

Government of India

Directorate General of Civil Aviation

**FINAL INVESTIGATION REPORT ON IN-FLIGHT SEPARATION OF RIGHT-SIDE
PASSENGER WINDOW TRANSPARENCY TO M/S NATIONAL FLYING TRAINING
INSTITUTE PVT. LTD DIAMOND DA-40 AIRCRAFT VT-NFF ON 23.12.2021.**

FOREWORD

In accordance with Annex 13 to the International Civil Aviation Organisation 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.	ATC	Air Traffic Control
3.	AMM	Aircraft Maintenance Manual
4.	ARC	Airworthiness Review Certificate
5.	BA	Breath Analyzer
6.	CPL	Commercial Pilot License
7.	CVR	Cockpit Voice Recorder
8.	CRS	Certificate to Release
9.	CFI	Chief Flight Instructor
10.	CG	Centre of Gravity
11.	DGCA	Directorate General of Civil Aviation
12.	DFDR	Digital Flight Data Recorder
13.	DME	Distance Measuring Equipment
14.	Deputy CFI	Deputy Chief Flight Instructor
15.	DI	Daily Inspection
16.	DA	Diamond
17.	DVOR	Doppler Very High Frequency Omni Range
18.	FRTOL	Flight Radio Telephone Operator's Licence
19.	FTPR	Flight Training Progress Report
20.	FL	Flight Level
21.	IR	Instrument Rating
22.	IST	Indian Standard Time
23.	LH	Left Hand

24.	MTOW	Maximum Take-off Weight
25.	MEL	Minimum Equipment List
26.	MSN	Manufacturer's Serial Number
27.	NM	Nautical Mile
28.	NDB	Non-directional Beacons
29.	OEM	Original Equipment Manufacturer
30.	POH	Pilot Operating Handbook
31.	RH	Right Hand
32.	RWY	Runway
33.	SOP	Standard Operating Procedure
34.	SPL	Student Pilot License
35.	SE	Single Engine
36.	TSN	Time Since New
37.	TSO	Time Since Overhaul
38.	UTC	Coordinated Universal Time
39.	VMC	Visual Meteorological Conditions
40.	VFR	Visual Flight Rules
41.	VOR	Very High Frequency Omni-Directional Range

INDEX:

Contents		Page No
Synopsis		2
1	Factual information	2
1.1	History of the Flight	2
1.2	Injuries to Persons	4
1.3	Damage to Aircraft	4
1.4	Other Damage	5
1.5	Personnel Information	5
1.6	Aircraft Information	6
1.7	Meteorological Information	11
1.8	Aids to Navigation	11
1.9	Communication	12
1.10	Aerodrome Information	13
1.11	Flight Recorders	14
1.12	Wreckage and Impact Information	15
1.13	Medical and Pathological Information	16
1.14	Fire	16
1.15	Survival Aspects	16
1.16	Tests and Research	16
1.17	Organizational & Management Information	16
1.18	Additional Information	16
1.19	Useful or effective investigation techniques	17
2	Analysis	17
3	Conclusions	20
3.1	Findings	20
3.2	Probable Cause	21
4	Safety Recommendations	21

**Final Investigation Report on In-Flight Separation of Right-Side Passenger
Window Transparency To M/s NFTI Diamond DA-40 Aircraft VT-NFF
On 23.12.2021**

1. Aircraft
 - Type : DIAMOND
 - Model : DA-40
 - Nationality : INDIAN
 - Registration : VT-NFF
2. Owner : NATIONAL FLYING TRAINING INSTITUTE
PVT. LTD
3. Operator : NATIONAL FLYING TRAINING INSTITUTE
PVT. LTD
4. Cadet-in-Command : SPL Holder
- Extent of injuries : NIL
5. Date of incident : 23.12.2022
6. Time of incident : 09:10 UTC (approx.)
7. Place of Incident : En-route
8. Co-ordinates of incident site : 22° 8' 21.5952" N, 81° 47' 14.694" E
9. Last point of Departure : VAGD (BIRSI AIRPORT, GONDIA)
10. Intended place of Landing : VAGD (BIRSI AIRPORT, GONDIA)
11. No. of passengers on board : NIL
12. Type of operation : TRAINING FLIGHT (CROSS COUNTRY
SOLO NAVIGATIONAL SORTIE)
13. Phase of operation : CRUISE
14. Type of Incident : INFLIGHT SEPARATION OF RIGHT-SIDE
PASSENGER WINDOW TRANSPARENCY

Synopsis: -

On 23.12.2021, M/s National Flying Training Institute (NFTI) DA-40 aircraft VT-NFF was engaged in cross country solo navigational sortie of a student cadet from Gondia-to-Gondia overflying city of Ratanpur. The sortie was authorized and detailed by Deputy Chief Flight Instructor. Aircraft took-off from RWY 04 at 0822 UTC, carried out normal flight procedures and at 0838 UTC, aircraft reached cruising altitude i.e., at FL75. At 0910 UTC, approx. 90 NM, student cadet heard a loud sound from the rear area. The cadet was in contact with Kolkata Radar. The cadet aborted the sortie and decided to return back to Gondia. Gondia Tower has given priority for a rejoin and thereafter carried out a safe landing at 1003 UTC. After landing, during post-flight inspection student cadet found the rear right side passenger window transparency was missing and no other damages observed.

DGCA-India, vide Order No DGCA-15018(19)/10/2021-DAS dated 04.01.2022 instituted investigation of the occurrence under Rule 13 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017 by an Investigator-In-Charge.

The most probable cause could be the deterioration of the terostat adhesive sealant resulting in separation of window transparency from the airframe during flight.

1. Factual Information: -

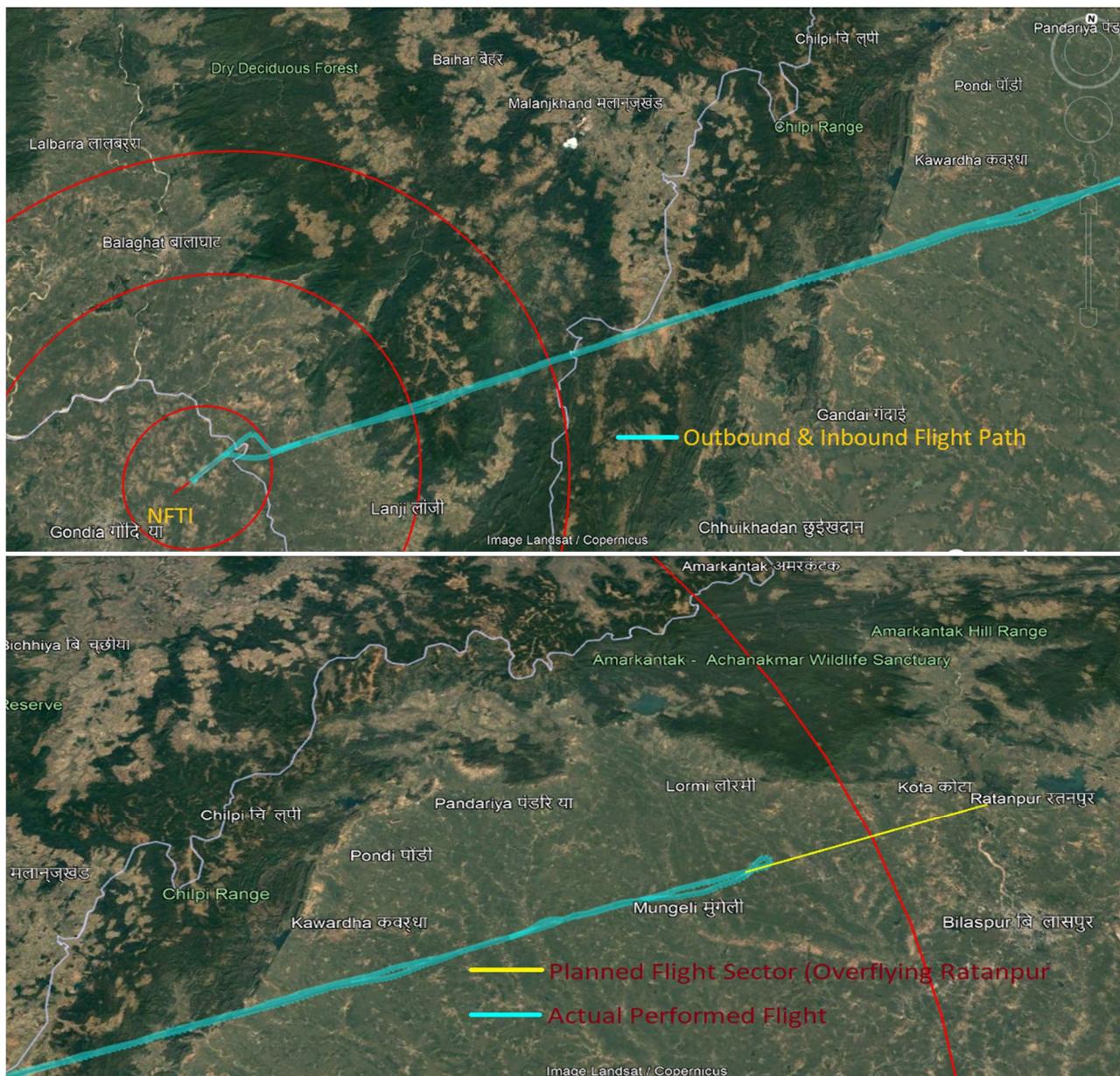
1.1 History of flight:

On 23.12.2021, Student cadet was authorized and detailed by Dy. CFI for a cross country solo navigational sortie from Gondia-to-Gondia overflying city of Ratanpur (R-067/114) on DA-40 aircraft VT-NFF of M/s NFTI. AME had carried out Daily inspection on 23.12.21 as per the approved daily inspection schedule along with the snag rectification as reported in the Flight Report Book on 22.12.21. While carrying out the daily inspection AME did not observe any abnormalities. After completing the snag rectification and daily inspection schedule, the AME had issued Certificate of Release to Service and the aircraft was released for normal flying. The aircraft had operated three sorties prior to the incident sortie without any snag. The incident sortie was the fourth sortie of the aircraft and first sortie of the student cadet. Student cadet had submitted the self-declaration for BA as per the then DGCA Order. The aircraft was in normal condition for flight. Aircraft took-off from RWY 04 at 0822 UTC, carried out normal flight procedures and at 0838 UTC, reached Top of Climb i.e., at FL75.

The aircraft had been cruising and was in contact with Kolkata Radar. While cruising, 90 NM out on R-067, at 0910 UTC, student cadet heard a loud bang from the rear area and had felt vibrations. Student cadet immediately checked the flight control and engine parameters, which were all normal and in the green zone. Further, student cadet got in contact with the instructor on the radio (Company frequency) and informed him about the situation and his intention to coming back to Gondia. Student cadet was instructed to check the flight controls for any possible damage and was advised to set course back to Gondia. The same was informed to Kolkata Radar and was approved. Thereafter the student cadet set the course back to Gondia.

During return, student cadet was guided by CFI. CFI requested Gondia Approach to provide priority to the aircraft. At 0930 UTC, approx. 50 NM inbound to Gondia, student cadet established positive contact with Gondia Approach and requested for descending to FL65. The aircraft then changed over to Gondia Tower and further clearances were given by the Gondia Tower. Student cadet was given clearance to land on RWY 22. Thereafter, the aircraft proceeded for landing and had landed safely at 1003 UTC. After landing, during post-flight inspection student cadet found the rear right side passenger window transparency was missing and no other damages observed.

There was no fire as a result of the incident and no injury was reported to the student cadet.



Track of VT -NFF for the incident sortie (approx.)

1.2 Injuries to persons: -

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

1.3 Damage to aircraft: -

During visual inspection of the aircraft, the following was observed:

- i. Window transparency (Acrylic Glass) of right-side passenger compartment was found missing.



- ii. Paint peel off about 2.5 inches long was observed just below the location where the window transparency was installed.
- iii. Observed separation of elastic adhesive at one point on the forward edge of the groove where the window was installed.



Damage was limited to the detached item (window transparency) and no other damage was reported.

1.4 Other damages: -

After the incident local authority at the place of occurrence was informed by the operator to check for the detached item and confirm if any damage/injuries had been caused. The local authority had confirmed to operator that the detached item had not been found and no other damages/injuries had been reported.

1.5 Personnel information: -

Details		Student Cadet
License		SPL
Date of Initial Issue		17 Feb 2021
Valid up to		16 Feb 2026
Category		Aeroplane SE Land
FRTOL valid upto		25 Mar 2031
Total flying experience		134:20 Hrs.
Medical		Class I
Valid up to		12 Jan 2022
Experience on type	Single Engine	134:20 Hrs.
Experience as PIC on type	Single Engine	60:15 Hrs.
Total flying experience during last 365 days		134:20 Hrs.
Total flying experience during last 180 days		100:15 Hrs.
Total flying experience during last 30 Days		26:45 Hrs.
Total flying experience during last 07 Days		06:00 Hrs.
Total flying experience during last 24 Hrs.		00:00 (Not including this flight)

Student cadet joined NFTI to undergo flying training for grant of CPL. He commenced flying in May 2021 and operated his first solo flight in June 2021. Student cadet was not involved in any incident/accident in past and he was current in all training and had adequate rest prior to operating the incident flight.

As per FTPR, the cadet performance was 'Satisfactory' for most of his sorties

1.6 Aircraft information: -

The DA 40 is a single-engine, four seat, low-wing monoplane. It has a cantilever wing and a 'T' tail. The airplane structure is fiber-reinforced plastic composite. The semi-monocoque fuselage is a glass-fiber reinforced-plastic (GFRP) shell with GFRP bulkheads and stiffeners. Left and right half-shells bond together with a center section to make the fuselage. The center section makes the bottom of the cockpit. It has the main bulkheads which connect to the spars in each wing. The vertical stabilizer has two GFRP half-shells that are part of the fuselage shells.

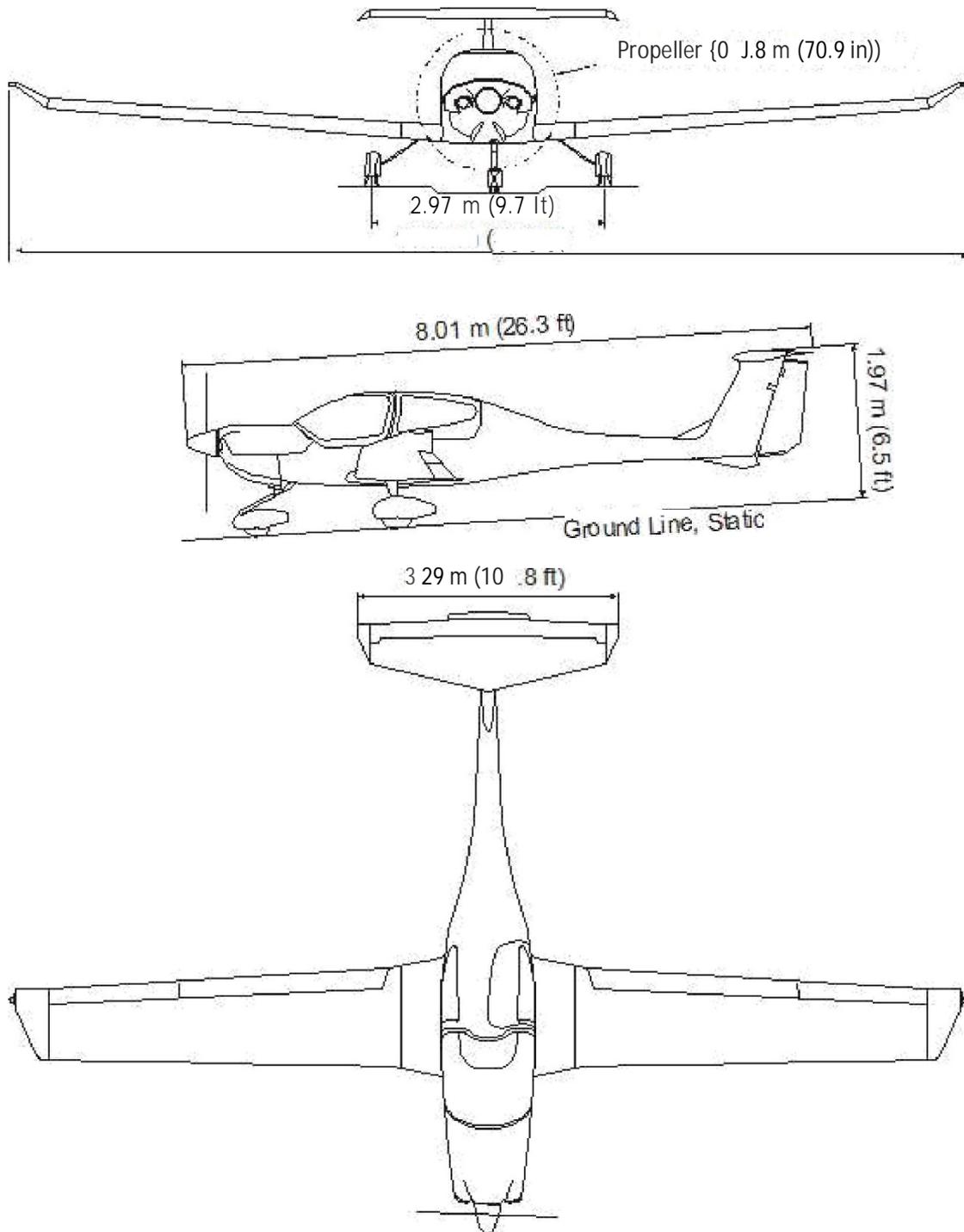
The cantilever wing is a semi-monocoque structure. Each wing has two I-shaped spars with webs made from GFRP/rigid foam sandwich and caps made from CFRP bands. The wings attach to the fuselage center section. Each wing has two stump-spars. Four large bolts attach each wing to the fuselage main bulkheads. Standard ailerons and electrically operated flaps attach to the trailing edge of the wing. The horizontal stabilizer is a semi-monocoque structure. It has top and bottom shells made of GFRP. The shells bond to GFRP spars and ribs. The trailing edge has a conventional elevator and a trim tab.

The one-piece canopy has a large quantity of wrap-around glazing. This gives a good all-round view from the cockpit. A glazed rear passenger door gives access to the rear seats from the left side of the airplane

The fixed tricycle landing gear has fairings attached to each leg. The main legs attach to the fuselage center-section. The nose leg attaches to the forward fuselage. Each main wheel has a disc brake on the inside and hydraulic pressure operates each disc brake.

The flight control system uses conventional ailerons, elevator and rudder. The DA 40 has 2 control sticks and 2 rudder pedal assemblies to operate the primary flight-controls. Push-pull rods operate the ailerons and elevator. Cables operate the rudder. An electric motor operates the wing flaps. A hand wheel and Bowden cable operate the elevator trim.

The DA 40 operated by M/s NFTI is powered by Lycoming IO-360-M1A - a four-cylinder, direct drive, horizontally-opposed engine. The engine has a fuel injection system and a conventional wet-sump oil system. This version of the DA 40 has a hydraulic constant-speed propeller with three blades.



General Dimensions of DA-40 with Lycoming Engine

1.6.1 Aircraft: -

Aircraft VT-NFF (MSN:40.1001) was manufactured in year 2009. The aircraft was registered with DGCA under the ownership of M/s National Flying Training Institute Pvt Ltd. The aircraft is registered under Category 'A' and issued Certificate of registration No. 3969 on dated 23 June 2009.

The Certificate of Airworthiness Number 6078 under "Normal category" subdivision "Passenger" was issued by DGCA on date 23 June 2009. The specified minimum operating crew is "one" and the maximum all up weight is 1200 Kgs. At the time of accident, the Certificate of Airworthiness (C of A) was current and valid until unless suspended/cancelled subject to validity of Airworthiness Review Certificate (ARC). ARC was issued on 04/10/2021 and was valid upto 06/10/2022. The Aircraft was holding Aero Mobile License No A-051/005/WRLO-09 at the time of accident which was valid up to 31/12/2023.

Accordingly, the last inspection was 50 Hours / 03 Months Inspection Schedule and was carried out on 17/12/2021. Subsequently all lower inspections (Daily Inspection / Pre-flight checks, Service Checks, Monthly Checks) were carried out as and when due before the incident.

The aircraft was last weighed on 05/10/2018 and the weight schedule was prepared and duly approved by the DGCA on dated 06/12/2018. As per the approved weight schedule the Empty weight of the aircraft is 808.35 Kg. Maximum Usable fuel Quantity is 109.44 Kgs. Maximum payload with fuel tanks full is 197.21 Kgs. Empty weight CG is 2.463 meters aft of datum. All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine were complied with as on date of event. The aircraft was equipped with Lycoming IO-360 M1A engine. The engine S/N L-29129-51E was overhauled on dated 22/01/2021 and had logged 6208:45 Hrs since new and 911:05 Hrs since last overhaul on the day of incident. The last inspection on engine was 50 Hours / 03 Months Inspection Schedule and was carried out on 17/12/2021 and since then the aircraft had flown approx. 87 hrs till the incident sortie.

Propeller fitted on the engine was next due for overhaul at, 9530:15 Hrs aircraft TSN or 18/03/2024, whichever was earlier and was complying with all modifications at the time of incident.

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 airframe logbook. No DGCA mandatory modification was pending and there was no MEL invoked on this aircraft at the time of incident.

1.	Certificate of Registration (C of R)	C of R No.	3969
		Registration	VT-NFF
		Year of manufacture	2009
		MSN:	40.1001
2.	Certificate of Airworthiness (C of A)	C of A No.	6078
		Issue date	23/06/2009
3.	Airworthiness Review Certificate	ARC No.	NFF/6078/ARC 12T 2021149
		Issue date	04/10/2021

	(ARC)	Valid upto	06/10/2022
4.	TSN	9446:00 Hrs.	
5.	Engine	Make	Lycoming
		Model	IO-360 M1A
		P/N	HENPL-RT10051
		S/N	L-29129
		TSN	6208:45 Hrs.
		TSO	911:05 Hrs.
6.	Propeller (LH)	Make	Hartzell
		Model	HC-C2YR
		P/N	HC-C2YR-1BFP/F7497
		S/N	CH44021B
		TSN	8816:35 Hrs.
		TSO	2315:45 Hrs.
	Last Schedule Inspection on Aircraft	50 Hrs./03 Months Inspection	A/C TSN – 9408:40 Hrs/ dtd.- 17.12.2021
	Last schedule Inspection on Window Transparency	200 Hrs./12 Months Inspection	A/C TSN – 9359:00 Hrs/ dtd.- 07.12.2021

1.6.2 Flight Compartment Windows: -

1.6.2.1 General: -

The DA-40 has three windows. Each window is polycast molded acrylic glass (plexiglass). This material gives good optical characteristics. It is also strong and it can be accurately formed into three dimensional shapes. A high-performance elastic adhesive bond each window to the structure. A flexible white sealant fills the small gap between the edge of the window and the structure. The window transparency is glued from the outside without any supporting rivets/bolts.

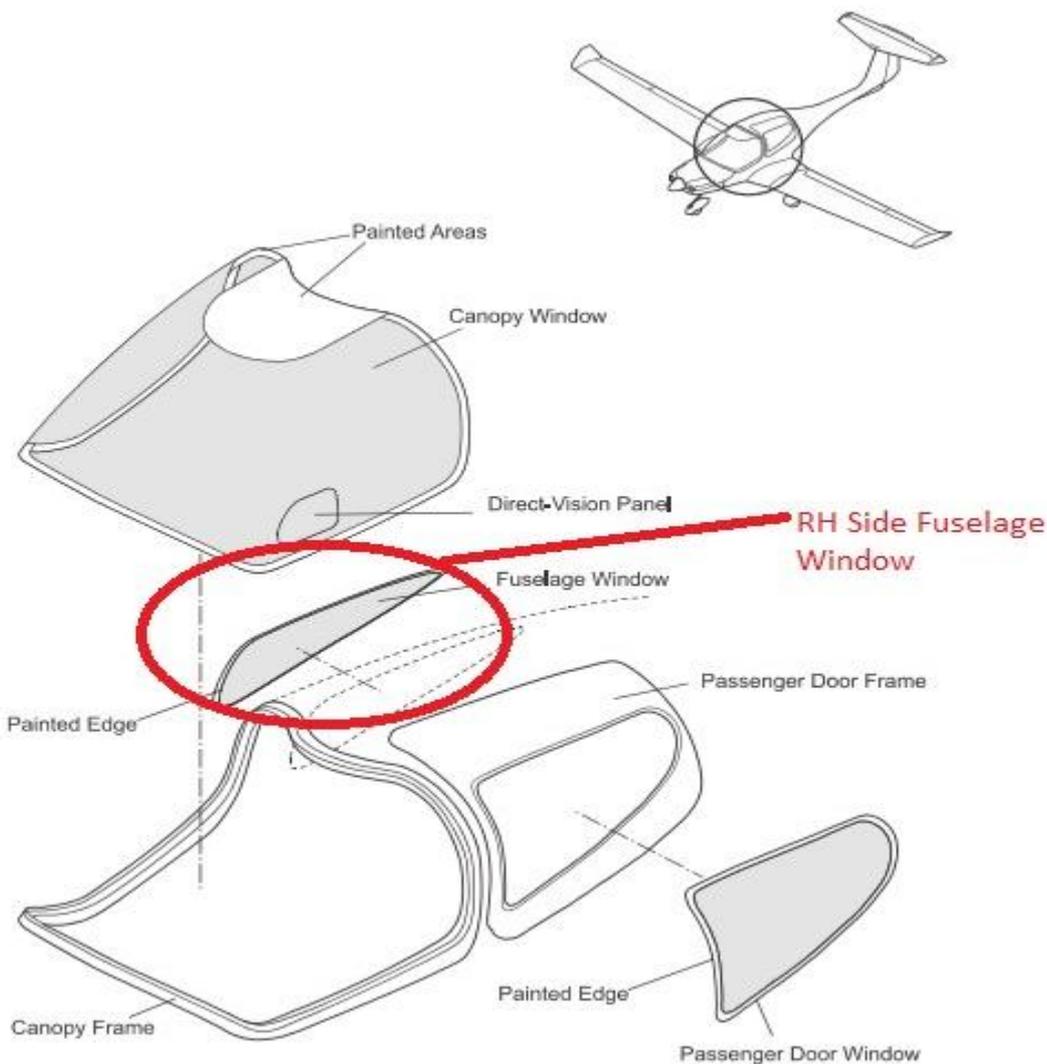
Each window has a band of white paint over the area where it bonds to the structure. The canopy window also has a screened area above the cadet's head. This is a sun-shade.

1.6.2.2 Front Canopy and Emergency Windows: -

The one-piece canopy window covers the cadet's cockpit and it also the windscreen. It has a small emergency window on the left side. The emergency window has a hinge and the emergency window can open in flight.

1.6.2.3 Rear Windows: -

The passenger door has a window for the left side of the passenger compartment. The right side of the fuselage also has a window for the passenger compartment.



Window configuration Diamond DA-40

1.6.3 Last Scheduled Inspection on the RH side window: -

As per the 200 hrs scheduled inspection, the rear window on RH side has to be examined for any cracks, damage and bonding between the window and the frame as per section 56-10 of DA-40 AMM. As per records, the last 200 hrs inspection was completed out on 07.12.21 and remarks for the above conditions are satisfactory.

1.6.4 Daily Inspection Schedule: -

As per the daily inspection schedule, the windows have to be checked for any damage, crazing marks and cleanliness. As per the last CRS issued by the AME, there were no observations apart from the snag rectification carried out on 23.12.21.

1.6.5 Flight Plan: -

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



1.6.6 POH Reference: -

There is no POH procedure to be followed by the crew in case of inflight window transparency separation.

1.6.7 Cadet Defect Report (PDR): -

The defect report made by the student cadet at Gondia states the following: -
During flight the acrylic glass (plexiglass) of the right-hand side rear window flew off.

1.7 Meteorological information: -

There is no conventional MET station for the airfield. The visibility is quantified by the sighting of various obstacles (such as towers, overhead tanks, etc). The CFI/ Deputy CFI declares the operations to be fit as he/she finds the clouds to be in VMC conditions. On 23.12.2021, the temperature was approximately 20°C. The winds were calm and the weather was fine with visibility reported as 5000m.

1.8 Aids of navigation: -

The flying exercise conducted was cross country flying and landing under VFR flight rules. Gondia airport is equipped with NDB, VOR and DME.

1.9 Communication: -

Two-way radio communications were available between aircraft and ATC. The radio communications for Gondia aerodrome were handled by the CPL holders or personnel with ATC background. The crew did not report any un-serviceability/ communication issues.

VT-NFF was on a cross-country flight enroute Ratanpur (Radial 066 GDA 114 miles). At the time of incident, the CFI and Deputy CFI came in contact with the aircraft and ATC. As advised by CFI, priority was given to the aircraft for landing. The relevant portions of Gondia, ATC transcript with student cadet, CFI and Deputy CFI is as follows:

TIME in UTC	RT Transcript Gondia Approach (118.35)
09:18:16	VT-NFO – “Foxtrot Foxtrot, Victor foxtrot Oscar.”
09:21:28	APP - “Foxtrot Foxtrot, Gondia Approach..... VFF Gondia Approach.”
09:21:39	Unknown - “Reported 82 miles.”
09:24:45	VFB - “VFF this is VFB, how do you read?”
09:26:32	Unknown - “Sir is in contact with Foxtrot Foxtrot.”
09:33:07	VT-NFO – “Sir, VFO, 17 miles, relaying for VFF, 55 miles inbound.” APP - “Roger, next report 30.” VT-NFO - “Foxtrot Foxtrot, next report 30.”
09:33:28	APP - “VFF go ahead, FF go ahead.”
09:36:06	APP - “Foxtrot go ahead” APP - “Standby 01” APP - “Level 65 approved, report reaching”
09:36:33	VT-NFO - “Kindly give preference for arrival to Foxtrot Foxtrot” APP - “Monitored.”
09:40:46	VT-NFF - “Approach, NFF, 40 miles inbound.” APP - “Confirm 40?” VT-NFF - “40, maintaining radial 067, level 65.” APP - “Roger, next report 25” VT-NFF - “confirm next report?” APP - “25” VT-NFF - “Next report 25, VFF”
09:46:30	APP - “VFF, DME?” VT-NFF - “VFF is 30 DME inbound.” APP - “Roger.”
09:48:43	VT-NFF - “Approach, VFF is 25 miles inbound.” APP - “Re-cleared to 5000 feet on QNH 1012.” VT-NFF - “Re-cleared to 5000 feet on ONH 1012.”
09:49:39	VT-NFF - “Approach, VFF, confirm we can maintain 6000 feet due terrain.” APP - “Approved.” VT-NFF - “Approved, VFF.” APP - “Confirm you would like to maintain 6000 feet till dead-side.” VT-NFF - “Will call you when clear of terrain.”

09:51:53	VT-NFF- “Approach, VFF maintaining 6000 on QNH 1012” APP- “Confirm ready for descend?” VT-NFF- “Negative sir, will be 05.” APP- “Roger”
09:52:44	VT-NFF- “Approach, VFF, clear of terrain request descend further” APP- “Cleared to 5000” VT-NFF- “Cleared to 5000, VFF”
09:55:37	VT-NFF- “Approach, VFF is 12 miles inbound maintaining 5000 on QNH 1012.” APP- “VFF re-cleared 4000 feet.” VT-NFF- “Re-cleared 4000 feet.”
09:56:20	APP- “ VFF, check level passing? ” VT-NFF- “ Passing altitude 4700 feet for 4000. ”
09:58:02	APP- “ Foxtrot Foxtrot, position? ” VT-NFF- “ VFF, 8 miles maintaining 4000. ” APP- “ Report clear of terrain for further descend. ” VT-NFF- “ Clear of terrain, request further descend. ” APP- “ VFF, re-cleared 3000, over to tower ” VT-NFF- “ Re-cleared to 3000, over to tower, VFF ”
VT- NFF changes over to 122.175 (Gondia Tower)	
09:58:45	VT-NFF – “VFF with you passing 3800 for 3000, 7 miles inbound.” TWR- “VFF roger, report reaching 3000 feet.”
09:59:36	TWR- “VFF, Tower.” VT-NFF – “Go ahead.” TWR- “Confirm RWY 22 acceptable?” VT-NFF – “Affirm sir.” TWR- “VFF roger, report 5 miles. VT-NFF – “Now 5 miles sir” TWR- “Descend as per profile, report final RWY 22.” VT-NFF – “Descend as per profile, report RWY 22.” TWR- “VFF check altitude passing?” VT-NFF – “Altitude now 3000 feet, descending as profile.” TWR- “Roger.” VT-NFF – “And RWY 22 in-sight.” TWR- “Roger.”
10:01:32	VT-NFF – “VFF on finals RWY 22.” TWR- “VFF RWY 22 cleared to land, winds calm.” VT-NFF – “Cleared to land RWY 22, VFF. Winds copied.”
Note: -	VT-NFF landed at 10:03 and taxied to the apron.

1.10 Aerodrome information: -

Gondia Airport (VAGD) is located at Birsi village, 12 kilometres North-East of Gondia, Maharashtra, India. It is used for general aviation and cadet training. Gondia airport is controlled by Airports Authority of India. The airport has a single RWY (04/22). The surface

of the RWY is level and paved with bitumen. It is not a critical airfield and is used for flying training by National Flying Training Institute. The ATC is controlled by Airports Authority of India. The declared distances for RWY are as under:

RWY Designation	Code	Elevation	TORA(M)	TODA(M)	ASDA(M)	LDA (M)
04	4C	993ft	2135	2135	2135	2135
22	4C	990ft	2135	2135	2135	2000



Birsi airfield overview

1.11 Flight recorders:

1.11.1 CVR: -

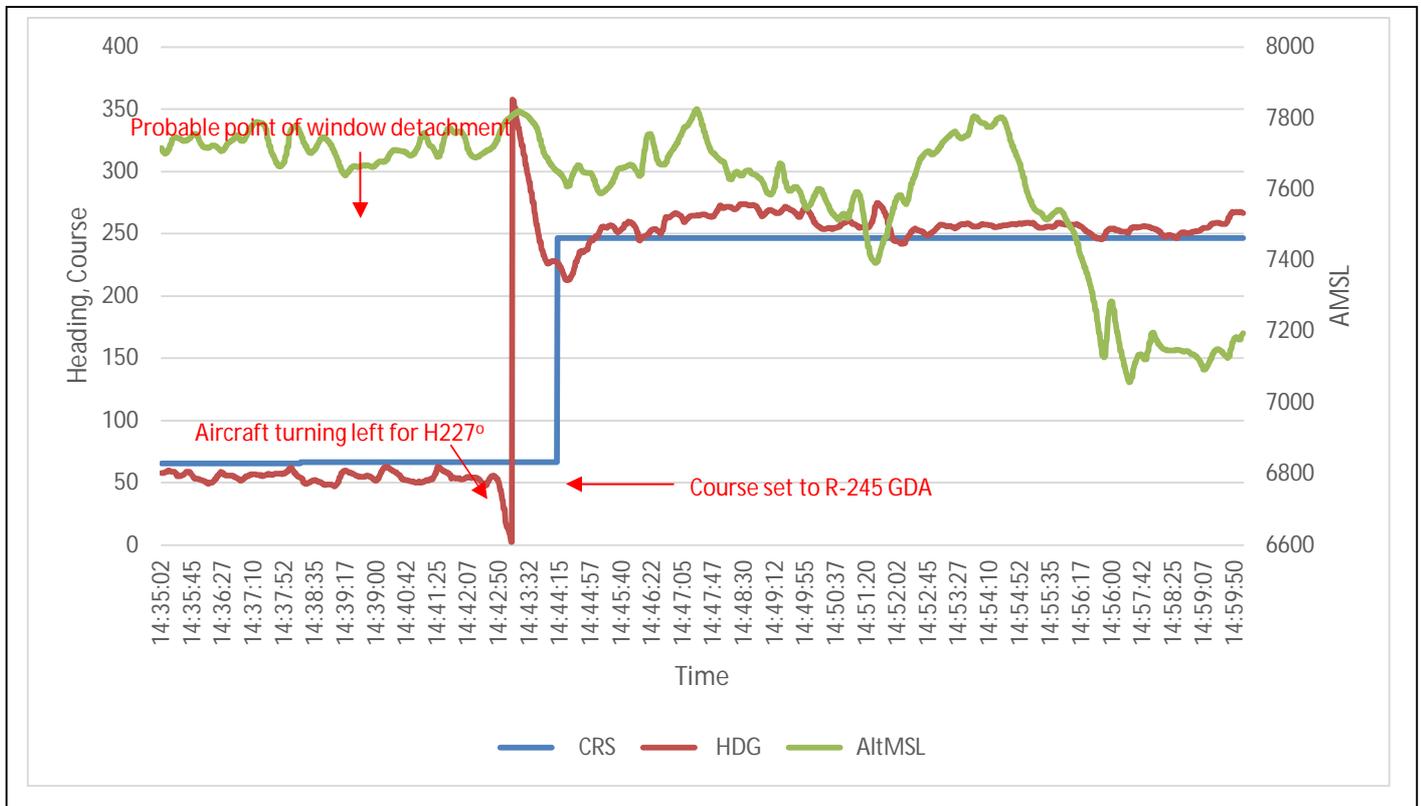
The aircraft is not installed with a Cockpit Voice Recorder, as it is not required.

1.11.2 DFDR: -

The aircraft is equipped with a flight recorder of make Garmin G1000 with SD card for storage. The recording of the unit was retrieved and salient points are as interpreted below: -

1. The aircraft took-off from Gondia at 13:52:02 hrs IST.
2. At 14:05:49 the aircraft reached its planned cruise level of 7500ft.
3. At 14:42:42 hrs IST, at 7527 ft aircraft heading was changed from 55.6 degree and track was changed from 68.1 degree.

4. At 14:44:12, the aircraft course was changed from Ratanpur to VAGD at 7648 ft, heading was 225.7 degree and track was 214.3 degree
5. At 14:47:57, aircraft started descending from 7529ft, heading was 272.4 degree and track was 260.8 degree. The aircraft then continued to Gondia and made a continuous descent till touchdown.
6. The aircraft landed at Gondia at 15:33:16 hrs IST. The aircraft taxied under its own power.



Heading, Course and Pressure altitude Vs Time

1.12 Wreckage and impact information: -

During the aircraft visit, apart from the missing of window transparency, there was small paint peel off about 2.5 inches long was observed just below the location where the window transparency was installed. This was observed to be not due to detachment of window transparency during flight. The same was not documented/any entry were made by the engineering staffs/crew during their routine inspections.



1.13 Medical and pathological information: -

Self-declaration for non-consumption of alcohol was submitted by the student cadet prior to flight as per then DGCA Order dated 02.11.2021 issued under current COVID-19 pandemic.

1.14 Fire: -

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

1.15 Survival aspects: -

The incident was survivable. There was no injury reported to the student cadet or any other personnel on ground due detached item.

1.16 Tests and research: -

Nil.

1.17 Organizational& Management Information: -

National Flying Training Institute Pvt. Ltd., A joint venture of CAE Inc. and Airports Authority of India, is the flying training institute with an objective to impart cadet training to the student cadets. The Institute was setup at Gondia, Maharashtra in the year 2008. National Flying Training Institute Pvt. Ltd. is structured under the management of the Accountable Manager. NFTI was approved by DGCA to impart flying training to student cadets on DA40 and DA42 type of aircraft and the approval was valid on the date of incident.

1.18. Additional information: -

1.18.1 As per statement of AME: -

After checking the flight report book for any reported snag, on 23.12.2021, he started carrying out the daily inspection as per the approved daily inspection schedule along with the

snag rectification reported in the flight report book on 22.12.2021. While carrying out the daily inspection, he did not observe any signs of separation of the window transparency from the structure. After completing the snag rectification and daily inspection schedule, he issued the CRS for flying.

1.18.2 Post Incident Procedural Change: -

After the incident, OEM was consulted by the operator for details of any similar incident in the past, as well as guidance on how to check the other aircraft in the fleet. OEM confirmed that no such case was on their records during flights, however in Diamond Canada they had a similar case, but the window got only disbonded at a certain area and not missing during flight. The manufacturer advised operator to carry out visual inspection of all such panels on other aircraft in the fleet, to look for scratch marks on the window transparency and to press gently from inside to check for any loose fitment. 1

Operator had carried out one time inspection on all other aircrafts and the condition of the window transparency was found satisfactory. Further, manufacturer advised operator to check the condition of window on a regular basis during maintenance by pushing the window transparency with the fingers right above the frame from the inside to the outside with a gently force and also to check for cracked seals around the window. Accordingly, operator had amended the DI Schedule, 25 Hrs. inspection schedule, 50 Hrs/ 03 Months inspection schedule and 100 Hrs/ 06 Months inspection schedule to incorporate the same.

After the installation of the window transparency and necessary schedule inspections, the CRS was issued on 03.03.2022.

1.19 Useful or effective investigation techniques: -

Nil.

2. Analysis: -

2.1 Serviceability of the aircraft: -

The aircraft VT-NFF was issued a Certificate of Registration on 23.06.2009 by DGCA-INDIA and its last ARC was issued on 04.10.2021 valid till 06.10.2022. The last inspection was carried out on 17.12.2021 for 50 Hours / 03 Months Schedule inspection and the last schedule inspection on window transparency was carried out during 200 hrs/12 months inspection performed on 07.12.2021 and after the inspection the aircraft had flown approx. 87 hours. The aircraft had accumulated a total of 9446 Hrs since new.

The last snag reported on the aircraft was left wings strobes light not working on 22.12.21 and was rectified by replacing the same on 23.12.21. While carrying out the daily inspection on 23.12.21, AME did not observe any signs of separation of the window transparency from the structure. After completing the snag rectification and daily inspection schedule, AME issued the CRS for normal flying on 23.12.21.

As per records, the subject issue had not occurred earlier in this aircraft or any other company aircraft. Also, it was observed that there was no work carried out/replacement of the window transparency was carried out by the operator since the aircraft induction i.e., from 2009. The missing window transparency was the original fitment on the aircraft. Further, during inspection of the aircraft, it was observed that the paint peel off at the lower end surface of the window frame was not due to the detachment of the window transparency. The same was not documented/any entry were made by the engineering staff/flight crew during the pre/post flight inspections prior to the incident flight.

Post Incident, the operator had intimated OEM regarding the inflight separation of window transparency and asked to provide the details of such incident during flights. OEM confirmed that no such incidents were reported during flights. As advised by OEM, operator had carried out one time inspection on all the aircrafts and condition found satisfactory. Further, as guided by manufacturer to check the window condition on a regular basis, operator had amended the DI Schedule, 25 Hrs. inspection schedule, 50 Hrs/ 03 Months inspection schedule and 100 Hrs/ 06 Months inspection schedule.

As per approved procedure, the certificate to release to service is valid for 24 hours elapsed time until and unless any snag/maintenance/component replacement occurred. Hence pre-flight inspections after every flight will be carried out by the PIC of the flight in accordance with the checklist given in the aircraft flight manual before commencement of every flight. On the date of incident, the aircraft had operated 03 flight sortie, without any defects/abnormalities during flight and pre/post flight inspections. The incident sortie was the fourth sortie of the aircraft.

The aircraft was in a serviceable condition when it was released for the cross country solo navigational sortie on 23.12.2021. The serviceability of the aircraft was not a factor which contributed to the incident.

2.2 Operational handling of the aircraft: -

On 23.12.2021, student cadet was authorized and detailed by the Deputy CFI for cross country solo navigational sortie from Gondia-to-Gondia overflying city of Ratanpur with alternate airport as Raipur. The student cadet had enough rest before the flight. The student cadet after finishing the documentation work, reached the aircraft for the pre-flight checks. As per the log book, the student cadet accepted the aircraft at 0805 UTC. The load sheet shows that the MTOW & CG was within limits. The student cadet respective ratings and medicals were valid. Cadet had given the BA undertaking prior to the sortie. The student cadet was fit to fly as on incident date and last flown the aircraft on 20.12.21.

During pre-flight inspection no abnormality was observed by the student cadet and was the first sortie of the student cadet. The aircraft had took off from RWY 04 at 0822 UTC and carried out normal flight procedures. The aircraft had settled at FL75 as per the cruising altitude filed in ATC flight plan. While cruising 90NM out on R067, the student cadet heard loud sound and had felt vibrations. As the emergency window and rear canopy door was found in locked position, the student cadet had checked the flight control for any possible

changes in flight characteristics, engine parameters, which were all normal and in the green zone. The student cadet immediately got in contact with the instructor on the radio and informed about the situation. The instructor advised to check the flight controls for any possible damage and also advised to set course back to Gondia. The student cadet informed the decision to Kolkata Radar and was approved. At the of time of incident, the aircraft was approx. 90 NM from the Gondia and approx. 58 NM from the alternate destination i.e., Raipur, however crew decided to return to Gondia as being a main base for the organisation.

During return, student cadet was on the radio with the CFI and was guided by him. Further CFI advised Gondia Approach to provide priority landing to the aircraft and accordingly provided priority to the aircraft for landing. The same were correlated with ATC RT replay and the instructions by the ATC are appropriate to the situation. At the time of landing, weather reported was calm and aircraft landed safely on RWY 22 at 1003 UTC. After landing, during post-flight inspection student cadet found the rear right side window transparency was missing.

From the DFDR readout, it is established that the aircraft was on steady flight before initiating the return back to gondia. The flight path was observed to be same as per the planned route.

The student cadet had accumulated 132 hrs till the incident sortie out of which 62 hrs as solo flying. The FTPR records reveals the cadet performance was 'Satisfactory' for most of his sorties. After the window transparency flew off in the air, the student cadet didn't declare any emergency. The student cadet handled the emergency competently and landed the aircraft safely, despite the discomfort experienced due to the low temperature and wind blast.

From the above crew handling the aircraft was not a factor to the incident. The student cadet handled the situation and landed back safely at Gondia, however in the absence of any POH/operational procedure in case of such incidents crew could have decided to land back at Gondia Airport instead of nearby airport at the time of incident/ alternate airport filed in the flight plan i.e., Raipur Airport.

2.3 Circumstances leading to the incident: -

The aircraft was released in serviceable condition and no defect was reported on the aircraft by the crew prior to the incident flight. The aircraft had three other satisfactory sorties before the incident flight performed by other crew, and thus not the first flight of the day. The incident sortie was the fourth flight of the day.

The missing window transparency was the original fitment on the aircraft. There was no work/replacement of the window transparency was carried out by the operator since the aircraft induction. The schedule inspection on the rear window on RH side was carried out during the 200 hrs inspection carried out on 07.12.21 and the condition was found satisfactory. The aircraft had flown 87 hrs approx. after the 200 hrs scheduled inspection. On 23.12.21, the daily inspection schedule was carried out and no observations were made by the AME on the rear right side window transparency.

As per aircraft design, the terostat elastic adhesive sealant bonds the window transparency to the structure. The window transparency is only glued from the outside without any supporting rivets/bolts.

From the above, it is inferred that the applied terostat adhesive sealant on the window transparency could have deteriorated over a period of time.

3. Conclusion: -

3.1 Findings: -

1. The aircraft was having a valid Certificate of Registration and Airworthiness Review Certificate at the time of incident
2. The aircraft was maintained in accordance with the certified aircraft maintenance program and applicable Airworthiness Directive, Service Bulletins were complied with.
3. The student cadet was having valid licences and ratings for operating the aircraft.
4. The student cadet had submitted self-declaration prior to operating the flight as per then BA Order issued by DGCA due covid-19 pandemic.
5. The student cadet had accumulated 132 hrs till the incident sortie out of which 62 hrs as solo flying.
6. The aircraft was released from Gondia for a training flight in a serviceable condition. There were no defects reported prior to the occurrence sector or any items under MEL. The aircraft had operated three sorties prior to the incident sortie. No snag was reported during these sorties and did-not report any abnormalities by the crew during pre/post flight inspections.
7. The incident sortie was the fourth sortie of the aircraft and the first sortie of the involved student cadet.
8. During pre-flight inspection, no abnormality was observed by the student cadet and the aircraft was took off from RWY 04 at 0822 UTC.
9. While cruising 90 NM outbound, at 0910 UTC, student cadet heard a loud bang from the baggage compartment area and had felt vibrations. All parameters were found satisfactory by the student cadet.
10. As per FDR, at time 14:43:10 IST, while at a baro altitude of 7606 ft with a speed of 94 knots, the aircraft heading was changed to set course back to Gondia. Further the VOR was changed to Gondia at time 14:44:12 IST. The aircraft was observed to be in level flight before initiating the heading change.
11. No similar defects were recorded for any of the sorties in this aircraft or any other company aircraft.
12. As per RT replay, it was observed that instructor and CFI were guiding the cadet for handling the situation appropriately. The instructions by the ATC are appropriate to the situation.
13. There is no POH procedure to be followed by the crew in case of inflight window transparency separation.
14. The student cadet was unaware of the problem during the flight and in the absence of any POH/operational procedure student cadet decided to land back at the Gondia airport instead of the nearby airport at the time of incident.

15. As per records, there was no work/replacement of the window transparency was carried out by the operator since the aircraft induction. The missing window transparency was the original fitment on the aircraft.
16. During the last 200 hrs scheduled inspection completed on 07.12.21 and the daily inspection carried out on 23.12.21, no abnormality was observed on the window transparency on right side passenger compartment window. The aircraft had flown 87 hrs approx. after 200 hrs inspection.
17. The paint peel off about two and half inches was observed just below the location where the window transparency was installed was not due to the detachment of the missing window transparency. However, the same was not documented/any entry were made by the engineering staff/flight crew during the pre/post flight inspections prior to the incident flight.

3.2 Probable cause: -

The most probable cause could be the deterioration of the terostat adhesive sealant resulting in separation of window transparency from the airframe during flight.

4. Safety Recommendations: -

Action as deemed fit by DGCA, Hqrs in view of above findings.

Date: 14/11/2022

Place: Bengaluru

(Jinu Thomas)
Assistant Director Air Safety
Investigator-In-Charge