



सत्यमेव जयते

**Government of India**

**Directorate General of Civil Aviation**

**Final Investigation Report on Incident to M/s Redbird Flight Training Academy  
Cessna 172S Aircraft VT – CAY on 25.06.2023 near Kalaburagi Airport, Kalaburagi.**

## **FOREWORD**

*In accordance with Annex 13 to the International Civil Aviation Organization Convention and the Aircraft (Investigation of Accidents & Incidents) Rules 2017, the sole objective of this investigation is to prevent aviation incidents/ accidents in the future. It is not the purpose of the investigation to apportion blame or liability.*

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

## **GLOSSARY**

1	AME	Aircraft Maintenance Engineer
2	AMSL	Above Mean Sea Level
3	ATC	Air Traffic Control
4	ARC	Airworthiness Review Certificate
5	BA	Breath Analyzer
6	BDC	Bottom Dead Centre
7	CAR	Civil Aviation Requirements
8	CRS	Certificate of Release to Service
9	CVR	Cockpit Voice Recorder
10	DGCA	Directorate General of Civil Aviation
11	FADEC	Full Authority Digital Engine Control
12	FTO	Flying Training Organization
13	FTPR	Flying Training Progress Record
14	HPP	High Pressure Pump
15	PFME	Pre – Flight Medical Examination
16	METAR	Meteorological Terminal Air Report
17	OEM	Original Equipment Manufacturer
18	PDR	Pilot Defect Report
19	PIC	Pilot in Command
20	RT	Radio Telephony
21	RWY	Runway
22	SPL	Student Pilot License
23	TSN	Time Since New
24	UTC	Universal Coordinated Time
25	VMC	Visual Meteorological Conditions

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**Final Investigation Report on Incident to M/s Redbird Flight Training Academy Cessna 172S**

**Aircraft VT – CAY on 25.06.2023 near Kalaburagi Airport, Kalaburagi.**

1. Aircraft

Type : Cessna

Model : Cessna 172S

Nationality : INDIAN

Registration : VT – CAY

2. Owner : M/s REDBIRD FLIGHT TRAINING ACADEMY PVT.  
LTD.

3. Operator : M/s RED BIRD FLIGHT TRAINING ACADEMY PVT.  
LTD.

4. Pilot-in-Command : CPL Holder

5. Extent of injuries : NIL

6. Date of incident : 25.06.2023

7. Time of incident : 03:54 UTC (approx.)

8. Place of Incident : Open field (Chitpur) near Kalaburagi Airport

9. Co-ordinates of incident site : 17°11'56.796"N, 76°59'23.5248"E

10. Last point of Departure : VOGB (M/s AAI, Kalaburagi Airport, Kalaburagi)

11. Intended place of Landing : VOGB (M/s AAI, Kalaburagi Airport, Kalaburagi)

12.No. of passengers on board : 02

13.Type of operation : Dual Instrument Flying

14.Type of Incident : SCF-PP.

(All timings are in UTC unless specified)

**Synopsis: -**

M/s Redbird Flight Training Academy Private Limited Cessna 172S Aircraft VT – CAY was planned for a dual instrument flying training on 25.06.2023. The sortie was authorized by the instructor pilot, who was also a Flight Instructor.

The aircraft departed from runway 09 of VOGB at 0315 UTC. After completion of 30 minutes of flying, they reported aircraft position to ATC. While practicing rate one turn, Instructor advised the student pilot to reduce the power by 2-3 %.

However, when the student pilot reduced the power, the engine's power indication dropped to 1%. The instructor immediately took control of the aircraft and attempted to increase power, but the engine responded for a second for increment of power up to 40% and thereafter power dropped to 1% again. The instructor and student pilot observed that the FADEC A & B warning lights were illuminating.

Despite attempts to reset the FADEC system, the issue persisted. The instructor then tried to switch to an alternate FADEC system but in vain. Realizing the seriousness of the situation, the instructor declared an emergency to air traffic control (ATC) at around 03:54 UTC approximately due to the engine failure.

Instructor glided the aircraft by 1NM/1000ft. When aircraft was around 10 NM, Instructor force landed the aircraft in an open field. The instructor and the student pilot evacuated the aircraft unhurt.

DGCA India, vide Order No DGCA-15018(17)/24/2023-DAS dated 11.07.2023 instituted investigation of the occurrence under Rule 13 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017 by an Investigator-In-Charge.

The probable cause of the incident was blockage in inlet valve of High-Pressure pump of the fuel system in closed position resulted engine power loss and subsequently led to forced landing of the aircraft in an open field.

## **1. Factual Information: -**

### **1.1 History of flight:**

On 25.06.2023, M/s Redbird Flight Training Academy Private Limited's Cessna 172 S Aircraft VT – CAY was involved in a Forced landing incident in an open field near Kalaburagi airport, Kalaburagi.

Incident Flight was the third flight of the day and first flight for the instructor and the student pilot. Previously, two sorties had been operated by another set of instructor and student pilot uneventfully.

After completion of briefing, the instructor and the student pilot took off from Runway 09 of Kalaburagi airport, at 03:15 UTC for instrument flying before watch hours by coordinating with another flying club. They were flying between 5 to 10NM south at 3600 ft. After the watch opened at 03:45 UTC aircraft contacted Kalaburagi Tower and reported their position.

After completion of sector flying for about 30 minutes and during the rate 1 turn practice, the instructor advised the student pilot to reduce the power by 2-3%. As soon as the student pilot reduced the power, in response engine power was reduced to 1 percentage. Immediately the instructor realized the situation and took over control and tried to maximize the power. During this time, the aircraft responded for 1 - 2 seconds and increment of power up to 40% & dropped back to 1 % again.

Instructor soon verified the position of the fuel knob and found it was in both positions (fuel supply from both wing tanks) and sufficient fuel was observed by the crew as they were carrying 100 liters which ensures an endurance of 5 Hours. Immediately instructor trimmed the aircraft and saw FADEC A & B warning lights were illuminating

Following the checklist, the instructor attempted to reset the FADEC by holding the test button for more than 2 seconds, but this was unsuccessful. Since they were flying at 3600 ft, they attempted to switch to FADEC B manually using the Force B switch, but received no response from the engine. Despite several attempts to restart the engine, but in vain. In the meantime, the instructor again attempted to restart the engine for 3 - 4 times as the propeller was windmilling but no response from the engine.

Instructor declared engine failure at 03:55:15 UTC and ATC advised the aircraft to “descend to circuit altitude and report flight insight” and the crew reported back stating “Unable sir going for landing.”

Since the aircraft had completely lost power and the crew could not make it back to airport, they decided to carry out force landing in an open field near Kalaburagi Airport. The

instructor glided the aircraft and at around 300 feet put the engine master off and flaps to 10, 20 & 30 in sequence were selected. Crew landed the aircraft on a clean field without any obstruction. After carrying out force landing instructor and the student pilot came out of the aircraft unhurt.

Post landing, the aircraft was moved from the incident site to hangar by removing the aircraft wings and transported in a vehicle with prior notification to DGCA.

### 1.2 Injuries to persons: -

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/None	Nil/02	Nil	

### 1.3 Damage to aircraft: -

Buckling of Port Side Fairing of Main Landing Gear as shown in the picture below:



Pic:1

### 1.4 Other damages: - Nil



## **1.5 Personnel information: -**

### **1.5.1 Instructor pilot (Flight Instructor):**

Age	32 Years, Male
License	Commercial Pilot License (CPL)
Date of Issue	29/07/2016
Valid Upto	28/07/2026
Category	Aeroplane
Date of Class I/II Med. Exam	10/07/2022
Class I Medical Valid Up to	14/07/2023
Date of issue of FRTOL License	29/07/2016
IR rating and instructor rating	IR: Valid upto:06/02/2024 FIR: Valid upto:01/08/2023
FRTOL License Valid Upto	28/07/2026
Total Flying Experience (Experience on type)	1739 hours 40 minutes, (C-172 24 hours 15 minutes & Ground refresher for C-172 done on 08.01.2023)
Total experience during last 01 year	259 hours 20 minutes
Total experience during last 06 months	190 hours 20 minutes
Total experience during last 30 days	51 hours 20 minutes
Total experience during last 07 days	09 hours 15 minutes
Total experience during last 24 hours	01 hours 55 minutes
Duty time Last 24 hours	09 hours 30 minutes
Rest before the flight	16 hours 00 minutes

### **1.5.2 Student Pilot:**

Age	19 Years, Male
License	Student Pilot License (SPL)
Date of Issue	06/02/2023
Valid Upto	05/02/2033
Category	Aeroplane
Date of Class I/II Med. Exam	01/12/2022
Class I Medical Valid Up to	30/11/2023
Date of issue of FRTOL License	03/04/2023
IR rating and instructor rating	NA
FRTOL License Valid up to	02/04/2033
Total Flying Experience (Experience on type)	78 hours 10 minutes (C-172 07 hours 30minutes)
Total experience during last 01 year	78 hours 10 minutes
Total experience during last 06 months	78 hours 10 minutes

Total experience during last 30 days	29 hours 00 minutes
Total experience during last 07 days	08 hours 50 minutes
Total experience during last 24 hours	00 hours 00 minutes
Duty time Last 24 hours	00 hours
Rest before the flight	Adequately rested

#### **1.6 Aircraft information: -**

M/s Redbird Flight Training Academy Private Limited Cessna 172S Aircraft is a single-engine all metal high wing aircraft with fixed landing gear. This aircraft is powered by Thielert TAE 125-02-99 engine (Continental Diesel CD-135) is a liquid cooled four in-line four stroke engine with DOHC (Double overhead camshaft). The valves are activated by cam followers. The operation of the direct diesel injection engine is based on the common rail technique and is turbo charged. The engine is controlled by FADEC system. The propeller is driven by integrated gearbox. The engine is equipped with electric starter and an alternator.

Aircraft VT-CAY (MSN:172S10264) was manufactured in year 2006. The aircraft was registered with DGCA under the ownership of M/s Red bird Flying Training Academy Private Limited. The aircraft is registered under Category 'A' and issued Certificate of registration No. 5027 on dated 31 October 2022.

Last phase 3 inspection along with weekly inspection was carried out on 05.04.2023, During the phase 3 inspection fuel feed pump, high pressure pump, rail pressure control valve, coolant, induction air filter, alternator & filter were replaced. The last PDR reported on the engine was Engine vibrations on 22.05.2023. Snag rectification carried out on 22.05.2023 during the rectification fuel lines were cleaned, fuel filters were cleaned ground run carried out and found satisfactory. Aircraft is issued with Certificate of Release to Service (CRS).

Last Phase 1 (50 hours) & Phase 2 (100 hours) inspection & 100 hours replacement kit was carried out on the engine on 19.06.2023. After 100 hours inspection test flight was carried out and found satisfactory. Fuel filters were replaced during the last 100 hrs inspection on 19.06.2023.

The aircraft and its engine were being maintained as per the approved maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as approved by Directorate General of Civil Aviation (DGCA). There was no similar snag reported by the previous sector crew on the aircraft and no snag was pending for rectification. No similar snag history was recorded as per the engine logbook. No DGCA mandatory modification was pending and there was no MEL invoked on this aircraft at the time of incident.

Aircraft Details		
1. Certificate of Registration (C of R)	C of R No.	5027/4
	Registration	VT-CAY
	Year of manufacture	2006
	MSN	172S10264
2. Certificate of Airworthiness (C of A)	C of A No.	7130
	Issue Date	20.11.2009
3. Airworthiness Review Certificate (ARC)	ARC No.	7130(ARC)
	Issue date	18.11.2022
	Valid Up to	17.11.2023
4. Engine	Make	Thielert
	Model	TAE 125-02-99
	P/N	05-07200-M000202
	S/N	02-02-06277
	TSN	1268:35 hours
5. Propeller	Make	MT Propeller Entwicklung GmbH
	Model	MTV-6-A/190-69
	No of Blades	03
	Type	Constant speed variable pitch propeller
	S/N	070649
	TSN	1114:20 hours
6. Fuel Capacity	Total capacity	180 liters
	Total usable fuel	168.8 liters
	2 tanks each	90 liters
	Type of fuel used	Jet A1/Diesel
7. Last Schedule Inspection on Aircraft	Phase 1 (50 hours) inspection & Phase 2 (100 hours) inspection	A/F TSN: 7459:00 dated 19.06.2023
8. Last scheduled maintenance of High-Pressure Pump	600 hours replacement	P/N-05-7312-k005303 S/N 1677 removal carried out on 04.04.2023 and fitted P/N-05-7312-K005303 S/N 3977 on 05.04.2023.

### **Rectifications and Troubleshooting: -**

Post incident in the site, AME carried out visual inspection for any damage and found buckling of port side fairing of main landing gear. Then the aircraft was moved from the open field to Kalaburagi Airport, after obtaining necessary clearance from DGCA. The aircraft was brought to the hangar in dismantled condition after the incident. Before removal of aircraft from the incident site, fuel and oil were drained out and store separately.

Post Incident, the operator had intimated OEM regarding the engine power loss issue with the FADEC data. After analysis of the FADEC Data OEM confirmed that the engine power loss due to loss of rail pressure and advised to carry out visual inspection of engine, routings of wires. Visual inspection of the wires and routings had been carried out and found to be satisfactory.

On 28.06.2023 removal of feed 2 pump and high-pressure pump were carried out and checked for any resistance by turning the pumps by hand and the same was found satisfactory.

The aircraft was assembled to make it airworthy & during the assembly of aircraft both LH & RH wing was installed during the assembly of wings the fuel tanks LH & RH & all associated fuel lines were purged & cleaned during assembly on 30.06.2023.

On 03.07.2023 as per the recommendations of OEM, AME replaced the High-Pressure Pump and tried to restart the engine. This time engine started normally and all parameters were found in range.

On 19.07.2023 rail pressure control valve inspected cleaned and reinstalled ground run carried out and the engine data has been downloaded and sent to OEM for further analysis.

On 21.07.2023 rail pressure control valve was replaced with new one since the OEM observed mild fluctuations in the data. After replacement of High-pressure pump and rail pressure control valve, OEM confirmed rail pressure is normal without any fluctuations. Aircraft was released for service on 24.07.2023. The entire fuel system was also inspected for any failure/FOD/contamination in view of the recommendation made by the OEM after detailed examination of the High-pressure fuel pump. No abnormality was observed during the inspection.

#### **1.6.1 Engine Fuel System:**

##### **General Description:**

The engine is a direct Diesel injection engine with common-rail technology. Fuel passes the selector, the electric gear pump (if installed) and reaches the filter module, where the cold fuel is warmed by returning fuel (until the feeding fuel temperature of 60°C).

Thereafter it reaches the feed pump (building a pressure of 5 bar [72.5 psi]) and then the high-pressure piston pump, producing a pressure up to 1500 bar (21755 psi), which is led to the rail.

The pressure is measured and regulated between 500 bar (7252 psi) and 1350 bar (19580 psi) by a pulse width modulated control valve. Since the main pump produces a high fuel flow and only a part of it is used for combustion, the rest is returned through the filter module and fuel selector to the tank in use, where it warms the remaining fuel.

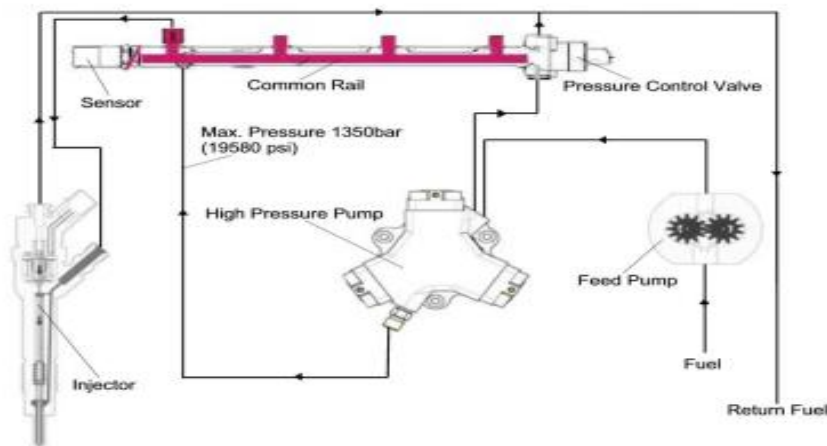


Figure 1 Engine Fuel System

### Feed Pump:

The feed pump is an intake-camshaft driven gearwheel pump which provides the HPP with diesel or jet-fuel with a pressure of 3-5 bar (43.5 psi to 72.5 psi). The main components are two counter rotating gear wheels which mesh with each other when rotating, whereby fuel is trapped in the chambers formed between the gearwheels and is transported to the outlet. Due to the camshaft drive, the delivery quantity is proportional to the engine speed.

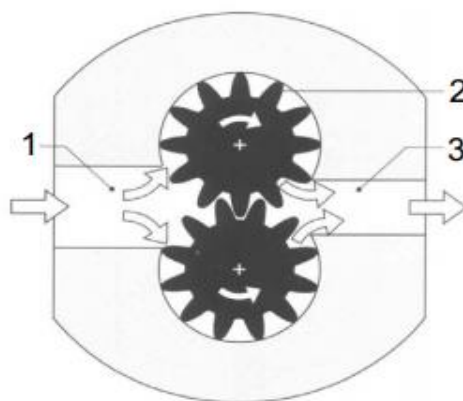


Figure 2 Fuel Feed Pump

- 1 Suction End
- 2 Drive Gear
- 3 Pressure end

## High Pressure Pump:

The High-pressure pump is an outlet-camshaft driven radial-piston-pump, which pressurizes the common rail with up to 1350 bar (19580 psi). The HPP is the interface between the low pressure and the high-pressure stages.

In contrast to conventional systems, the HPP continually generates the rail pressure so the fuel does not have to be specially compressed for the injection process. An eccentric drive shaft moves the 3 pistons of the pump up and down in accordance with the shape of the cam.

The feed pump forces fuel through the inlet valve into the pumping element chamber and the down moving piston sucks the fuel into the cylinder. Passing the BDC the inlet valve closes and the fuel can now be compressed. As soon the pressure in the cylinder is higher than the rail pressure, the outlet valve opens and the fuel enters the high-pressure circuit. Several parts of the HPP have got a special coating to ensure the operation with diesel and jet fuel in any mix-ratio.

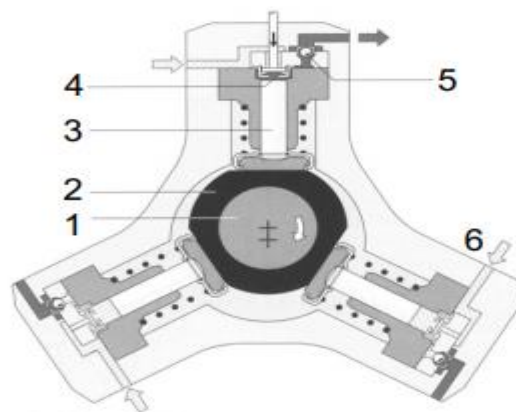


Figure 3 High Pressure Pump

- 1 Driveshaft
- 2 Eccentric cam
- 3 Pumping element with Pump Piston
- 4 Inlet Valve
- 5 Outlet Valve
- 6 Inlet

## Common Rail:

The common rail stores the pressure of the HPP and supplies the injectors with fuel. The sensor and the pressure control valve are fit in the common rail. The high-pressure accumulator is common to all cylinders. Its available rail volume is permanently filled with pressurized fuel. The compressibility of the fuel resulting from the high pressure is utilized to achieve the accumulator effect. This causes a practically constant rail pressure even when fuel leaves the rail for injection.

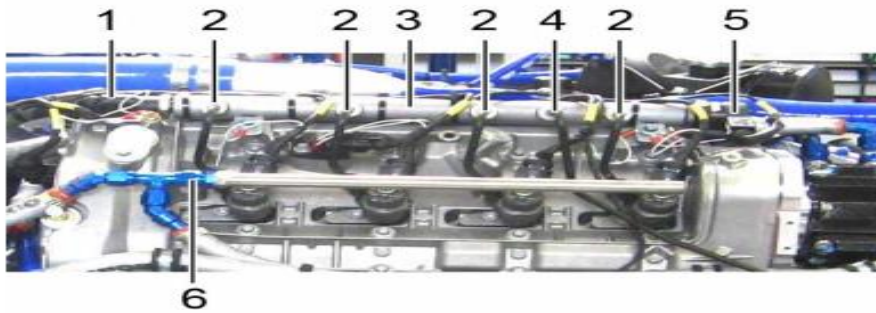


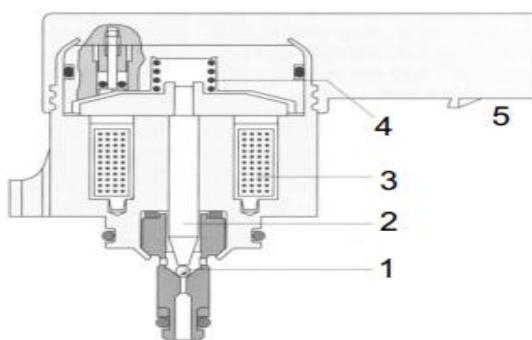
Figure 4 Common Rail (TAE 125-02-99)

- 1 Rail Pressure Sensor
- 2 Injector Duct Connection
- 3 Rail
- 4 High Pressure Supply
- 5 Pressure Control Valve
- 6 Fuel Return

### Pressure Control Valve:

The pressure control valve sets the correct pressure in the rail. It is a solenoid operation valve actuated by FADEC. The Pressure control valve is provided with a mounting flange for attachment to the rail and connection to the return fuel system. It incorporates two control loops:

- A fast-response mechanical control loop to compensate for the high-frequency pressure fluctuations. A spring closes the control valve up to maximum pressure of approximate 100 bar (1450 psi).
- A slow-response electrical control loop for setting a variable mean pressure in the rail. If the pressure in the high-pressure circuit must be increased, the force of the solenoid must be generated in addition to the spring force. The forces of the solenoid are proportional to its energizing current which is pulse width modulated with a frequency of 1 kHz.



- 1 Valve Ball
- 2 Armature
- 3 Electromagnet
- 4 Spring
- 5 Electrical Connection

Figure 5 Pressure control valve

### Rail Pressure Sensor:

The rail pressure sensor measures the instantaneous pressure in the rail and generates an output signal for the FADEC. The fuel flows to the rail pressure sensor through an opening in

the rail. Pressurized fuel reaches the sensor's diaphragm through a blind hole.

The sensor element for converting the pressure to an electric signal is mounted on this diaphragm. The signal is needed as feedback signal for the FADEC to control the rail pressure.

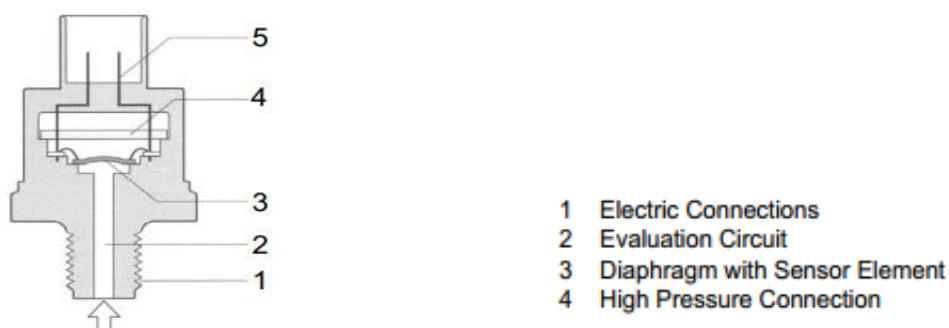


Figure 6 Rail Pressure sensor.

### 1.6.2 History of Schedule inspection carried out on High – Pressure Pump & Rail Pressure Control Valve:

The recommended inspection for High-pressure pump & Rail Pressure Control Valve is need to be replaced every 600 hrs as per the Aircraft Maintenance Program (AMP) & Operation and Maintenance manual (OM-02-02) of CD-135. The details of replacement of High-Pressure pump & Rail Pressure Control Valve are as follows:

#### High Pressure Pump:

Sl. No.	Date of Replacement	Description of the item	Engine Hours	Part Number of the replaced component	Status of the component
1	02.07.2022	High pressure Pump	00:00	P/N-05-7312-K005303 S/N 7817	Overhauled by the OEM (Continental Aerospace Technologies GmbH, Germany)
2	07.11.2022	High pressure Pump	597:35	P/N-05-7312-K005303 S/N 1667	Overhauled by the OEM (Continental Aerospace Technologies GmbH, Germany)
3	05.04.2023	High	1189:05	P/N-05-	Overhauled by the



		pressure Pump		7312-K005303 S/N 3997	OEM (Continental Aerospace Technologies GmbH, Germany)
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#### Rail Pressure control Valve:

Sl. No.	Date of Replacement	Description of the item	Engine Hours	Part Number of the replaced component	Status of the component
1	02.07.2022	Rail Pressure Control Valve	00:00	P/N 05-7320-E000703 S/N N/A	New
2	07.11.2022	Rail Pressure Control Valve	597:35	P/N 05-7320-E000703 S/N N/A	New
3	05.04.2023	Rail Pressure Control Valve	1189:05	P/N 05-7320-E000703 S/N N/A	New

#### 1.6.3 Flight Plan:

The following extract has been deduced from the online flight plan filed by the operator before operating the incident flight:

VTCAV

VOGB → VOGB

ETD 6/25/2023 0300

3600 FT

FILED

DLA

CNL

CHG

Copy

Upload

## ADC – C523C

#### 1.7 Meteorological information: -

Kalaburagi aerodrome has a facility to receive data from the Aviation Meteorological Office Bangalore. METAR issued on 25.06.2023 at M/s AAI Kalaburagi Airport, Kalaburagi on the day of the incident is as follows:-

Time	250330Z	Time	250400Z
Wind	270/08KT	Wind	290/10KT
Visibility	7000 M	Visibility	7000M
Cloud	Few 800 FT (240 M) SCT 1500 FT (450 M) BKN 8000 FT (2400 M)	Cloud	SCT 800 FT (240 M) SCT 1500 FT (450 M) BKN 8000 FT (2400 M)
Temperature	27	Temperature	27
Dew Point	24	Dew Point	24
QNH	1008 hPa	QNH	1008 hPa
QFE	0953 hPa	QFE	0953 hPa

### 1.8 Aids to Navigation: -

Kalaburagi Airport, Kalaburagi (VOGB) Airport is equipped with DVOR (Digital Very High Frequency Omni Range) /DME (Distance Measuring Equipment) & PAPI (Precision Approach and Path Indicator) on both the Runways i.e., Runway "09" & Runway "27".

### 1.9 Communication: -

Tape Transcript for VOGB Tower Frequency (122.025MHZ) of ATC unit, Kalaburagi Airport for time duration from 03:44UTC to 04:10UTC on 25.06.2023.

Note: Kalaburagi watch opening is at 03:45 UTC as per NOTAM C0504/23

Time	Unit	RT Communication
03:44:18- 03:44:48	VTCAV	VTCAV good morning
	Tower	Good morning, confirm south of the field, between 5 to 10NM
	VTCAV	Affirm sir, south of the field 5 to 10 nm, 3600feet, VAY
03:52:02- 03:52:24	Tower	VBL rejoin circuit and report right downwind RWY 27 and visual with field
03:54:41- 03:55:14	VTCAV	VTCAV
	Tower	Go Ahead
	VTCAV	Sir Declaring emergency due engine failure going for Forced Landing
	Tower	Roger just standby
	Tower	VBL orbit at present position to the north
	VTRBL	Initiating orbit towards North VBL at 4 miles
	Tower	Roger

	Tower	VAY descend to circuit Altitude and report field Insight
	VTCAV	Unable sir going for landing
	Tower	Vay Which portion

After this there is no communication was made to the ATC by the aircraft.

#### **1.10 Aerodrome information: -**

Kalaburagi Airport is a domestic airport owned M/s AAI and serving the city of Kalaburagi in the state of Karnataka, India. It is located 12 km (7.5 mi) east from the city Centre. M/s Star Air & Alliance Air were operating from Kalaburagi Airport. Apart from that M/s Asia Pacific Training Academy Private Limited is incorporating training in the Kalaburagi airport. Aerodrome is licensed under public category vide license no. AL/PUB/086 and valid till 30.10.2023. The airport has a single RWY (09/27) with a length of 3,175 meters and 45 meters width. The surface of the RWY is level and paved with asphalt. Aerodrome Reference Coordinates point are 17°18'28"N 76°57'29"E and approved with firefighting category CAT-6.

<b>RWY Designation</b>	<b>Elevation</b>	<b>TORA(M)</b>	<b>TODA(M)</b>	<b>ASDA(M)</b>	<b>LDA (M)</b>
09	1567	3175	3175	3175	3175
27	1567	3175	3175	3175	3175

M/s Redbird Flight Training Academy Private Limited is also operating and utilizing the airport facility for flying training and maintenance related activity also has permission to operate beyond watch hours Kalaburagi Airport in coordination with another flying club and handover the operations to VOGB ATC 30 minutes prior to commencement of watch hours in the same condition.

The SOP has procedures for conducting flight-training operations beyond watch hours at Kalaburagi Airport, Karnataka for Redbird Flying Training Academy.

DGCA approved Chief Flight Instructor/ Deputy Chief Flying Instructor/Flight Instructor will be in-charge of the training operations at Kalaburagi Airport.

Some of the salient points from the SOP as follows:

1. Aircrafts will maintain two-way communication with Red bird ATC and Redbird shall be responsible for maintaining the required separation.
2. This shall be maintained with the help of ground-based radio Telephony apparatus present in hangar.
3. Fully serviceable Backup RT sets shall be always available/ be available at all times.

All firefighting equipment will be provided by Redbird Flight Training Academy as per the DGCA guidelines for operations of light aircraft during the operations of flying carried out beyond watch hours.

The details of the same are given below:

- a) A trailer will be provided consisting of 4 members of 10Kg dry chemical extinguisher. 2 numbers of 10Kg Carbon dioxide extinguisher. 2 numbers of 10 gallons capacity foam extinguisher.
- b) The following cutting tools shall also provide with the trailer.
  - i) 1 large axe.
  - ii) 2 numbers of small fireman's axe
  - iii) 1 Hacksaw
  - iv) 1 crowbar 3 1/2

A vehicle shall be available to tow the trailer whenever necessary.

#### Medical Facilities:

All medical first aid facilities will be provided by Redbird Flight Training Academy during the operations of Flying carried out beyond watch hours. Ambulance services if required will be provided by the United Multi Speciality Hospital.

### **1.11 Flight recorders:**

As per the prevailing DGCA Civil Aviation Requirements, Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR) were neither fitted nor required. Aircraft is fitted with Garmin 1000 with SD Card. Salient points from the data is as follows: -

1. At 03:20:13 UTC the aircraft took off from Kalaburagi Airport from Runway 09.
2. At 03:23:49 UTC the aircraft attained 3611ft Above MSL from Kalaburagi.
3. AT 03: 52: 31 UTC aircraft started descending from 3745 ft, heading was 234.3 degrees and track was 219.5 degree.
4. AT 03:54:13 UTC started approaching for forced landing at 2439.6ft with VSpd of - 1018.14 fpm and continued approach and touchdown at 03:55:36 UTC.
5. At 03:55:42 UTC the aircraft came to a complete halt.

Parameters such as fuel flow, rpm, position of controls were not recorded in the SD card.

### **1.12 Wreckage and impact information: -**

On-site inspection revealed that there were neither damages nor defect on the aircraft due incident except bulking observed on the port side of the main landing gear. Aircraft after rolling for about 127 feet (approximately), aircraft came to a complete halt (Refer Pic Below).



Fig: Path followed by the aircraft and its final position

#### **1.13 Medical and Pathological Information: -**

Post Flight Medical Examination was carried out and found that the instructor and Student Pilot was not under the influence of alcohol. Further, both the crew underwent Pre – Flight Medical Examination before taking up the incident flight and found not under the influence of alcohol.

Instructor & Student pilot was taken to the hospital for Medical Examination and found that both were physically fit without any physical injury.

#### **1.14 Fire: -**

There was no fire or smoke during or following the incident.

#### **1.15 Survival aspects: -**

The incident was survivable as the instructor & student pilot came out of the aircraft unhurt post incident.

#### **1.16 Tests and research: -**

Fuel and oil Samples were collected and sent to DGCA Laboratory, New Delhi to analysis for any fuel contamination. The fuel and oil testing were found passed the test.

High-pressure Pump and Rail pressure control valve were sent to OEM for fault identification on 18.08.2023.

After inspection of the HPP, on 08.11.2023 OEM replied stating “the inlet valve was found blocked in the closed position and metal debris was found inside the HPP which however the metal debris did not belong to the HPP.” The origination of metal debris inside the High - Pressure Pump of the fuel system could not be established during investigation. OEM had recommended to check the entire fuel system. Inspection of Fuel system carried out and the inspection did not reveal any abnormality.

### **1.17 Organizational & Management Information: -**

M/s Redbird Flight Training Academy Private Limited is a DGCA approved flying training organization headquarter is at Baramati Airport, Pune, Maharashtra, and operational bases are situated in following locations:

- a. Suktara Airport, Seoni, Madhya Pradesh,
- b. Lilabari Airport, North Lakhimpur district, Assam,
- c. Kalaburagi Airport, Karnataka,
- d. Belagavi Airport, Karnataka &
- e. Harton Technology Park, Sector – 18, Gurugram

Having fleet size of 26 Single Engine Aircrafts (22 Tecnam P2008 JC Aircrafts and 04 Cessna 172 Aircrafts) and a single Multi Engine Aircraft of Tecnam P2006T Aircraft.

DGCA approval #01/2020 and valid up to 22.07.2025. Redbird Flight Training Academy Pvt. Ltd. has CAR-145 (AMO) & CAR-M subpart-G (CAMO) approval. CAMO and CAR 145 facilities are approved by DGCA under respective CARs for continuing airworthiness management and maintenance of their aircraft respectively.

### **1.18. Additional information: -**

#### **1.18.1 POH Reference: -**

In case of both the loss of power & FADEC lights are flashing the pilot must follow the below mentioned procedure as per the POH.

#### **ROUGH ENGINE OPERATION OR LOSS OF POWER**

##### **DECREASE IN POWER**

- (1) Push Thrust Lever full forward (Take-off position)
- (2) Fuel Selector to BOTH Position.
- (3) Electric Fuel Pump – ON
- (4) Reduce airspeed to 65-85 KIAS (best glide recommended),  
(max. 100 KIAS)
- (5) Check engine parameters (FADEC lights, oil pressure and temperature, fuel quantity)

If normal engine power is not achieved, the pilot should:

- i) Land as soon as possible
- ii) Be prepared for an emergency landing
- iii) Expect an engine failure

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**▲ WARNING:** The high pressure pump must be checked by an authorized service center before the next flight.

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## **ABNORMAL ENGINE BEHAVIOR**

If the engine acts abnormal during flight and the system does not automatically switch to the B-FADEC, it is possible switch to the B-FADEC manually.

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▲ **WARNING:** It is only possible to switch from the automatic position to B-FADEC (A-FADEC is active in normal operation, B-FADEC is active in case of malfunction). This only becomes necessary when no automatic switching occurred in case of abnormal engine behavior.

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(1) Select an appropriate airspeed to avoid engine overspeed.

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▲ **WARNING:** When operating on FADEC backup battery only, the "Force B" switch **MUST NOT BE** activated. This will shut down the engine.

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(2) "Force-B" switch to B-FADEC

(3) Flight may be continued, but the pilot should:

- i) Select an airspeed to avoid engine overspeed
- ii) Land as soon as possible
- iii) Be prepared for an emergency landing

### **b) Both FADEC Lights are flashing**

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◆ **Note:** CED load display should be considered unreliable with both FADEC lights illuminated. Use other indications to assess engine condition.

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1. Press FADEC test knob at least 2 seconds
2. FADEC Lights extinguished (LOW warning category):
  - a) Continue normal flight,
  - b) Inform service center after landing.
3. FADEC Lights illuminated steady (HIGH warning category):
  - a) Check the available engine power,
  - b) Expect engine failure.
  - c) Flight can be continued, however the pilot should
    - i) Select an appropriate airspeed to avoid engine overspeed.
    - ii) Land as soon as possible.
    - iii) Be prepared for an emergency landing.
  - d) Inform service center after landing.
4. In case a fuel tank was flown empty, proceed at the first signs of insufficient fuel feed as follows:
  - a) Immediately switch the Fuel Selector to BOTH
  - b) Electric Fuel Pump – ON
  - c) Select an airspeed to avoid engine overspeed.
  - d) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position).
  - e) If the engine acts normally, continue the flight and land as soon as possible.

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▲ **WARNING:** The high-pressure pump must be checked by an authorized service center before the next flight.

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**1.19 Useful or effective investigation techniques: -**

Nil.

**2. ANALYSIS: -**

**2.1 Serviceability of the aircraft:**

The aircraft was in a serviceable condition when it was released for the dual instrument flight. On the day of incident, the aircraft had operated 02 flight sortie, without any defects/abnormalities during flight. The incident sortie was the third sortie for the day.

The aircraft had a valid Certificate of Registration which was issued on 30.10.2022 by DGCA INDIA along with a valid Certificate of Airworthiness issued on 20.11.2009 and its last ARC was issued on 18.11.2022 valid Upto 17.11.2023.

The last inspection was carried out on the Aircraft was on 19.06.2023 which was 50 Hours Phase -1- & 100-Hours Phase-2 inspection at 7459:00 airframe hours. The last snag reported on the aircraft was of Engine vibrations on 22.05.2023 and rectification for the same has been carried out, Subsequently, CRS was issued on 22.05.2023.

Lately, phase 3 inspection along with weekly inspection was carried out on 05.04.2023, During the phase 3 inspection fuel feed pump, high pressure pump, rail pressure control valve, coolant, induction air filter, alternator & filter were replaced.

The High-Pressure Pump & Rail Pressure Control Valve Assembly needs replacement every 600 hours as per the Aircraft Maintenance Program (AMP) & Operation and Maintenance manual (OM-02-02) of CD-135. The replacement of High-Pressure Pump and rail control valve was carried out on 05.04.2023 at 1189:05 engine hours. Also, replacement of Rail Pressure control valve was on 05.04.2023 at 1189:05 engine hours.

After the replacement of High-Pressure pump and Rail pressure control valve the engine had completed 76:30 hours since inspection. No similar defects were recorded on this aircraft.

Post Incident, the operator had intimated OEM regarding the engine power loss issue along with the FADEC data. After analysis of the FADEC Data OEM advised to change the High-Pressure Pump and advised to change the rail pressure control valve. As per the instruction of OEM, operator had carried out the replacement of High-pressure pump, rail pressure control valve and checked on the entire fuel system check which was found to be satisfactory.



High-Pressure Pump and Rail pressure control valve were sent to OEM for fault identification. During inspection of the HPP the inlet valve was found blocked in the closed position and metal debris was found inside the HPP which however the metal debris was not originating from the High-Pressure Pump of the fuel system. OEM has recommended to check the entire fuel system. Fuel system was checked by the operator as per the recommendation of OEM and the same found satisfactory.

The origination of metal debris inside the High-Pressure Pump of the fuel system could not be established during the course of investigation.

## **2.2 Pilot Handling of the Aircraft: -**

Incident flight was the first flight of the day for the instructor and student Pilot. On 25.06.2023 the instructor and student pilot had enough rest to carry out the sortie. During preflight inspection there were no abnormalities observed by the pilots.

The aircraft took off from Kalaburagi airport beyond watch hours for Dual instrument flying. On completion of rate 1 turn practice by the student pilot, the instructor advised the student pilot to reduce the power by 2-3 percentage. After reduction of power, the crew soon observed complete power loss from the engine.

Keeping the above in mind, instructor immediately took over control from the student pilot and followed the POH procedure pertaining to Power loss to recover the engine. As per the procedure, instructor immediately maximized the power and received response from the engine for about 1-2 seconds and then the power dropped back again and the instructor also verified the fuel selector knob and it was in both position and had enough fuel. Then the Instructor noticed FADEC A & B failure was illuminating. The instructor followed the "Both FADEC Light Flashing" checklist and tried to restart the engine but no response from the engine.

Then he tried to restart the engine by manual override by pressing the FORCE B switch still no response from the engine After activation of Force B switch, they did not get any response from the engine. Since the instructor informed the ATC tower about the emergency and decided to land the aircraft as early as possible. The instructor glided the aircraft and at around 300 feet put the engine master off and flaps to 10, 20 & 30 in sequence were selected. Crew landed the aircraft on a clean field without any obstruction. After carrying out force landing instructor and the student pilot came out of the aircraft unhurt.

From the above it is inferred that; Pilot followed the emergency procedure and the handling techniques adopted by the crew was not a contributory factor.

### **2.3 Weather: -**

During the time of incident, visibility was reported to be 7000 m with winds 270/08knots, cloud few at 800 feet and scattered 1500 feet, broken clouds were observed 8000 feet, temperature 27 & dew point 24. However, few clouds were observed around 800feet and the weather is conducive for the flight. Weather was not a contributory factor for this incident.

### **2.4 Circumstances leading to incident: -**

During the investigation, it is understood that the engine is a type of diesel engine called a Direct Diesel Injection engine with common rail technology. The working principle of the diesel engine as follows: Fuel travels through different parts, like a selector, an electric gear pump (if it is there), and a filter module where cold fuel is warmed up by returning fuel until it reaches a temperature of 60°C. Then it goes through a feed pump, building pressure to 5 bar, and into a High-pressure piston pump, which boosts the pressure up to 1500 bar, and this high pressure is sent to the rail. Then, the pressure is measured and regulated between 500 bar and 1350 bar by a pulse width modulated control valve. Since the main pump produces a high fuel flow and only a part of it is used for combustion, the rest is returned through the filter module and fuel selector to the tank in use, where it warms the remaining fuel.

In this situation, the issue is that, the High-pressure pump was not generating adequate pressure because of the blockage of inlet valve of High- Pressure pump due the presence of metal debris, which resulting in falling short of the adequate pressure. Consequently, the rail pressure control valve is not receiving enough fuel from the pump. As a result, the engine did not receive sufficient fuel, causing it to fail to deliver power, ultimately leading the aircraft to forced landing in an open field.

## **3. CONCLUSION:**

### **3.1 FINDINGS:**

- 3.1.1.** The aircraft had a valid Certificate of Registration, Certificate of Airworthiness and Airworthiness Review Certificate at the time of incident.
- 3.1.2.** The instructor and the student pilot, both had valid license and ratings to operate the aircraft.
- 3.1.3.** The aircraft was maintained in accordance with the certified aircraft maintenance program and applicable Airworthiness Directive, Service Bulletins were complied with.

- 3.1.4.** Last phase 3 inspection along with weekly inspection was carried out on 05.04.2023. During the phase 3 inspection fuel feed pump, high pressure pump, rail pressure control valve, coolant, induction air filter, alternator & filter were replaced with new/overhauled component.
- 3.1.5.** On the day of incident, while performing a training flight, the instructor noticed sudden engine power loss followed by FADEC A & B failure.
- 3.1.6.** The instructor informed ATC, followed the emergency procedure and landed the aircraft safely on a clean field outside the aerodrome.
- 3.1.7.** During Rectification action by the operator post incident, the High-pressure pump of the fuel system was not building the required pressure.
- 3.1.8.** As per the recommendation of OEM, High-pressure pump of the fuel system was replaced.
- 3.1.9.** Rail pressure control valve was inspected, cleaned, and reinstalled. Data was downloaded and sent to the OEM for analysis.
- 3.1.10.** OEM observed some fluctuations in the data and asked the operator to replace the rail pressure valve also.
- 3.1.11.** High Pressure pump and the rail pressure control valve were sent to OEM for Defect analysis.
- 3.1.12.** During the investigation, OEM observed that, the inlet valve of the high-pressure pump was blocked in closed position due to metal debris found inside the pump. The debris was not originating from the HPP.
- 3.1.13.** The OEM recommended to inspect the fuel system for contamination. However, the inspection did not reveal any abnormality.
- 3.1.14.** After replacement of High-Pressure Pump and Rail Pressure control valve, no similar defect has been reported.

### **3.2 Probable Causes:**

Blockage of inlet valve of High-Pressure pump of the fuel system in closed position resulted in engine power loss and subsequently led to forced landing of the aircraft in an open field.

## **4. SAFETY RECOMMENDATIONS:**

Nil

Date: 21.11.2023

Place: Bengaluru

(Sangeetha A G)

Assistant Director of Air Safety,  
Investigator-In-Charge (VT-CAY)