bhopal that they were returning back due to winds and turbulence.
- (c) In returning leg, with deteriorating LH engine performance, crew shut down the LH engine. Meanwhile aircraft started losing its height and crew also weren't able to maintain the altitude with single engine i.e., RH engine.
- (d) Crew requested ATC Bhopal for cross runway for landing, to which ATC responded negative, as no cross runway was existing at Bhopal airport.
- (e) Crew replied to ATC by stating *"in that case stand by sir, we might be doing forced landing"*.
- (f) ATC immediately responded by extending all possible support like according permission to land on nearest runway 12. Further, ATC gave a call to land on any runway.
- (g) When the crew observed unusual sound from LH engine, there was an oil leak from the engine, due to which the oil pressure dropped and oil temperature had risen as indicated in the cockpit.
- (h) The oil splash marks over the LH wing and LH engine cowling panel corroborate the fact of oil leak taking place in air, as during the strip examination of the LH engine, only one liter oil was found remaining in the oil sump.
- (i) Due to oil leak, the LH engine frictional components like bearings, oil pump, propeller governor etc., ran dry. Ultimately the bearing on no.4 piston connecting rod failed and broke in to pieces. The remaining bearings were also subjected to lack of lubrication and excessive heat resulting in accumulating of metal particles in the oil sump.
- (j) The oil suction screen through which the oil is pumped to all LH engine frictional components got blocked with broken pieces of the no 4 piston connecting rod bearing.
- (k) Ultimately, the metal particles circulated through entire LH engine lubrication system resulting in presence of metal particles inside the oil pump.
- (l) Thus, the LH engine was subjected to lack of lubrication due to the oil leak that took place in air. This resulted in drop in LH engine oil pressure and rise in LH engine Oil temperature.
- (m) Further, due to drop in oil pressure, inadequate oil supply to Propeller Governor Mechanism resulted in feathering of LH engine and aircraft losing height. Finally, crew had to shut down the LH engine and go for emergency landing with available RH engine.

(n) As the aircraft was unable to maintain altitude, and was rapidly descending. At approx 400ft to 500 ft, crew took the decision to force land the aircraft. Therefore, crew search for vacant area and force landed the aircraft in a vacant agriculture field approx 3Nm from Bhopal Airport.

### **3. CONCLUSION**

#### **3.1 Findings**

1. On 23 March 2021, Scheduled maintenance was carried out on the aircraft and engines. During inspection as per procedure sheet the engine oil and oil filter were replaced. No defects were reported or observed on the aircraft, engines and its associated systems during the inspection.
2. On 25 March 2021, the aircraft had flown for approximately 2hrs and no snag was reported in the techlog book.
3. On 27 March 2021, after refueling, the preflight inspection was carried out by the PIC with nil abnormalities observed.
4. During the flight, there was oil leak from the left engine which resulted in drop in oil pressure and sudden rise in oil temperature.
5. The left engine was shut down by the pilots in air.
6. The LH engine oil gage tube was found not positively secured. Due to lack of lubrication the bearing on no. 4 Piston connecting rod broke into pieces. The broken bearing metal pieces were found inside the oil sump, which blocked the suction screen.
7. Operation Manager of M/s PAPL's had written a letter to APD Bhopal Airport requesting for entry of equipment & technicians for maintenance of VT-TAA aircraft on 26 Mar 2021 without the knowledge of CAM.
8. All requested tools, equipment and two maintenance personnel were taken inside the airport in the presence of Director Operations on 26 Mar 2021 and 27 Mar 2021. However, activities undertaken if any, on the aircraft subsequent to carrying the equipment and tools inside the airport was not documented.
9. Aircraft C of R, C of A, and ARC were valid and as per aircraft records the aircraft VT-TAA was airworthy.
10. Both crew were appropriately licensed, qualified and authorized as per prevailing DGCA civil Aviation Requirement (CAR) to undertake the flight.
11. On 27 March 2021, after shutting down the LH Engine, the crew did not declare emergency to ATC Bhopal as required by DGCA CAR Section 9, Series D part III.
12. Crew did not appraise the actual reason to ATC Bhopal for air turn back to Bhopal on 27 Mar 2021.
13. On the day of accident, the weather was clear, calm with no significant trend.
14. Pilots requested ATC Bhopal for permission to land on cross runway, which was denied by ATC as it was a runway in disuse only used as a taxiway.
15. Thereafter, the crew informed ATC Bhopal regarding force landing of the aircraft.
16. ATC Bhopal extended support to the aircraft after the crew informed their intention of force landing.
17. The Aircraft force landed in a vacant paddy field sustaining damages.

### **3.2 Probable cause of the Accident**

*The probable cause of the accident was Oil leak from the LH engine during the flight. Consequently, oil starvation and lack of lubrication resulted in excessive heat generation amongst the frictional components. Due to excessive heat, the bearing of no. 4 piston connecting rod failed and broke into pieces. However, the root cause of the LH engine oil leak could not be conclusively established.*

*Subsequent to LH engine seizure, the crew did not follow the emergency procedures for single engine operation and took a decision to come for landing with single engine (RH). The crew further aggravated the emergency situation by not communicating the actual reason with ATC, displaying gross lack of situational awareness in handling the emergency. Crew estimated that they cannot reach the airport runway due to the low altitude and force landed the aircraft before the airport.*

### **4. SAFETY RECOMMENDATIONS**

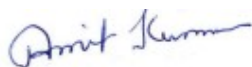
It is recommended that

**4.1** DGCA may carry out a regulatory audit of M/s PAPL to validate the compliance of regulatory requirements laid down in DGCA CAR M.

**4.2** DGCA may carry out a regulatory audit of M/s PAPL's contracted maintenance organization to validate the compliance of regulatory requirements laid down in DGCA CAR M & DGCA CAR 145.

**4.3** DGCA may review the Operations Manual of M/s PAPL with special emphasis on duties and responsibilities of DGCA approved Post Holders.

**4.4** The pilots may be imparted corrective training prior to release in order to ensure compliance of DGCA CAR, Section 9 Series D Part III.



**Amit Kumar**  
**Investigator In Charge**



**KUS Phani**  
**Investigator**

**Date:14 Nov 2022**

**Place: New Delhi**