



Final Investigation Report
on
Accident to Interglobe Aviation Ltd.
Aircraft ATR 72-212A (600 version), VT-IYM
Enroute Trichirapalli, Tamilnadu to Bengaluru, Karnataka
on 04 Sep 2021

Gp Capt. (Dr.) RD Sharma
Investigator-in-charge

Ravi Ramakrishnan
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
AMSL	Above Mean Sea Level
ARC	Airworthiness Review Certificate
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
AUW	All Up Weight
C of A	Certificate of Airworthiness
F/O	First Officer
FCOM	Flight Crew Operation Manual
FCTM	Flight Crew Training Manual
Hrs	Hours
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
LLZ	Localiser
MEL	Minimum Equipment List
MLG	Main Landing Gear
MTOW	Maximum Take Off Weight
NDB	Non Directional Beacon
NLG	Nose Landing Gear
NM	Nautical Miles
PA	Passenger Address
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
QRH	Quick Reference Handbook
RA	Radio Altitude
SB	Service Bulletin
VMC	Visual Meteorological Conditions
VOR	VHF Omni directional Range
UTC	Universal Time Coordinated

Aircraft and Accident details of Interglobe Aviation Aircraft VT-IYM on 04 September 2021			
1.	Aircraft	Type	ATR 72-212A (600 version), MSN1512
		Nationality	Indian
		Registration	VT-IYM
2.	Owner	M/S Truenoord Yamuna Limited	
3.	Operator	M/S InterGlobe Aviation Limited	
4.	Country of Manufacture	France and Italy	
5.	Pilot	ATPL and CPL	
6.	No. of Persons on board	52 passengers+02 Flight crew+02Cabin crew	
7.	Date & Time of Accident	04 Sept 2021	
8.	Place of Accident	During Cruise	
9.	Co-ordinates of Accident Site, AMSL	N11 44.504'N/78 18.590 E	
10.	Last point of Departure	Tiruchirapalli, Tamil Nadu, India	
11.	Intended landing place	Bangalore, Karnataka, India	
12.	Type of Operation	Scheduled Operation	
13.	Phase of operation	Cruise	
14.	Type of Occurrence	TURBULENCE	
15.	Extent of Injuries	Nil	

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

SYNOPSIS

On 04 Sept 2021, ATR 72-212(600), Reg. VT IYM, operated by M/S InterGlobe Aviation Ltd, flew into turbulent weather and experienced high vertical loads in flight during cruise. The Aircraft with call sign IGO 7739 was a scheduled flight from Tiruchirapalli airport (VOTR, INDIA) to Bengaluru airport (VOBL, INDIA). There were 52 passengers and four Crew members (Two Cockpit crew and Two Cabin crew) on-board. The aircraft was commanded by a PIC, an ATPL holder and he was assisted by a Co-pilot who was a CPL Holder. The Co-pilot was the PF and the PIC was the PM for this sector. The aircraft flew into turbulent weather and one of the Cabin crew (L1) had a fall and fractured her left leg.

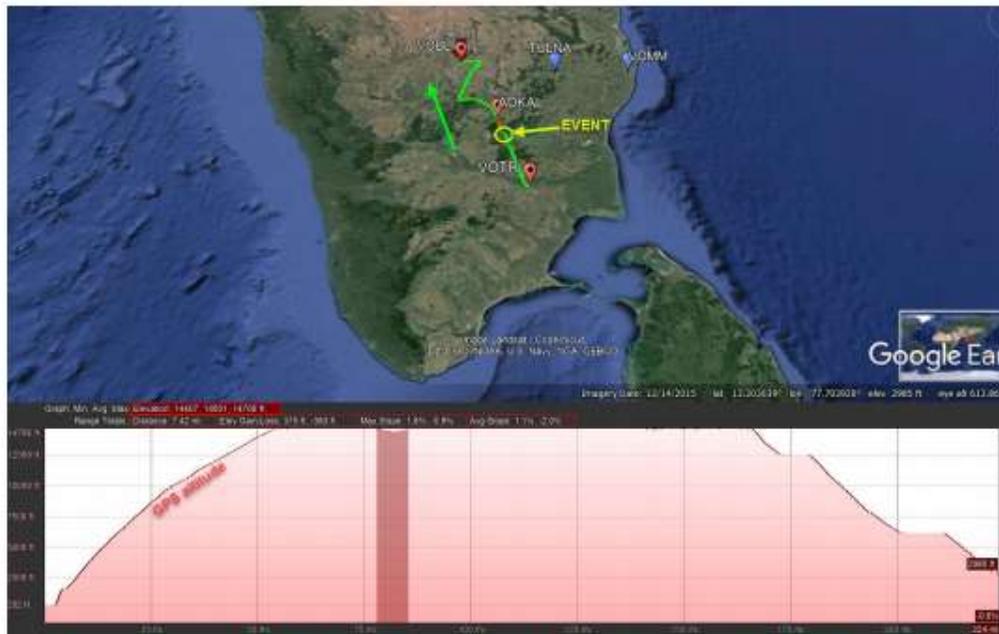


Figure 1: Overall Flight Trajectory based on GPS Position

Director General, AAIB appointed GP Capt(Dr) RD SharmaRetd.,Consultant, AAIB as Investigator – In – Charge and Shri Ravi Ramakrishnan, Consultant, AAIB as Investigator to investigate into the probable cause(s) of the accident, vide Order No. INV-11011/7/2021-AAIB dated 07 September 2021, as amended vide the same order number on 04 February 2022, under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017.

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 Flight

On 04 Sept 2021, an ATR 72-212A-600, MSN1512, Registration No. VT-IYM, operated by M/s InterGlobe Aviation Ltd, was scheduled to operate as IGO-7739 from Tiruchirapalli airport (VOTR, INDIA) to Bengaluru airport (VOBL, INDIA).The STD from VOTR was 1255 UTC and the aircraft departed at 1255 UTC, with 52 passengers and 04 crew members onboard (02 cockpit crew and 02 cabin crew).This was the second sector for the crew for the day. The Co-pilot was the PF and PIC was the PM.ATC cleared the aircraft for startup at 12:52:32 UTC for departure from Runway 27 and cleared for Takeoff at 13:02:31, winds 200/03kts.At 13:18UTC after reaching cruise level FL 140 the aircraft experienced high vertical loads in flight. The altitude remained close to the target altitude of 14000ft.At 13:23:23 the aircraft experienced a decrease in altitude from 14060 ft to 14000 ft at a VG of 2.419 and winds at 288/17 knots, stabilized for two seconds and climbed back steeply to 14060 ft at 13:23:25 UTC.At 13:23:28 UTC the aircraft altitude started to decrease again and reached 13810 ft at 13:23:39. The aircraft then again started climbing to 13900 ft and reached the target altitude at 13:23:50 UTC.The aircraft flew across a turbulent area for approximately 26 seconds from 13.23.09 UTC to 13.23.35 UTC and encountered horizontal and vertical loads.

As per the statement of the Captain who was the pilot monitoring, during climb a weather cell was picked up by the weather radar and a turn to the right was taken. After leveling off at approx 14000ft and 05 miles after TOC the aircraft entered turbulence. The Co-pilot in his statement said they took a Right turn to avoid weather, but entered dry weather that cannot be detected by Weather Radar.

At 13:26:12 UTC, Lead 2 informed the Captain that Lead 1 had a fall during the turbulence and got her leg fractured. (As per the statement of L2) she was returning to her seat after serving an ACM onboard when the aircraft entered turbulence and she had a fall.First Aid was provided and treated by a Doctor onboard. Medical assistance was provided at Bengaluru Airport on arrival.

1.2 Injuries to persons

The Cabin Crew performing the duties of L1 was injured.

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

1.3 Damage to Aircraft

NIL

1.4 Other damage

NIL

1.5 Personnel Information

Crew Information – PIC

Nationality	Indian
Date of Joining Organisation	11 November 2019
Age	51
License	ATPL
Date of Issue	31 August 2017
Valid up to	30 August 2022
Category	ATPL
Date of Class I Med. Exam	04 January 2021
Class I Medical Valid up to	10 January 2022
Date of issue FRTOL License	06 January 2022
FRTOL License Valid up to	06 July 2022
Endorsements as PIC	C-152 & ATR42/72
Total flying experience	3533:00
Total flying experience on type	361:25
Last Flown on type	02 September 2021
Total flying experience during last 1 year	361:25
Total flying experience during last 6 Months	205:51
Total flying experience during last 30 days	34:02
Total flying experience during last 07 Days	28:05
Total flying experience during last 24 Hours	00:00
Rest period before flight	46:03
Whether involved in Accident/Incident earlier	No
Date of latest Flight Checks, Ground Classes & Refresher	ALRC-22 February 2021 and 25 May 2021

Crew Information – Co Pilot

Nationality	Indian
Date of Joining Organisation	14 June 2018
Age	38
License	CPL
Date of Issue	29 December 2016
Valid up to	25 December 2021

Category	CPL
Date of Class I Medical Exam	10 November 2020
Class I Medical valid up to	21 November 2021
Date of issue FRTOL License	16 December 2016
FRTOL License valid up to	15 December 2021
Endorsements as PIC	N/A
Total flying experience	1267:34
Total flying experience on type	1019:07
Last Flown on type	03 September 2021
Total flying experience during last 1 year	370:06
Total flying experience during last 6 Months	223:09
Total flying experience during last 30 days	38:15
Total flying experience during last 07 Days	16:05
Total flying experience during last 24 Hours	00:00
Rest period before flight	23:10
Whether involved in Accident/Incident earlier	No
Date of latest Flight Checks, Ground Classes & Refresher	ALRC-17 June 2021& 22 November 2020

Cabin Crew Information

Name	Total flying experience as on 04 Sep 2021	Last recurrent training
L2	2 years 7 months	RCT- 30-7-22 To 31-7-22
L1	1 year 6 months	1-4-2022 to 4-4-2022 (Extended RCT)

1.6 Aircraft Information

The ATR 72-212A (600) is a, short haul regional airliner developed and built in cooperation by AIRBUS (France) and LEONARDO (Italy). It is a twin turboprop powered aircraft designed to carry 64 to 74 passengers. It has a glass cockpit and as per FCOM has a maximum takeoff weight of 23000kgs and a maximum cruise speed of 280 knots TAS, with a range of 1528 km and a ceiling height of 25000 ft. The Aircraft dimensions are depicted in the figure that follow.

Aircraft Information

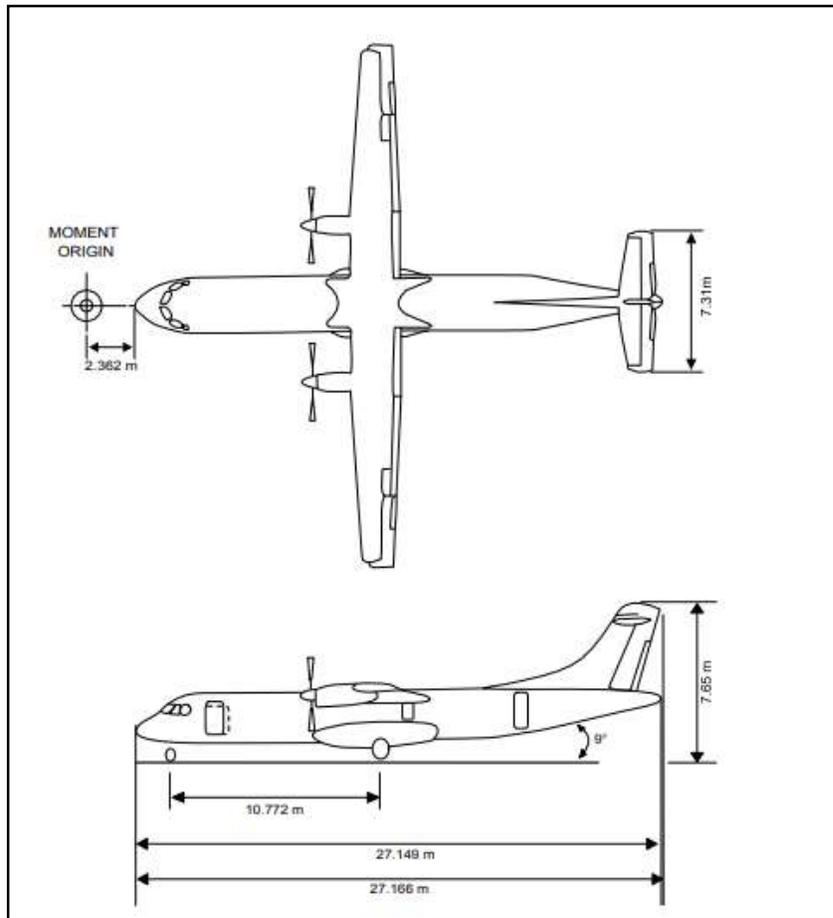


Figure 2: Aircraft Dimensions

Aircraft Model	ATR 72-212A(600 VERSION)
Aircraft S/N	1512
Year of Manufacturer	2018
Name of Owner	M/S TRUENOORD YAMUNA Ltd
C of R	5016
C of A	7119
Category	NORMAL
C of A Validity	N/A
ARC issued on	22 December 2020
ARC valid up to	01 January 2022
Aircraft Empty Weight & Empty weight CG	13053:221 & 15.458 MAC
Maximum Take-off weight	23000 KG
Date of Aircraft Weighment	09 August 2018
Empty Weight	13053.22 KG
Max Usable Fuel	5004.051 KG
Max Payload with full fuel	4529.84 KG
Next Weighing due	N/A
Total Aircraft Hours	6708:58 As on 04 September 2021)

Last major inspection	A3 Check on 24 June 2021
List of Repairs carried out after last major inspection till date of incidence	Nil
Engine Type	PW127M
Engine Sl. No.(LH)	ED1629
Date of Manufacture (LH)	25-11-2017
Last major inspection (LH)	A3 Check on 24 June 2021
List of Repairs carried out after last major inspection till date of incidence(LH)	Nil
Total Engine Hours/Cycles (LH)	6498:15 /5391 As on 04 September 2021
Engine Sl. No. (RH)	ED1630
Date of Manufacture (RH)	27-11-2017
Last major inspection(RH)	A3 Check on 24-06-2021
List of Repairs carried out after last major inspection till date of incidence(RH)	NIL
Total Engine Hours/Cycles(RH)	6074:31/5033 As on 04-09-2021
Aero mobile License	A-002-232/RLO(NR)
AD, SB, Modification	All applicable ADs, SBS, Modifications carried out

1.6.1 WeatherRadar

The Weather Radar System is a lightweight, X-band digital radar that is designed for weather detection and ground mapping. The purpose of the system is to detect storms along the flight path and give the pilot a visual color indication of rainfall intensity. After proper evaluation, the pilot can chart a course to avoid storm areas.

The weather radar system detects and displays different rainfall levels for ranges up to 300NM in 60° sector on each side of the aircraft path. If the "WX RADAR"



Figure 3: Weather Radar

is selected on the ND ONLY page on VCP, the MFD-ND (ARC or ROSE mode) displays weather information. In weather detection mode, storm intensity levels (from level 0 to level 4) are displayed in four bright colors contrasted against a dark background. The Weather Radar can also be used in ground mapping mode (GMAP) to display ground obstacles. It should not be used nor relied upon for proximity warning or anti-collision protection. In GMAP mode, prominent landmarks are displayed that enable the pilot to identify coastline, hilly and mountainous regions, as well as cities or even large structures. Video levels (from level 0 to level 3) of increasing reflectivity are displayed in three bright colors contrasted against a dark background.

The Weather Radar is controlled from the weather radar control box which allows selection of modes and antenna tilt. The selection is sent to the weather radar receiver transmitter antenna. The receiver transmitter generates an X band radio frequency for the purposes of weather radar detection and ground mapping. A 9345 +/- 25MHz signal is transmitted to the antenna Echo signals received by the antenna are routed to the receiver which processes the signals. Processed data is sent the Display Unit. Weather information is displayed, provided the Arc (or ROSE) Mode is activated on Navigation Display.

Range is selected from the EFCP box on the pedestal from 2.5 to 320NM. Two independent ranges can be displayed on each MFD. The Radar displays a 3D environment in a 2D view on the EFIS/MFD, due to which the display may not represent cells at aircraft level.

The Weather Radar detects only water droplets and not turbulence. Severe Turbulence is



often encountered in the tenuous anvil cloud 15 – 20 miles downwind from storm core. The storm cloud is only the visible portion of a storm cloud with up and down

Figure 4: Weather Radar Interface

drafts that often extend outside the storm. Due to this antenna tilts have to be adjusted during the flight to ensure optimum detection and visualization of weather. If the tilt management is not appropriate, pilots could minimize convective thunderstorms.

1.7 Meteorological Information

The local forecast for Tiruchirapalli airport and 100 NM around it was as follows:

Local forecast from 04/09/2021 06:00 UTC to 04/09/2021 14:00 UTC						
Altitude in meters	Wind Dir	Wind Speed (KT)	Vis (m)	Temp (°C)	Dew Point	QNH hPa
1400	250	07	4000	23	22	1008
1430	230	07	3500	23	22	1008
1500	230	10	6000	23	22	1009

1.7.1 Wind

The FDR wind speed and direction recorded from DU(FMS) during flight was between 260 to 315 degrees with a speed of 10 knots to 25 knots. Around the time of the event the wind speed was recorded from 285 degrees with a speed of 16 knots. The graph below shows that during most of the flight the estimated wind was from the west.

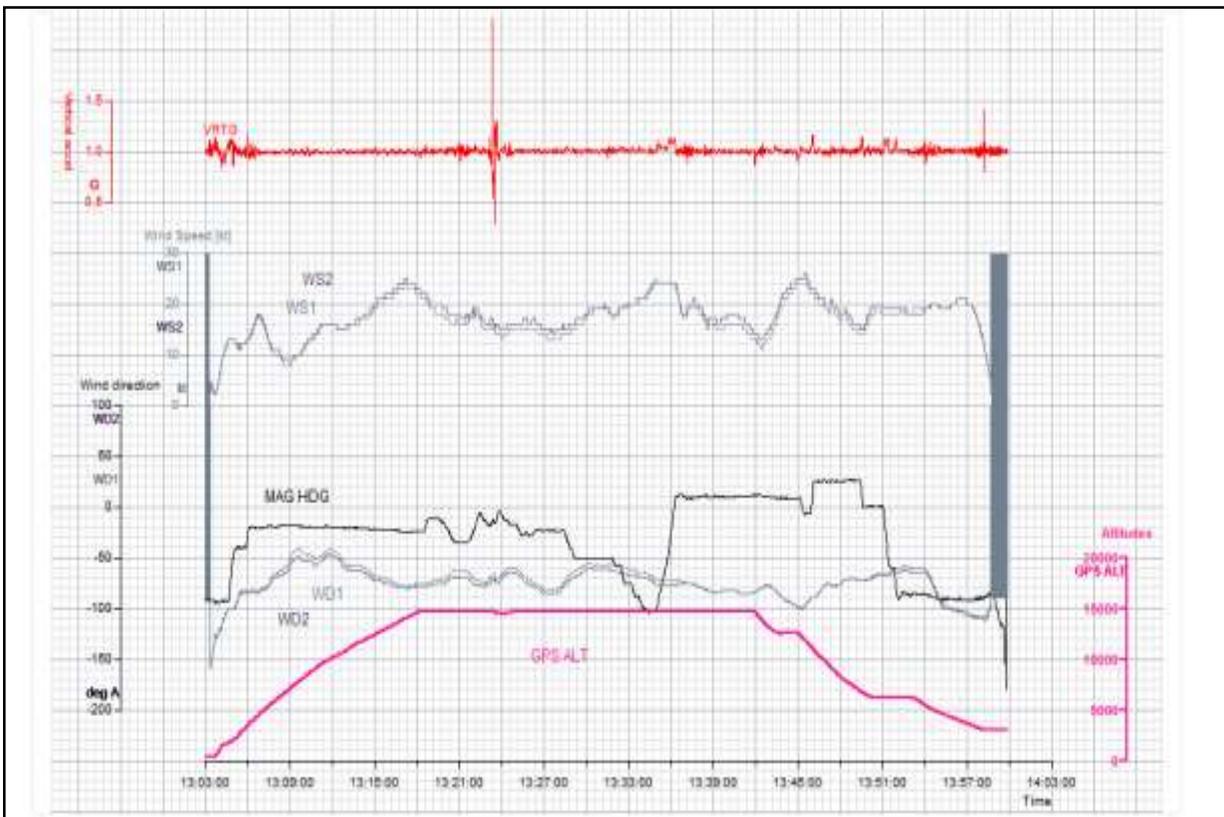


Figure 5: Recorded wind and context parameters during flight

1.8 Aids to Navigation

All the Navigation equipment installed in the Aircraft was serviceable and working satisfactorily.

1.9 Communications

There was two way communication between the aircraft and ATC throughout the flight.

1.10 Aerodrome Information

Nil

1.11 Flight Recorders

As per the FCOM, a Solid State Cockpit Voice Recorder and one Solid State Flight Data Recorder are installed on the aircraft. The Recorders are automatically energized as soon as the aircraft is on its own electrical power supply and are switched OFF automatically 10 minutes after engines are shut down. When the aircraft is on external power, the Recorders remain OFF till one engine is started.

The Recorders can be energized by selecting ON the RCDR push button and de-energized by pressing the RESET push button when the Aircraft is not connected to its own power (i.e. with both engines OFF). In this manner, the Recorders can be selected ON when the engines are OFF, for recording Landing Checklists after engines are shut down, during maintenance checks etc. It should be switched to OFF on completion of checks.

The CVR keeps recorded data of the last 120 minutes of operation in memory. All crew communication transmitted through the RCAU are recorded. In addition, the CVR microphone acquires the cockpit conversation and aural alerts in the cockpit for recording. The cabin crew announcements are also recorded. The active data can get erased from memory, if the same is kept ON for prolonged periods on ground and are required to be deactivated as per DGCA's CAR Section 2 dated 30 Oct 2018 upon completion of flight time following an incident or accident and not reactivated before their disposition in accordance with instruction issued by DGCA.

EVENT pushbutton allows the flight crew to flag an event (e.g. turbulence etc.) occurring during a flight. This flag then allows easier and quicker data analysis by the Flight operation / the safety team of the airline.

Both Solid State Cockpit Voice Recorder (SSCVR) and Solid-State Flight Data Recorder (SSFDR) were downloaded and readout was carried out by the Investigation Team.

1.11.1 Cockpit Voice Recorder

CVR downloading was carried out and the recording quality was satisfactory. The important transcript relevant to the accident is as below (English translation of Hindi Transmissions are given within brackets):

Time	Transmitted by	Transmission
13:16:23	IGO 7739	HAL I FLY 7739 SIR (46:53)
13:16:26	HAL RADAR	I FLY 7739 HAL RADAR IDENTIFIED VERIFY LVL 127
13:16:31	IGO 7739	AFFIRM SIR CLIMBING PASSING LEVEL 127 IFLY 7739
13:16:51	AURAL ALERT	ALTITUDE ALERT
13:16:52	CO PILOT	KYA HOGAYA (WHAT HAPPENED)
13:16:54	CAPT	BADAL HEIN SAMNE(CLOUDS IN FRONT)
13:16:55	CO PILOT	HAAN THO HATALENGE NA ISKO ANATHO. RIGHT MEIN LELENGE KYA DIKKHAT HEIN.(LET IT COME WE WILL TAKE A RIGHT TURN. NO PROBLEM)
13:17:02	CAPT	TRICHY I FLY 7739
13:17:06	ATC	I FLY 7739 TRICHY
13:17:11	CAPT	WE ARE TWO WAY WITH HAL CHANGING OVER JAI HIND.
13:17:16	ATC	I FLY 7739 IDENTIFICATION TERMINATED. YOU CAN CHANGE OVER TO HAL APPROACH
13:17:23	CAPT	AND SIR CONFIRME WE ARE CLEAR TO CLIMB TO FL 140 ONLY
13:17:28	CO PILOT	WHO DEGA WHO DEGA SIR HAL SE LENA (SIR HAL WILL GIVE US THE LEVEL)
13:17:37	CO PILOT	SIR RIGHT LELENGE AAP USKO BOLDO RIGHT HEADING 350 (SIR TELL HIM HEADING 350. WE WILL TURN RIGHT)
13:17:57	CAPT	HAL I FLY 7739
13:18:01	HAL	GO AHEAD
13:18:02	CAPT	SIR. APPROACHING FL 160 CORRECTION 140 SIR
13:18:13	HAL	ROGER CONFIRM YOU WOULD LIKE TO CLIMB
13:18:17	HAL	I FLY 7739 CONFIRM FINAL LEVEL REQUESTED FL140
13:18:23	CAPT	AFFIRM 140 SIR DUE WEATHER SIR AND I REQUESTING HEADING RIGHT 350
13:18:30	HAL	DEVIATION TO RIGHT APPROVED
13:18:33	IGO 7739	SIR I FLY 7739
13:23:33	CAPT	TURN RIGHT TURN RIGHT I SAID TURN RIGHT I SAID
13:24:13	CO PILOT	AUTOPILOT BHI DISCONNECT NAHI HUA SIR(AUTOPILOT ALSO DISNOT GET DISCONNECTED SIR)
13:25:47	CAPT	SEAT BELT ON THI KYA.(WERE THE SEAT BELT SIGNS ON?)
13:25:49	CO PILOT	SEAT BELT ON THI(SEAT BELT SIGNS WERE ON)
13:25:55	CO PILOT	POOCHTE HEIN ALL OK IN CABIN CHOTASA BADAL THA. (LET US ASK IF ALL OK IN CABIN. IT WAS A SMALL CLOUD)
13:26:01	CAPT	MAM CONFIRM ALL OK IN CABIN
13:26:12	CABIN CREW	CAPT L1 LEG GOT FRACTURED
13:26:54	CAPT	L1 LEG GOT FRACTURED MAM..HOW
13:26:56	CABIN CREW	SHE WAS STANDING ACHAANAK SE TURBULENCE HUA AND SHE FELL DOWN PAER MUDGAYA DISLOCATE HOGAYA POORA.(THE TURBULENCE WAS SUDDEN AND SHE FELL DOWN. HER LEG GOT FRACTURED))
13:27:04	CAPT	FRACTURE HOGAYA MAM OR JUST SPRAIN HAI(IS IT A FRACTURE MAM OR JUST A SPRAIN)

Time	Transmitted by	Transmission
13:27:07	CABIN CREW	NAI CAPTAIN DISLOCATE HOGAYA P00RA(NO CAPTAIN COMPLETELY DISLOCATED)
13:27:11	CAPT	OK MAM RIGHT MAM COPIED
13:27:26	CO PILOT	SMALL VERY SMALL CLOUD
13:27:30	CAPT	CAPT MAM BUT SEAT BELTS WERE ON NO?
13:27:36	CABIN CREW	YES CAPT L2 HERE
13:27:39	CABIN CREW	HAAN CAPTAIN SEAT BELTS WERE ON. WE WERE DOING THE SERVICE. BUT ACHAANAK SE TURBULENCE HOGAYA. CAPTAIN (YES CAPTAIN SEAT BELTS WERE ON. BUT THE TURBULENCE WAS SUDDEN. CAPTAIN)
13:27:46	CAPT	SERVICE KYON MAM (WHA SERVICE MAM)
13:27:47	CABIN CREW	SERVICE NAHI THA CAPTAIN. ACTUALLY SERVICE HOPGAYATHA SERVICE THA NAHI. THERE WAS A CREW.USKA ACM MEAL THA. HUMLOG NE ALREADY SERVICE KARLIYA.SHE CAME AND SHE WAS GOING TO SIT JABTAK TURBULENCE HOGAYA.(NO SERVICE CAPT. ACTUALLY WE HAD FINISHED SERVICE. THERE WAS NO SERVICE.THERE WAS A CREW WHOSE ACM MEAL WAS THERE. WE HAD ALREADY SERVED HIM AND SHE WAS GOING TO SIT BY THAT TIME THERE WAS TURBULENCE.
13:28:00	CAPT	WHERE IS SHE? IS SHE IN THE FRONT?
13:28:01	CABIN CREW	SHE IS BEHIND
13:28:06	CAPT	RIGHT MAM
13:28:29	CO PILOT	I HAVE CONTROLS AND COMMUNICATIONS. FLYING DIRECT TO GURBI. EK KAAM KARNA KISIKO BULAO PEHELE KISIKO.(DO ONE THING CALL SOMEONE INSIDE FIRST)
13:28:36	CAPT	KISKO BULAOUN MEREKO JAANAPADEGA (WHO CAN I CALL, I HAVE TO GO)
13:28:37	CO PILOT	NAHI NAHI ABHI NAI JAANA PADEHA SIR KISIKO BULALO. DHO KO HONACHAYIYE COCKPIT MEIN (NO NOT NOW NO NEED TO GO SIR, CALL SOMEONE. TWO HAVE TO BE INSIDE THE COCKPIT)
13:28:43	CAPT	KISKO BULAUN(WHOM TO CALL)
13:28:44	CO PILOT	O LEAD KO BULALANA AUR AAP CHALEJANA TOILET USE KARNEKA BAAD(CALL THE LEAD, YOU GO AFTER USING THE TOILET)
13:28:49	CAPT	HELLO MAM
13:29:05	CO PILOT	SEAT BELTS ON THI AUR CHOTA SAA CLOUD THA (SEAT BELTS WERE ON AND THE CLOUD WAS SMALL TOO)
13:29:09	CABIN CREW	YES CAPTAINL2 HERE
13:29:10	CAPT	YOU CAN COME INSIDE
13:29:11	CABIN CREW	YES CAPTAIN I HAVE PAGED FOR THE DOCTOR, I AM COMING CAPTAIN JUST WAIT FOR TWO MINUTES.
13:29:17	CAPT	OK MAM. I WANT TO COME AND HAVE A LOOK AT HER. OK
13:29:33	CO PILOT	VERY SMALL IT WAS NOT RED ONLY
13:29:44	CAPT	NEECHE THA BUILD UP HORATHA(IT WAS BELOW AND WAS BUILDING UP)
13:30:00	IGO 7739	HAL I FLY 7739 REQUEST

Time	Transmitted by	Transmission
13:30:07	HAL	GO AHEAD
13:30:08	IGO 7739	REQUEST LEFT FOR ANOTHER CLOSE 15 TO 20 MILES DUE WEATHER
13:30:14	HAL	DEVIATION TO LEFT APPROVED
13:30:15	IGO 7739	DEVIATION TO LEFT APPROVED 7739
13:30:36	CO PILOT	GO AHEAD MAM (CALL FROM CABIN CREW)
13:30	CABIN CREW	CAPT L2 HERE
13:30:45	CO PILOT	MY CONTROLS MY COMMUNICATION. SIR JALDI AAJANA(SIR COME SOON)
18:31:29	CABIN CREW	MUJHE EK BAATH BATHAIYE CAPT(TELL ME ONETHING CAPTAIN)
13:31:41	CO PILOT	IT WAS VERY SMALL MAM. ANY OF THE RADARS CANT CAPTURE IT IF IT IS LIKE YELLOW ALSO NO, IT IS NOT EVEN YELLOW IT IS GREEN. YOU KNOW HOW MUCH SECONDS IS THERE
13:31:50	CABIN CREW	I KNOW CAPTAIN
13:31:52	CO PILOT	SO IT IS SOMETHING HIGH OF YOU.YEAH YEAH YOU CAN SEE THAT EK DHUMSE HUA(ALL AT ONCE IT HAPPENED)& THEN WE TURNED ALSO... IMMEDIATELY WE TURNED AWAY BUT IT IS NOT SHOWING ON THE RADAR.... IF IT IS NOT SHOWING ON THAT RADAR NAA... THEN SUPPOSE WE ARE CROSSING IN THE GREEN AREA...THEN WE ARE TELLING YOU AND AREA IS A BIT.... NOW YOU CAN SEE THAT.... IT'S HARDLY FOR 2 SECONDS... BY THE TIME WE REALISED IT.... IT WENT AWAY... THAT'S WHY WE JUST PUT ON THE SEAT BELTS SIGNS... AND THIS IS A NON SERVICE SECTOR...AND THIS IS BASICALLY
13:32:28	CABIN CREW	NON SERVING SECTOR MEALS DEDIYAATHA(MEALS SERVED)BUT MEALS DENE KI BAAD ME HUA GALLEY MEIN JALDI AYI NA.(AFTER MEALS IT HAPPENED, SHE CAME IN A HURRY TO THE GALLEY NO) EVEN I WAS STANDING
13:32:32	CO PILOT	I M REALLY VERY SORRY.... BUT IT'S ALL GREEN... NOTHING THERE ON THE RADAR.... SEALT BELT SIGN IS ON... THAT'S ONLY WHAT WE ARE TELLING... IF WE ARE GOING TOWARDS YELLOW AND RED AREA... AND WE CANT AVOID IT... THEN IT IS LIKE... FOR MAY BE ANOTHER 2 MINUTES OR 3 MINUTES... EVEN 5 SECONDS... YEAH YEAH.... THAT IS DEFENITELY...IT IS DEFINITELY OUR PROCEDURE ALSO...IF WE ARE GOING TO THAT AREA NO.
13:32:54	CALLBELL	CAPTAIN ENTERS
13:33:43	CAPT	FRACTURE AS PER THE DOCTOR
13:33:46	CO PILOT	FRACTURE HAI POORA (TOTAL FRACTURE??)
13:33:47	CAPT	AS PER THE DOCTOR WE HAVE TO RAISE AN INCIDENT REPORT
13:33:52	CO PILOT	AAP DISCUSS KARLENA FLEET SUPERVISOR SE YEH AISE HEIN.(PLEASE DISCUSS WITH THE FLEET SUPERVISOR)
13:33:55	CAPT	KARENGE HUM(I WILL DO)
13:33:57	CO PILOT	HAAN,HAAN(YES,YES)
13:34:24	CAPT	ACTUALLY HUMKO BHI KEAHNA CHAIYE THA(ACTUALLY WE SHOULD HAVE ANNOUNCED)
13:34:32	CO PILOT	KYA SIR EH SEAT BELTS IS ON, NON SERVICE SECTOR.(WHAT SIR

Time	Transmitted by	Transmission
		SEAT BELT SIGNS WERE ON, IT'S A NON SERVICE SECTOR)
13:34:36	CAPT	CABIN CREW TO YOUR SEATS, SEAT BELTS SIGNS ON SHOULD HAVE BEEN ANNOUNCED.
13:34:39	CO PILOT	SIR ITHNA CHOTA 5 SECS KA THA OH. 3 - 4 SECS KA THA AND IT IS NOT SHOWING RED. OH RED BHI NAHI AARATHA, YELLOW BHI NAHI AARATHA THA, GREEN BHI NAHI AARATHA (SIR IT WAS A SMALL. JUST IT WAS 5 SECONDS. 3-4 SECONDS MAYBE, NOT RED TOO, NOT YELLOW TOO, NOT EVEN GREEN)\
13:34:47	CO PILOT	TURNING RIGHT AND PROCEEDING DIRECT TO GURBI BATHATHO SIR EK BAR INKO(SIR TELL THEM TURNING RIGHT AND PROCEEDING DIRECT TO GURBI)
13:37:40	CALL BELL	CALL FROM CABIN
13:37:40	CO PILOT	SEAT BELTS
13:37:42	CAPT	YES MAM
13:37:44	CABIN CREW	CAPT L2 HERE CAN I COME INSIDE CAPT
13:37:49	CAPT	HAAN JI MAM, HOW FAR YOU NEED.THODASA PRESSURIEDHAI WEATHER HAI BARISH HAI BUT AAP AAJAO ANYTHING URGENT PAHELE BATHAO (YES MAM. HOW FAR DO YOU NEED? LITTLE UNDER PRESSURE DUE TO WEATHER..IT IS RAINING, BUT YOU COME, ANYTHING URGENT PLEASE LET ME KNOW.
13:37:56	CABIN CREW	HAAN CAPTAIN URGENT.(YES CAPTAIN URGENT)
13:37:58	CAPT	HAA ANDHAR AAJAO NO PROBLEM
13::39:04	CABIN CREW	OTHER CAPTAIN INFORMED ME WE NEED ORGANISING AMBULANCE, STRECHERS
13:38:26	CAPT	AMBULANCE STRECHER

The aircraft landed and was parked in stand approximately at 14:02:26, but CVR was on till approximately 14:34:26.

1.11.2 Digital Flight Data Recorder

DFDR data was downloaded and analysed by the Investigation Team. The DFDR data relevant during the period of the accident is tabulated below:

Time UTC	Std alt	Heading	IAS	Vertsp d	Pitch	Vertac c	Latacc	Wind speed	Wind dir
13:21:01	13879	322.1	207	64	1.2	1.023	-0.01	18	289
13:22:32	13916	351.4	207	80	1.1	0.975	-0.018	17	282
13:23:09	13897	339.6	212	0	0.9	0.968	-0.012	16	285
13:23:15	13888	339.5	212	0	1.3	0.991	0.006	17	286
13:23:20	13898	341.5	212	96	1.8	0.908	0.024	17	287
13:23:21	13911	341.9	212	224	2	0.862	0.01	17	288
13:23:22	13897	342	213	160	3	1.533	0.006	17	288
13:23:23	13923	343.2	208	496	2.1	2.419	0.033	17	288

Time UTC	Std alt	Heading	IAS	Vertsp d	Pitch	Vertacc	Latacc	Wind speed	Wind dir
13:23:30	13962	342.6	206	272	-5.5	0.347	-0.059	16	289
13:23:34	13822	341.7	216	-2368	-4.6	0.869	0.009	15	286
13:23:35	13842	341.6	219	-1888	-3.3	1.087	0.015	16	285
13:23:36	13806	341.6	221	-2096	-2.2	1.217	0.021	16	285
13:23:38	13698	342.6	222	-1664	-.01	1.270	0.013	16	284
13:23:40	13686	344.9	222	-832	2	1.304	0.009	16	284

Main Parameters during the Turbulence

The main parameters during the turbulence can be seen in the **Figure 6**. At 13.23.23 UTC, VRTG was maximum at +2.42g(2.419) and the aircraft experienced a decrease in altitude from 14060 feet to 14000 feet. LAOA1 reached a maximum of +9.8° and LAOA2 reached +8.9°. AP was commanding mainly nose down orders through elevators, pitch angle started to decrease from +3.0°. Difference between GS and TAS indicated that there was a probable decrease in the head wind. IAS decreased by 5kt within 1 second. The standard altitude increased towards altitude target +90ft. based on VRTG, on the difference between pitch angle and true angle of attack and on the difference between TAS and GS, significant horizontal and vertical wind changes most probably occurred around this time. The aircraft climbed back to 14060 ft at approximately 13:23:25 UTC. At 13:23:28, the aircraft altitude started to decrease and reached 13910 ft at 1323:39. The IAS continued to remain between 207 – 212 knots throughout this period. The Autopilot modes remained in the HDG SEL and the ALT modes throughout the turbulent area and remained engaged throughout.

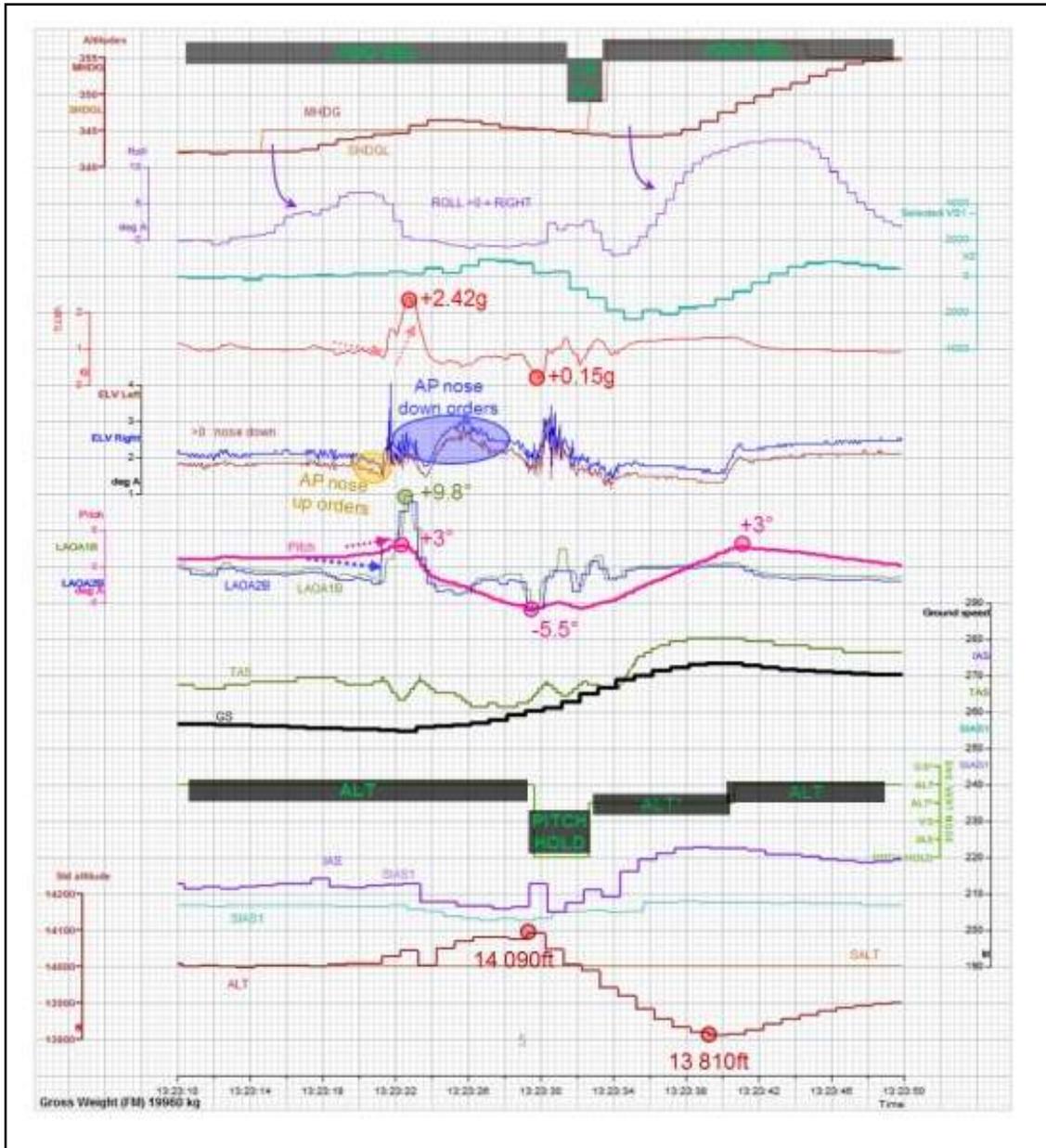


Figure 6: Main Parameters during the turbulence

1.12Wreckage and Impact Information

Nil

1.13Medical and Pathological Information

The crew had undergone pre-flight medical (Breath Analyzer Test) before departure as per requirement of CAR Section 5, Series F, Part III. The test results of the Cockpit crew and Cabin crew were negative. One of the Cabin Crew performing the duties of L1 was injured due to a fall during the turbulence and fractured her left leg.

1.14 Fire

There was no fire.

1.15 Survival Aspects

The incident was survivable.

1.16 Tests and Research

Nil

1.17 Organizational and management information

The aircraft is operated by InterGlobe Aviation (IndiGo), a scheduled airline based in Gurugram. IndiGo fleet consists of 287 aircraft including Airbus A320-Ceo, A320-Neo, A321-Neo and ATR72 aircraft. IndiGo connects all metros and other stations across India and few international stations. It has a main base station at Delhi. Approved night halt facilities have been established to carry out line maintenance and necessary approved maintenance checks. Pre-flight medical facility is also made available to the crew at locations wherever necessary with adequate supporting facility for Pre Flight Medical check.

In order to effectively discharge the responsibilities, the management of IndiGo has established a Flight Safety Department with the Chief of Flight Safety directly reporting to the Accountable Executive. The operator has a training centre, where all ground training is conducted by DGCA approved ground instructors. It also utilizes the CAE Simulator facilities at Bengaluru, Madrid and FSTC at Gurgaon.

The Organisation conducts its operations as per its Operation Manual approved by the DGCA. Detailed operational procedures and limitations of aircraft is provided in the AFM and FCOM. The Organisation conducts its Training for its Aircrew as per FCTM and for the Cabin Crew as per CCTM.

1.18 Additional Information

1.18.1 Duties and Responsibilities of PIC and Co-pilot

Pilot – In – Command

1. PIC will be responsible for the operation and safety of aircraft and safety of persons onboard during flight time.
2. Be responsible to ensure that passengers and crew are seated when seatbelts sign are ON, the crew may be permitted to continue with their duties if he considers it safe to do so.
3. Ensure all checklists and SOPs are adhered to and thoroughly carried out.
4. Be responsible in notifying the nearest authority of any accident involving the airplane resulting in death or serious injury or substantial damage to the airplane or property.
5. Be responsible for certifying Flight report book/journey book or equivalent document.

6. Be responsible for reporting any known defect or suspected defects at the time of termination of flight. He shall inform the OCC and MCC of the defects accepted and MEL application after door closure and continuation of flight, through ACARS.
7. Coordinate all crew duties as provided in the company manuals.
8. Take all actions to improve the efficiency and comfort of flight without having any adverse effect on safety.

Co-pilot

1. He will be under the direct supervision of the PIC and shall carry out all duties pertaining to the operations of a flight and any other duty as assigned from time to time.
2. He is responsible for the navigation of the airplane. Any deviation from track shall be brought to the attention of the PIC.
3. He is responsible to bring to the notice of PIC, any lapses on the part of the Cabin crew.
4. He shall remain in his station at all times during flight except when authorized to leave by his PIC.
5. Shall not alter any flight condition, controls, switches etc. without the knowledge and approval of the PIC, except where such alteration is necessary in an emergency.
6. He shall read out the check list at the appropriate time and ensure its compliance.
7. He shall maintain a listening watch on R/T when within Area, Approach or Airport control boundaries.
8. When a Co-pilot is performing supervision PF duties, the PIC will perform PM duties. However, PIC will retain the authority and responsibility for final disposition of aircraft.

1.18.2 Duties of Cabin Crew

The cabin crew duties are specified in Operation Manual 1.1.9.5, 1.1.9.6 & 1.1.9.7 and in the Safety and Emergency Procedures Manual. As per Para 1.1.9.7, the cabin crew should be seated and strapped whenever the seat belt signs are switched ON unless authorised by the PIC to continue with their service.

1.18.3 Training details of cabin crew

The L2 had completed the required Initial Training on ATR 72-600 Aircraft as per Section 7 Series M Part 1, Issue 111 on 30 Nov 2018 and the Familiarisation training on 28 Dec 2021. The L2 completed the required Initial Training on ATR 72-600 Aircraft as per Section 7 Series M Part 1, Issue 111 on 13 Jan 2020 and the Familiarisation training on 08 Apr 2022.

1.18.4 Manuals

Flight Crew Operating Manual (FCOM) constitutes the primary flight crew reference for the operation of an aircraft under normal, abnormal, and emergency conditions. These include

system descriptions, normal and emergency procedures, supplementary techniques, and performance data.

FCOM specifies procedures related to flight into turbulence under ANOR.7 under the heading Severe Turbulence. It recommends the following:

1. Request a lower flight level to increase margin to buffet onset. Maximum Rough Air Speed (VRA) = 180 Knots.
2. Secure all loose equipment and keep Seat belt signs ON.
3. Keep Autopilot ON.

Flight Crew Training Manual (FCTM) specifies the training procedures for the Flight Crew. The Training Manual specifies Abnormal and Emergency procedures under Chapter 63 Upset and Recovery Training. The Training procedures specify recovery only from Wake Turbulence under Environmentally induced Turbulence and not from any other Turbulence.

The FCTM specifies Crew Co-ordination under Chapter 7 and states that the Flight Crew must notify Cabin Crew of all significant flight phase initiation including entering Turbulence Area.

1.18.5 Non Service Sector

The sector was a non-service sector, but the crew had to serve meals to off-duty air crew travelling. ANOR 7.1 dated 08 Sep 2020 of FCOM states that in order to avoid turbulence area, maximum Rough Air Speed (VRA) should be 180 knots. The seat belts signs should be ON. The SOP for circum-navigating weather is given in Chapter 17 of Issue 4 rev 03 of Operation Manual Part A.

1.18.6 Layout of Passenger Accommodation (LOPA)

The extract of the LOPA in ATR 72-600 is given below:

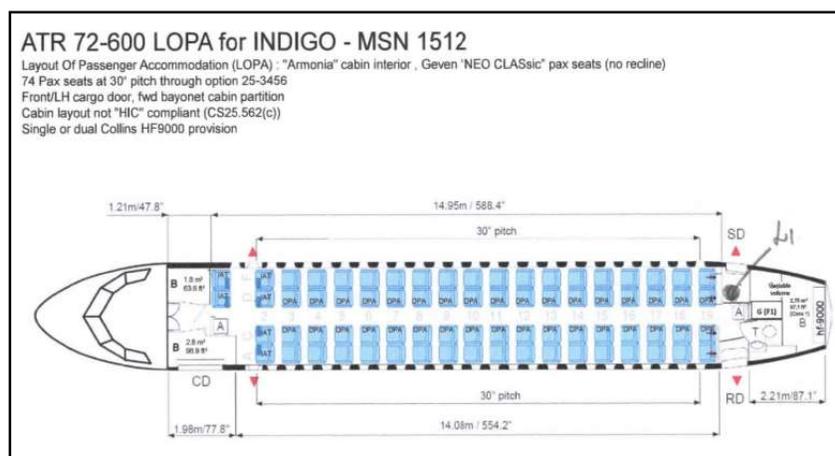


Figure 7: LOPA ATR 72-600

1.19 Useful or effective Investigation Techniques

The Statements of both cabin and cockpit crew, Chief Pilot, Director Training were recorded and analysed. Weather data from IMD and CVR, DFDR data were analysed.

2. Analysis

General

Both operating crew were appropriately licensed and qualified to operate the flight. Their preflight Medicals were valid. The crew training status was up to date.

The accident happened due to non-adherence of SOP by both cabin and cockpit crew. In this aspect the Pilot did not announce either turbulent weather expected or that the signs were ON and everybody to return to seats. The cabin crew continued to serve when the signs were ON and also did not make the announcement; she also failed to inquire from the captain regarding the signs. This resulted in the cabin crew falling down and fracturing her leg when the aircraft hit the turbulence.

The aircraft had a valid Certificate of Airworthiness at the time of accident. The Aircraft held valid Certificate of Release to Service. Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications had been complied with. Transit inspections were carried out as per approved transit inspection schedules and all higher inspection schedules including checks/inspection as per the manufacturer's guidelines.

2.1 Serviceability of Aircraft

The aircraft was serviceable.

2.2 DFDR and CVR Analysis

2.2.1 DFDR

On 4 September 2021, the ATR 72-212A (600 version), MSN1512, registered as VT-IYM, operated by InterGlobe Aviation (IGO), performed the flight IGO-7739 from TIRUCHIRAPPALLI airport (VOTR, INDIA) to BENGALURU airport (VOBL , INDIA) and experienced high vertical loads in flight during cruise at FL140. The main parameters during turbulence are shown in the graph at **Figure 6**.

CLIMB: Aircraft performed its climb phase with AP engaged in LNAV / VNAV IAS modes and in cruise at FL140 at around 13h18 UTC. IAS target was increased to 207kt and aircraft accelerated towards the target.

CRUISE: Once in cruise, the autopilot mode changed from VNAV to ALT and then from LNAV to HDG SEL. Both NDs of DU 2 and DU 4 were selected to display weather, with a range of 10NM and 20NM. The crew reported that "no weather was being picked up by the weather radar on the deviated track". HEADING target was frequently modified in both leftwards and rightwards directions before and after the event. Aircraft was flying at FL140.

13.21 UTC: IAS reached 207kt which was the target IAS at the beginning of the cruise phase. TAS was approximately 260kt. While the wind was recorded at 18kt from 285°, the magnetic heading changed from 325° to 354°, the headwind decreased and the ground speed increased. Then, the magnetic heading decreased to 340° and the headwind increased regularly. IAS increased from 207kt to 214kt while the ground speed decreased from 258kt to 254kt, within 45 seconds. Use of HEADING SEL mode with frequent new heading target selection indicates an attempt to avoid bad weather. From 13.22.32 UTC, the headwind increased from around 4kt to 14kt (at 13.23.14 UTC).

13.23.09 UTC: The aircraft was wing level with the heading close to its target. While the previous accelerations and surfaces positions showed only small variations (calm flight conditions), VRTG started to vary between +0.86g and +1.15g within the 2 next seconds. LAOA1&2 varied with a magnitude of around 2°.

13.23.15 UTC: The heading target changed from 342° to 345° and the right bank started to increase toward +6°.

13.23.20 UTC: LAOA1&2 and VRTG decreased, AP commanded nose up orders through elevators and the pitch angle increased from +1.5°, Roll angle was +6° decreasing to +5°, while heading was close to the heading target.

13.23.21 UTC: VRTG reached a local minimum of +0.74g then increased towards +1.5g, Pitch angle was +2°, still increasing, LAOA2 reached -2° then increased to +4°. AP orders changed from nose up to nose down through elevators, while the standard altitude was above the target (recorded around 25ft above the altitude target) - TAS reached a local maximum of 269kt, and then decreased.

13.23.23 UTC: VRTG reached a maximum of +2.42g. LAOA1 reached a maximum of +9.8° and LAOA2 reached +8.9°. AP was commanding mainly nose down orders through elevators, pitch angle started to decrease from +3.0°. Difference between GS and TAS indicated that the headwind decreased in from 14kt to 0kt within the next 3 seconds. IAS decreased by 5kt within 1 second. The standard altitude increased towards altitude target +90ft. Based on VRTG, on the difference between pitch angle and true angle of attack and on the difference between TAS and GS, significant horizontal and vertical wind changes occurred around this time.

13.23.30 UTC: The pitch angle decreased to a minimum of -5.6°. Standard altitude was around 90ft above the target and started to decrease. VRTG decreased towards +0.15g and at the same time, LAOA decreased to -5.8°. Drops and jumps were recorded on IAS up to 8kt in 1 second.

13.23.24 UTC to 13.23.29 UTC: The standard altitude increased while the pitch angle was up to 4° below the true angle of attack, which means a descent in the air, at which point, the aircraft encountered an updraft. At the same time, variation of IAS showed variations on the longitudinal wind. The vertical mode of AP changed to PITCH HOLD during 3 seconds. ALT SEL mode armed. Pitch angle varied around -5.5°.

Until 13.23.35 UTC: The local angle of attack from both sides varied between -6° and +3°. Altitude decreased, crossed the selected altitude (FL140), ALT* mode engaged. Altitude kept

on decreasing down to 13810ft. While Vz was near 0ft/min, ALT modes engage. IAS had increased up to 222kt (maximum IAS during the event). ALT mode engagement was probably due to push on the ALT button. In such a case, the current altitude (~13800ft) becomes the altitude target. The displayed selected altitude is not synchronized. The altitude converged to 13800ft. Then IAS mode was engaged, aircraft climbed again and captured altitude target at 14000ft.

The turbulent area was observed during approximately 26 seconds, from 13.23.09 UTC to 13.23.35 UTC. Based on GoogleEarth ground elevation, the turbulent area was located downwind and western of mountains with ground elevation up to 5400ft. Aircraft was flying at FL140.



Figure 8: Location of turbulence area as per Google Earth

2.2.2 CVR

Quality of recording of CVR was satisfactory. Cockpit conversation and sounds were clearly audible except when at times the speech overlapped (trying to speak at the same time). While the incident was communicated to ATC, the fact regarding aircraft encountering turbulence was not communicated. After landing CVR remained ON for approximately more than 30 minutes. The aircraft landed and parked in stand approximately at 14:03:24, but CVR was on till approximately 14:34:26.

2.3 Operational/ Human Factors

2.3.1 Crew handling of the aircraft and decision making

Autopilot was kept ON by the crew while encountering Turbulence as provided in FCOM (ANOR 7.1 Severe Turbulence)

As recorded in CVR the crew discussed the clouds ahead and requested for 140FL and a change in HDG to 350° at 13:18:23. However, as per DFDR, the HDG remained between 339.6° to 341.6° throughout the turbulence.

The Flight crew did not reduce the speed to VRA (Max 180KT) as recommended in FCOM(ANOR7.1). At around 13:21 UTC IAS reached 207 kt (target in Auto mode). The Flight crew could have requested for a lower level to increase margin to buffet onset (Max Rough Air Speed (VRA)=180knots).

Pilot-In-Command

The PIC was the PM during this sector. As per the statement of the Co-pilot, the Seat belt signs were switched 'ON' by him approximately 15 minutes before encountering turbulent weather. Analysis of CVR transcript indicates that the PIC (PM) was not aware that the seat belt signs were ON. The PIC (PM) did not make an announcement to alert the cabin crew of an anticipated bad weather and instruct them to remain seated. The PF also mentioned after encountering turbulence, (as observed from the CVR analysis) that the turbulence was from below and building up. The PIC (PM) could have assisted and advised the PF in monitoring the weather ahead but was preoccupied with his paper work.

Co-pilot

The Co-pilot was the PF and as per his statement had switched 'ON' the seat belt sign 15 minutes before encountering turbulence. He failed to call-out, 'seat belts' while switching it 'ON' he also failed to make an announcement or inform the cabin crew. Since he had correctly anticipated a likely bad weather ahead, well before actually encountering turbulence, he could have used better weather radar handling techniques to detect weather ahead or could have requested guidance from the PIC on the better use of Weather radar handling techniques.

Cabin Crew L2

The L2 had noticed that the Seat belt signs were 'ON' for about 15 minutes but failed to enquire from the PIC as to the reason that they were ON. As per SOP, when the seat belt signs are on, the Cabin crews are required to be seated and are allowed to move, only when they are permitted to do so by the PIC. L2 was standing in the galley and she also permitted/instructed her L1 to serve food to persons on-board, when both should have been seated with their seat belts fastened, as per SOP.

Cabin Crew L1

The L1 was serving food to some staff travelling on duty (For location of L1 at the time of turbulence refer **Figure 7**). She too had noticed that the seat belt signs were 'ON' but continued with her service. She could have enquired from L2 if it was safe to move around in that situation. She did not follow the stipulated SOPs.

2.4 Circumstances leading to the incident

- The crew was unaware of the buildup under the aircraft ahead of them.
- The Radar can only display a 3D environment in a 2D view on the EFIS/MFD, due to which the display may not represent weather cells at aircraft level.

- Due to this antenna tilts have to be adjusted during the flight to ensure optimum detection and visualization of weather. If the tilt management is not appropriate, pilots could minimize convective thunderstorms.
- The PF switched ON the seat belts signs, but failed to call out while switching it ON. As a result, the PIC (PM) did not notice that the seat belt signs were switched ON and continue with the work he was doing.
- The Crew failed to make an announcement of an anticipated turbulent weather and Cabin crew were not seated with seat belts ON.
- The L2 was standing in the Galley and the L1 was returning to her seat after service. The sudden turbulence unbalanced L1, who had a fall and sustained a fracture on her left leg.

3. Conclusion

3.1 Findings

3.1.1 General

- a) The Certificate of Airworthiness, Certificate of Registration and Certificate of Flight Release of the Aircraft was valid on the day of Incident.
- b) All concerned airworthiness directives, mandatory service bulletins, mandatory modifications on the aircraft and its engines on date of incident had been complied with.
- c) Both operating crew were duly qualified on ATR72-600 aircraft to operate the flight.
- d) As per Flight Duty Time Limitations (FDTL), both cockpit and cabin crew had adequate rest prior to undertaking the flight on 04 Sep 2021.
- e) There was no snag reported prior to the incident flight.
- f) The taxi out and the takeoff was uneventful.
- g) The PF anticipated turbulent weather ahead, switched 'ON' the seat belt signs approximately 15 minutes before encountering turbulence. He however, failed to call out 'seat belts' or inform the PIC of a likely turbulent weather ahead.
- h) The PIC who was busy with his paper work failed to inform the cabin crew of an anticipated turbulent weather ahead.
- i) Passing FL 127 and climbing FL 140 the aircraft established contact with HAL Radar.
- j) The aircraft encountered turbulent weather at 13:23:09 which lasted for about 26 seconds up to 13:23:35, with a maximum VRTG of 2.42 g experienced at 13:23:23.
- k) The Cabin crew failed to follow SOP that requires them to be seated with belts fastened when Seat Belt signs are switched ON, unless permitted to continue with service by the PIC.
- l) L2 was standing in the galley when the turbulence occurred and the L1 was serving Food to some Staff members travelling on duty even though the seat belt signs were ON.
- m) As per CAR Section 2 Part VI dated 30 Oct 2018, CVRs are required to be deactivated upon completion of flight time following an accident/incident and not reactivated before

their disposition in accordance with instruction issued by DGCA. CVR was selected manually ON and it continued to remain ON for about 30 minutes after parking.

3.1.2 Contributory Factors

Weather and actions of cabin and the cockpit crew in not following the laid down SOP were the contributory factors that led to the accident.

3.2 Probable causes of the accident

1. The weather en-route TRZ – BLR was turbulent, since Weather Radar detects only water droplets and not dry air turbulence. If tilt management is not appropriate pilots could misinterpret the weather target displayed and could inadvertently minimize convective thunderstorm.
2. Anticipating turbulent weather the crew switched 'ON' the seat belts sign, but failed to announce over PA or inform the cabin crew of possible turbulence ahead.
3. The cabin crew too did not enquire from the Captain the reason for the Seat belts signs ON. This is a serious communication failure between the cockpit and cabin crew. Indigo airlines addressed this issue by carrying out amendments in their safety and emergency manual, SEA, Part Three Section 3.12, Turbulence dated 15 September 2021 after this accident.
4. The sudden drop in altitude by 250 feet, owing to the turbulence when the aircraft encountered weather, led to the cabin crew L1, falling down and getting her leg fractured. The cause of the accident was aircraft entering turbulent weather and both the Cockpit Crew and Cabin crew not following assigned SOPs, while flying through Turbulence.

4. Safety Recommendations

It is recommended that

1. Both the cockpit and the cabin crew may be imparted periodical training and practice SOP to handle such occurrences. This has been included in the training manual of the IndiGo Airlines, Safety and Emergency Procedure Manual. Importance of situational awareness should be emphasized during training for the cabin and cockpit crew.
2. The cockpit crew may be imparted training on the correct use of weather radar.
3. The procedure laid down in the CAR Section 2 Part VI dated 30th Oct 2018 regarding CVRs should be strictly followed by the cockpit crew.



GpCapt (Dr) RD Sharma
Investigator -In- charge



Ravi Ramakrishnan
Investigator

