



सत्यमेव जयते

**Final Report on Serious Incident Involving Airprox between
M/s Air India, B787 aircraft VT-ANM and
M/s Virgin Atlantic Airways, B787 aircraft G-VBZZ in Mumbai Oceanic region on
14 Sep 2022**

**Aircraft Accident Investigation Bureau
Government of India
Ministry of Civil Aviation**

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

AAI	Airport Authority of India
AAIB	Aircraft Accident Investigation Bureau
AFN	Aeronautical Facilities Notification
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATS Inter Facility Data Communication
AMSL	Above Mean Sea Level
AMSS	Aeronautical Mobile Satellite service
ARC	Airworthiness Review Certificate
ARP	Aerodrome Reference Point
ARSR	Air route Surveillance Radar
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATPL	Airline Transport Pilot License
BOM	Mumbai
CCWS	Current Controller Work Station
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CNS/ATM	Communication Navigation Surveillance/ Air Traffic Management
CPDLC	Controller Pilot Data Link Communication
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DGCA	Directorate General of Civil Aviation
ft	Feet
GPWS	General Purpose Work Station
Hrs	Hours
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rule
IMD	Indian Metrological Department
Km	Kilometre
Kt	Knot
LAC	Lower Area Control
m	Metres
MATS	Manual of Air Traffic Services
MEL	Minimum Equipment List
MHz	Mega Hertz
MSN	Manufacturer's Serial Number
NM	Nautical Miles
OCC	Oceanic Controller Centre
OCC-N	Oceanic Controller Centre North
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring

RH	Right Hand
SCHMID VCCS	Voice Communication Control System
SIT	Slot Issue Time
STD/ISD	Subscriber Trunk Dialling/ International Subscriber Dialling
TCWS	Terminal Controller Work Station
TMA	Terminal Manoeuvring Area
UTC	Universal Coordinated Time
VABB	CSMI Airport Mumbai
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omni directional Range

SYNOPSIS

On 14 September 2022, Air India's B787 aircraft VT-ANM was operating flight AIC912 from Dubai International Airport (OMDB) to Chhatrapati Shivaji International Airport, Mumbai (VABB) with 88 person on board and Virgin Atlantic Airlines' B787 aircraft G-VBZZ was operating Flight VIR354 from Heathrow, London to Chhatrapati Shivaji International Airport, Mumbai (VABB) with 165 person on board.

Both aircraft were on airway Route L301 with G-VBZZ maintaining FL410 and VT-ANM maintaining FL390. At about 02:39 UTC descent was initiated by G-VBZZ leading to breach of separation.

The minimum vertical separation was reduced to zero and lateral separation was reduced to 03 NM.

The occurrence was classified as a Serious Incident as per Aircraft (Investigation of Accidents and Incidents) Rules, 2017 and Shri Jasbir Singh Larhga, Deputy Director, AAIB was appointed as Investigator-in-Charge to carry out investigation into circumstances of this serious incident, with Shri Ajendra Singh as Investigator to undergo his on On-Job Training vide order no. INV-12012/2/2022-AAIB dated 23 September 2022, under Rule 11(1) of Aircraft (Investigation of Accidents and Incidents) Rules, 2017.

SUMMARY

Final Report on Serious Incident involving Airprox between Air India's B787 aircraft VT-ANM and Virgin Atlantic's B787 aircraft G-VBZZ in Mumbai Oceanic region on 14 September 2022			
1.	Aircraft Type	BoeingB788	BoeingB789
2.	Nationality	Indian	British
3.	Registration	VT-ANM	G-VBZZ
4.	Owner	Air India	Virgin Atlantic Airways
5.	Operator	Air India	Virgin Atlantic Airways
6.	Pilot-in-Command	ATPL HOLDER	ATPLHOLDER (Pilot Flying)
	Extent of Injuries	NIL	NIL
7.	Co-Pilot	ATPL HOLDER	ATPLHOLDER (Pilot Monitoring)
	Extent of Injuries	NIL	NIL
8.	Place of Incident	Mumbai Oceanic	
9.	Co-ordinates of incident Site(Location)	Near waypoint ANKOX on Airway route L301	
10.	Last point of Departure	Dubai (OMDB)	London (EGLL)
11.	Intended place of Landing	Mumbai (VABB)	
12.	Date & Time of Incident	14.09.2022,02:39:00UTC	
13.	Extent of Injuries(Crew)	NIL	NIL
14.	Extent of Injuries(Passenger)	NIL	NIL
15.	Phase of Operation	Cruise	
16.	Type of Incident	Airprox	

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

1. FACTUAL INFORMATION

1.1 History of flight

On 14 September 2022, Air India's B787 aircraft bearing registration VT-ANM was operating flight AIC912 from Dubai International Airport (OMDB) to Chhatrapati Shivaji International Airport, Mumbai (VABB) with 88 person on board. AIC912, B788, was maintaining FL390 on airway Route L301.

At the same time, Virgin Atlantic Airways' B787 aircraft bearing registration G-VBZZ was operating Flight VIR354 from London Heathrow to Chhatrapati Shivaji International Airport, Mumbai (VABB) with 165 person on board and trailing VT-ANM on same airway (Route L301), while maintaining FL410.

Flight VIR354 was operated by a set of 03 Flight Crew. The PIC was relieved by the Relief Pilot and was having in-flight rest in his bunk. Co-Pilot was on controls at RH seat as Pilot Flying. Relief Pilot was on the LH seat as Pilot Monitoring.

At 02:00 UTC, there was routine changeover of ATCO shift in Mumbai ATC. Controllers of OCC-N and Unit U-5 arrived and took over their shift duty in the Oceanic Control Centre of Mumbai ATC. Workstation of OCC-N and U-5 controller are adjacent to each other. Both controllers were to be on watch duty till 08:00 UTC with continuous duty not stretching more than 02 hours without a 30 minute break.

CPDLC connection request was made by controller to VT-ANM and G-VBZZ at 02:08:36 UTC and 02:16:30 UTC respectively. The requests were confirmed by both the aircraft at 02:08:45 UTC and 02:16:46 UTC respectively. G-VBZZ was maintaining MACH 0.82 as per restriction given by Muscat ATC.

At 02:23:33 UTC, G-VBZZ requested clearance from OCC-N for maintaining MACH 0.84. As per the statement of the crew, relief pilot left Flight Deck for a break to use the lavatory after sending message to OCC-N on CPDLC to return to cruise Mach. Flight Services Manager entered the cockpit and the Co-Pilot donned the headset.

At 02:38 UTC, OCC-N sent a CPDLC message to G-VBZZ to maintain speed 0.84 M, which was acknowledged at 02:39:13 UTC. Meanwhile, as per DFDR data, at 02:38:50 UTC (DFDR Timings) the MCP altitude on G-VBZZ was reduced from 41000 ft to 34000 ft, and the aircraft began to descend at 02:39:07 UTC.

By then, both VT-ANM and G-VBZZ had crossed waypoint ANKOX on Route 301. The U-5 controller had not taken G-VBZZ in its jurisdiction yet, but observed descent by G-VBZZ on the CCWS at 02:39:27 UTC.



Fig 1: G-VBZZ observed descending at 02:39:27 UTC



Fig 2: Separation reducing observed at 02:39:29 UTC

OCC-N controller also stated to have monitored the descent and sent a CPDLC message to G-VBZZ to maintain FL400 at 02:40:32 UTC.

U-5 controller observed that the Pilot Selected Altitude on CCWS was shown as FL340. U-5 gave repeated calls to G-VBZZ between 02:40:02 UTC and 02:40:29 UTC, but none was answered. The flight crew in their statement stated that they did not receive these calls from the U-5 controller.



Fig 3: Selected altitude on G-VBZZ observed to be FL 340 at 02:39:56 UTC

As U-5 controller could not establish contact with G-VBZZ, she advised OCC (N) controller to give Frequency 135.75 Mhz to G-VBZZ on CPDLC. OCC-N mistyped frequency as 123.75 Mhz and sent CPDLC message at 02:41:23 UTC. The crew of G-VBZZ checked in as requested and was told to contact Mumbai on 135.75 Mhz.

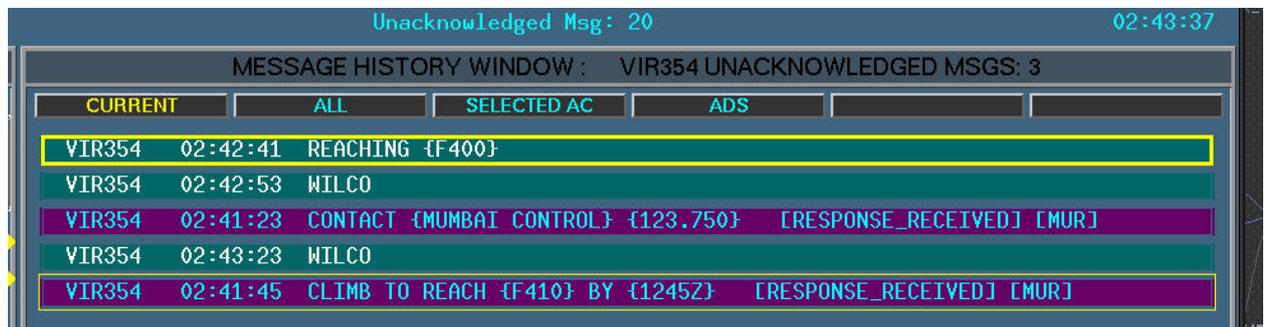


Figure 4: CPDLC Message Window

Meanwhile, on receiving the CPDLC message to hold at FL400 the Co-Pilot selected ALT HOLD on the MCP at 02:40:32 UTC (DFDR Timing). G-VBZZ replied to CPDLC message to maintain FL400 but the aircraft continued to descent for another about 10 seconds and reached the lowest point FL389 at 02:40:42 UTC. At about same time the Relief Pilot also returned to his seat in the flight deck on Left side.

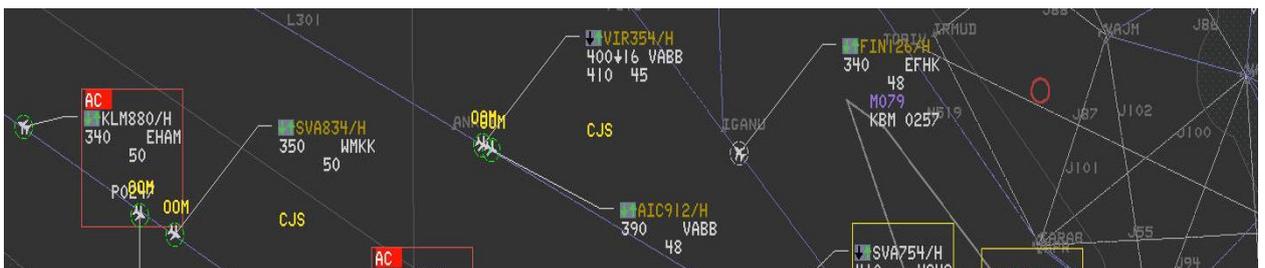


Fig 5: Selected altitude by G-VBZZ observed changed to 410 02:40:03 UTC



Fig6: G-VBZZ descended to lowest level of FL389 at 02:40:42 UTC

Later MCP altitude was increased to 40000 ft by the Co-Pilot and at 02:41:32 UTC, G-VBZZ was noticed by U-5 controller to have started climbing. At 02:41:39 UTC, U-5 Controller was able to establish contact with G-VBZZ over VHF.



Fig 7 : G-VBZZ observed to be climbing at 02:41:47 UTC

U-5 controller asked G-VBZZ to confirm its flight Level. G-VBZZ sought clarification for mistyped frequency and FL400 message received on CPDLC and enquired the Flight Level it was required to maintain. U-5 Controller instructed it to maintain FL410 and G-VBZZ then confirmed setting climb to FL410.



Fig 8: G-VBZZ observed reaching FL410 at 02:43:37 UTC

At 024337, VT-ANM also contacted U-5 and confirmed that it was maintaining FL390 and that Traffic behind them (VIR354/G-VBZZ) was climbing to FL410.

U-5 controller sought clarification from G-VBZZ for descending without clearance to which G-VBZZ informed that they received clearance on Guard Frequency (121.5 Mhz) and it was read back. The crew in their statement stated that they were not able to differentiate between voices of controllers operating 135.75 Mhz and 121.5 Mhz frequency.

The minimum vertical separation was reduced to zero as VIR354/G-VBZZ descended and later climbed through FL390 i.e. the level maintained by AIC912/VT-ANM. The minimum lateral separation had reduced to 03 NM while both aircraft were at FL390 at 02:41:05 UTC.



Fig 9: Aircraft were at minimum reduced separation at 02:41:05 UTC

None of the aircraft reported receiving TCAS RA alert. Since U-5 controller had not taken G-VBZZ in its contact yet, there was no automation generated conflict warning on the CCWS as well. Both VT-ANM and G-VBZZ continued journey to safely land at Mumbai at 0348 UTC and 0350 UTC respectively.

The matter was immediately notified to DGCA by officials of Mumbai ATC over phone and officers from DGCA, Mumbai office visited Virgin Atlantic Airways' office at Mumbai Airport. DGCA officials obtained details of the occurrence including statements from the Flight Crew. AAIB was not notified by DGCA about the occurrence, but G-VBZZ was cleared by DGCA for operating return flight to London without removal of Flight Recorders or download of CVR.

AAIB received formal notification of occurrence from AAI over e-mail and sought preservation of Flight Recorders data and occurrence details from Air India and Virgin Atlantic. Virgin Atlantic provided AAIB with copies of statements obtained from Flight Crew by DGCA and informed that G-VBZZ flight recorders were not removed at Mumbai before operating the return sector to London and therefore the CVR data was overwritten and not available. It was also informed that the flight was cleared by DGCA for return journey to London without any requirement to remove the Flight Recorders or preserve Flight Recorders Data.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil

1.3 Damage to aircraft

None of the aircraft suffered any damage in the incident.

1.4 Other damage

There was no other damage.

1.5 Personnel Information

1.5.1.1 Pilot in Command - VT-ANM

Nationality	Indian
Age	54 Yrs
License	ATPL
Date of Issue	10 Oct 2002
Valid up to	09 Oct 2026
Date of Class I Med. Exam	28 Oct 2021
Class I Medical Valid up to	30 Oct 2022
Date of issue FRTOL License 20554	10 May 2013
FRTOL License Valid up to	09 May 2023
Endorsements as PIC	Cessna 152, TB-20, King Air C-90, A-310, B-777, B-787-800
Total flying experience	13686:27 Hrs
Total flying experience on type	6396:27 Hrs
Last Flown on type	10 Sept 2022
Total flying experience during last 01 year	464:29 Hrs
Total flying experience during last 06 Months	348:02 Hrs
Total flying experience during last 30days	46:09 Hrs
Total flying experience during last 07Days	05:41 Hrs
Total flying experience during last 24Hours	Nil
Rest period before flight	19:30 Hrs

1.5.1.2 Pilot Flying– G-VBZZ

Nationality	British
Age	50 Yrs
License	ATPL
Date of Issue	07Jun 2022
Valid upto	Valid for Life
Date of Class I Med. Exam.	23 Sept 2022
Class I Medical Valid up to	02 Oct 2023
Date of issue FRTOL License	07 Jun 2022
FRTOL License Valid up to	Valid for Life
Total flying experience	6979 Hrs
Total flying experience on type	684 Hrs
Total flying experience during last 01 year	684 Hrs
Total flying experience during last 06 Months	535 Hrs
Total flying experience during last 30 days	80:09Hrs
Total flying experience during last 07 days	08:51 Hrs
Total flying experience during last 24 Hours	Nil

1.5.2.1 Co-Pilot – VT-ANM

Nationality	Indian
Date of Joining to the Organization	June 1996
Age	47 Years
License	ATPL
Date of Issue	03 Mar 2003
Valid upto	02 Mar 2027
Category	Fix Wing
Date of Class I Med. Exam.	30 June 2022
Class I Medical Valid up to	01 July 2023
Date of issue FRTOL License	11 Oct 1994
FRTOL License Valid up to	05 June 2034
Endorsements as PIC	A320, B777, B787
Total flying experience	13900 Hrs
Total flying experience on type on day of incident	6200 Hrs
Total flying experience during last 01 year	408:53 Hrs
Total flying experience during last 06 Months	283:42 Hrs
Total flying experience during last 30 days	46:13 Hrs
Total flying experience during last 07 Days	Nil
Total flying experience during last 24 Hours	Nil

1.5.2.2 Pilot Monitoring – G-VBZZ

Nationality	British
Age	52 Yrs
License	ATPL
Date of Issue	07 June 2021
Valid up to	Valid for Life
Date of Class I Med. Exam.	06 Sep 2022
Class I Medical Valid up to	01 Oct 2023

Total flying experience	16000 Hrs approx
Total flying experience on type	967 Hrs approx
Total flying experience during last 01 year	440.1 Hrs
Total flying experience during last 06 Months	237.3 Hrs
Total flying experience during last 30 days	19 Hrs
Total flying experience during last 24 Hours	Nil

1.5.3 Air Traffic Controller

1.5.3.1 OCC-N Controller

Details of License	
Date of issue	21 Oct 2019
Validity of License	25 Dec 2044
Rating Held and Date of Endorsement	
Area Control Procedural	21 Oct 2019
Oceanic Control	21 Oct 2019

OCC-N controller had joined AAI in May 2010. OCC-N controller had 656 Hrs of logged controlling experience as on date of incident. He had undergone his last proficiency check in Oceanic Control on 05 Sept 2022 and Area Procedural Control on 03 Nov 2022.

1.5.3.1 U-5 Controller

Details of License	
Date of issue	31 Oct 2019
Validity of License	06 Jun 2044
Rating Held and Date of Endorsement	
Area Control Procedural	30 Oct 2019
Oceanic Control	30 Oct 2019
ARSR	09 Feb 2021

U-5 controller had joined AAI in Jan 2009 and had 1417 Hrs of logged controlling experience as on date of incident. She had undergone her last proficiency check in Oceanic Control on 27 Aug 2022, Area Procedural Control on 16 Aug 2022 and ARSR on 15 Nov 2022.

1.6 Aircraft Information

1.6.1 VT-ANM

Aircraft Model	Boeing 787-800
Aircraft S/N	36284
Year of Manufacturer	2013
Name of Owner	Air India Ltd.
C of R issued on	14 June 2013
C of A Validity	Subject to validity of ARC
ARC issued on	15 Sept 2022
ARC valid up to	16 Sept 2023
Aircraft Total Hours on the day of incident	31958:09 Hrs
MEL, CDL and deferred maintenance if any	NIL

1.6.2 G-VBZZ

Aircraft Model	Boeing 787-900
Aircraft S/N	37976
Year of Manufacturer	2016
Name of Owner	Virgin Atlantic Airways Ltd.
C of R issued on	29 March 2016
C of A Validity	Subject to validity of ARC
ARC issued on	14 Mar 2022
ARC valid up to	27 Mar 2023
Aircraft Total Hours on the day of incident	27596 Hrs
MEL, CDL and deferred maintenance if any	NIL

1.7 Meteorological Information

As per Indian Metrological Department (IMD) Metrological office situated at Mumbai, the weather (METAR) on 14 Sep 2022 at Mumbai (VABB) was as follows:

Met Report at VABB	At 0200Z	At 0230Z	At 0300Z
Wind	230°/08KT	230°/09KT	220°/10KT
Visibility	2500	2500	3000
Wx	Haze	Haze	Haze
Cloud	FEW 012 SCT 018 FEW 025 TCU BKN 090	SCT 018 FEW 030 CB BKN 090	SCT 018 FEW 030 CB BKN 090
Temperature	27°C	28°C	28°C
Dew Point	26°C	26°C	26°C
QNH	1005	1005	1006
Trend	NOSIG	BECMG 3000 HZ	NOSIG

1.8 Aids to Navigation

Following navigation and landing aids are available at Mumbai as per MATS Part II Volume 1. All navigation aids were serviceable as per logbook record of ATC Mumbai.

Radio Nav-Aids and Landing Aids Facility	IDENT	Frequency	Site of Antenna	Elevation of Antenna	Remarks
DVOR/DME	BBB	116.6 MHz	190510.21N 0725228.93E	5.0 Meter	NIL
NDB	BBB	1200/ 1137 MHz	190507.4N 0725231.3E	5.0 Meter	Collocated with DVOR
LOC 27	ISCZ	110.3 MHz	190518.7815N 0725042.1861E	5.0 Meter	---
GP 27	---	335.0 MHz	190516.26872N 0725222.556E	5.0 Meter	30
DME (ILS 27)	ISCZ	1001(Tx)/106 4(Rx) MHz	190516.26872N 0725222.556E	5.0 Meter	Collocated with GP 27
LOC 09	IBOM	109.5 MHz	190520.59N 0725252.290E	10.3 Meter	---
GP 09	---	332.6 MHz	190515.248N 0725109.213E	3.716 Meter	30

Radio Nav-Aids and Landing Aids Facility	IDENT	Frequency	Site of Antenna	Elevation of Antenna	Remarks
DME (ILS 09)	IBOM	993(Tx)/1056 (Rx) MHz	190515.248N 0725109.213E	3.716 Meter	Collocated with GP 09
LOC14	IBBY	110.1 MHz	190446.779N 0725240.408E	7.5 Meter	---
GP 14	---	334.4 MHz	190540.67N 0725147.09E	10.5 Meter	---
DME (ILS 14)	IBBY	999(Tx)/1062 (Rx) MHz	190540.67N 0725147.09E	15.2 Meter	Collocated with GP 14
PSR S-BAND		2765/2766/2795/ 2796 MHZ.		190530.5147 N 0725204.1310 E	
MSSR S-BAND		1030/1090 MHZ		190530.5147 N 0725204.1310 E	
PSR L-BAND		1290/1291/1320/1321 MHZ		190538.5901N 0725001.3925 E	
MSSR L-BAND		1030/1090 MHZ		190538.5901N 0725001.3925E	
ELDI S 1	2845/2861/2878/2898 MHz	190508.80N 0725128.23E	22.25 Mtr. (73feet)	---	

1.9 Communications

Details of Air Traffic Services Communication facilities relevant to the present incident are given below:

Service Designation	Call Sign	Channels
OAC	Mumbai OCC	135.750 Mhz
ALRS	-----	121.500 Mhz

The transcript of communication made on 135.75 Mhz frequency and Guard Frequency 121.5 Mhz was obtained from Mumbai ATC. The relevant portion of transcript is given below:

TIME (HH:MM:SS)	FROM	TEXT
121.500 MHz		
02:27:33	ALRS	EMIRATES 356 MUMBAI IF YOU READ CONTACT MUMBAI CONTROL 133.3 EMIRATES 356 MUMBAI IF YOU READ CONTACT MUMBAI CONTROL 133.3
02:27:46	UAE356	1333 EMIRATES 356
135.750 MHz (U-5)		
02:30:47	FIN 126	FIN 126 MAINTAINING FL340
02:30:55	QTR976	MUMBAI QATARI 976 POSITION
02:31:21	QATAR 836	SAY AGAIN QATAR AIR 836 [GARBLED]
02:36:25	U-5	FEDEX 5030 RADAR IDENTIFIED CONFIRM FLIGHT LEVEL 3400
02:36:32	U-5	ROGER REPORT ANKOX NEXT
02:36:50	FDX5030	REPORT VAXIM FEDEX 5030
02:39:05	U5	FINNAIR126 RADAR
02:39:08	FIN126	GO AHEAD FINN AIR126
02:39:11	U5	FINN AIR 126 RADAR SERVICE TERMINATED APPROACHING KABIM KARACHI CONTROL ON 133.025
02:39:18	FIN126	GO AHEAD

02:39:23	U5	FINNAIR 126 APPROACHING KABIM KARACHI CONTROL ON133.025
02:39:35	FIN126	133DECIMAL
02:39:38	U5	133025
02:40:02	U5	VIRGIN 354 RADAR
02:40:05	U5	VIRGIN 354 RADAR
02:40:10	U5	VIRGIN 354 RADAR
02:40:15	U5	VIRGIN 354 RADAR
02:40:24	U5	VIRGIN 354 RADAR
02:40:29	U5	VIRGIN 354 RADAR
02:40:50	AIC912	MUMBAI AIC912
02:41:01	U5	VIRGIN354 RADAR
02:41:39	VIR354	VIRGIN 354 CAN YOU CONFIRM LEVEL PLEASE
02:41:43	U5	VIRGIN 354 SAY AGAIN
02:41:46	VIR354	VIRGIN 354 CAN YOU CONFIRM WHICH LEVEL YOU WOULD LIKE US TO MAINTAIN PLEASE
02:41:51	U5	VIRGIN354CLIMBTOFLIGHTLEVEL410
02:41:59	VIR354	CAN YOU JUST CONFIRM 410 PLEASE BECAUSE YOU TOLD US TO MAINTAIN 400 VIRGIN354
02:42:05	U5	VIRGIN 354 CLIMB TO FLIGHT LEVEL410
02:42:11	VIR354	OKAY CLIMB TO FLIGHT LEVEL 410 VIRGIN354
02:46:00	VIR354	THE DESCEND WAS VIA VOICE ON GUARD
02:46:05	U5	DID YOU GET DESCEND ON GUARD
02:46:07	VIR354	AFFIRM AND IT WAS READ BACK VIRGIN 354

1.10 Aerodrome Information

Mumbai airport is known as Chhatrapati Shivaji International Airport. It is licensed for both IFR and VFR traffic. The IATA location identifier code as BOM and ICAO location Indicator code is VABB. Airport Reference code is 4F.

Co-ordinates of the Aerodrome Reference Point are 190530N, 0725158E. The location is 328.97°/368.7 m from the intersection of Runway. Elevation of ARP is 23.46 feet/7.15 m. Aerodrome Elevation is 40 Feet /12.3m. Aerodrome is equipped with Category 10 type of fire fighting facilities and Meteorological Information can be availed for 24 hours.

1.11 Flight Recorders

Both aircraft were equipped with CVR and DFDR as per the prevalent requirements. As per the requirement contained at para 9.1 of CAR Section 5 Series C, Part I, in case of an accident/serious incident CVR is required to be removed from the aircraft. Further Para 9.2 of the said CAR also require CVR to be removed in cases where the separation between the aircraft was less than prescribed for the situation.

The occurrence was reported by Mumbai ATC to local DGCA office over phone and later by e-mail to AAIB and DGCA. An officer from DGCA's Mumbai office visited Mumbai airport for initial investigation and obtained statements of the crew and other details from Virgin Atlantic Airways. As per the information from Virgin Atlantic, the flight was cleared for next sector by DGCA without any requirement to remove CVR or download CVR data. Hence, CVR data from G-VBZZ was lost. However, the DFDR data was downloaded on its return to London and provided to AAIB for investigation.

Air India in compliance of the requirement laid at Para 9.1 and 9.2 downloaded the CVR as well DFDR data from the Flight. The same was made available to AAIB for investigation.

1.11.1 Cockpit Voice Recorder

As stated above, the CVR of G-VBZZ was not available as the aircraft was cleared by DGCA without removal of CVR data from aircraft. The CVR of VT-ANM was made available to AAIB by Air India and used for Investigation. The relevant transcript from VT-ANM is available below:

CVR ELAPSED TIME (MM:SS)	FROM	TEXT
13:44	ATC	VIRGIN 354 SERVICE TERMINATED CONTACT MUMBAI HF CPDLC
13:52	VIR354	CONTACT MUMBAI HF CPDLC VIR354
13:58	ATC	AIR INDIA 912 SERVICE TERMINATED CONTACT MUMBAI HF CPDLC
14:05	AI912	MUMBAI HF CPDLC AI912 GOOD DAY SIR
27:55	QTR 976	MUMBAI QATAR 976 POSITION
28:14	FIN 126	MUMBAI OCEANIC CONTROL FIN 126 MAINTAINING FL340
28:20	AIC912	MUMBAI, MUMBAI AIR INDIA 912
28:31	AIC912	MUMBAI RADIO, MUMBAI RADIO AIR INDIA 912
28:36	FIN 126	MUMBAI OCEANIC CONTROL FIN 126 FL340 MAINTAINING
28:44	QTR 976	MUMBAI QATAR 976 POSITION
28:49	AIC912	MUMBAI, MUMBAI AIR INDIA 912
28:58	SVA 754	OCEANIC SAUDIA 754 GOOD MORNING LEVEL 410
29:01	AIC912	MUMBAI, MUMBAI AIR INDIA 912
29:10	QTR 836	SAY AGAIN QATAR AIR 836 YOUR TRANSMISSION WAS BLOCKED
29:21	QTR 836	12375 QATAR AIR 836
29:24	SVA 754	OCEANIC SAUDI 754 LEVEL 410
29:36	SVA 754	754
33:01	FDX5030	CONTROL FEDEX 5030 FL340
33:26	FDX5030	CONTROL FEDEX 5030
34:10	FDX5030	CONTROL FEDEX 5030
34:19	U-5	...LEVEL 3400
34:20	FDX5030	WE ARE LEVEL 3400
34:40	IFLY 1769	MUMBAI OCEANIC IFLY 1769 GOOD MORNING
35:02	CONTROL	SAY AGAIN REPORT FOR FDX5030
36:10	FDX5030	CONTROL FEDEX5030
37:17	U5	FINAIR 126 APPROACHING KABIM KARACHI CONTROL ON 133.025
37:24	FIN126	133.025 FINAIR BY BYE
38:05	U5	VIRGIN 354 RADAR
38:14	U5	VIRGIN 354 RADAR
38:19	U5	...54 RADAR
38:24	IFLY 1769	VIRGIN354 MUMBAI OCEANIC CALLING YOU ON 135.75
38:39	AIC 912	MUMBAI AIR INDIA 912
38:52	U5	VIRGIN354 RADAR
39:10	IFLY 1769	VIRGIN354 THIS IS IFLY1769 YOU WANT US TO RELAY A MESSAGE TO MUMBAI

CVR ELAPSED TIME (MM:SS)	FROM	TEXT
39:16	VIR 354	YEAH VIRGIN354 CAN YOU GIVE US FREQUENCY PLEASE FOR MUMBAI WE GOT A CPDLC WE ARE TRYING TO CONTACT THEM
39:22	IFLY 1769	135.75
39:24	VIR354	135.75
39:29	VIR354	VIRGIN 354 CAN YOU CONFIRM LEVEL PLEASE
39:33	U5	VIRGIN 354 SAY AGAIN

1.11.2 Digital Flight Data Recorder

As per the DFDR data obtained from G-VBZZ, the Pilot Selected Altitude was set to 34000 ft by the crew of G-VBZZ at about 02:38:50 UTC and aircraft began to descent at 02:39:07 UTC. Later at 02:40:32 UTC, ALT HOLD was selected on MCP while the aircraft was descending through FL390. Minimum Altitude reached by the aircraft was 38850 Ft (on STD 1013hPA). At 02:40:51 UTC the MCP Altitude was increased to 40000 ft. Later at 02:41:56 UTC climb to FL410 was executed.

DFDR data from VT-ANM confirmed that the aircraft maintained the altitude assigned by ATC. None of the aircraft was observed to have got TCAS RA/TA trigger in the cockpit. The timings indicated above are as per the DFDR.

1.12 Wreckage and Impact Information

Not relevant to the present incident.

1.13 Medical and Pathological Information

There were no injuries to any of the occupant of both aircraft.

1.14 Fire

Not relevant to the present incident.

1.15 Survival Aspects

Incident was survivable.

1.16 Tests and Research

Not relevant to the present incident.

1.17 Organizational and Management Information

1.17.1 Airports Authority of India

Air traffic services at Mumbai airport are provided by the Airport Authority of India. Airports Authority of India (AAI) is a statutory body working under the Ministry of Civil Aviation, Government of India. It provides Communication Navigation Surveillance / Air Traffic Management (CNS/ATM) services over Indian airspace and adjoining oceanic areas. AAI has issued Manual of Air Traffic Services (MATS) for standardization and quality assurance in every sub-system of Air Traffic System, while maintaining harmony with the ICAO Standards and Recommended Practices. MATS Part II, Volume 1 and 2 are applicable for operations in Mumbai ATC.

Air traffic controllers in Mumbai Oceanic Control Centre are provided with GPWS (General Purpose Workstation) or TCWS (Terminal Controller Workstation). The GPWS is an operational workstation that provides processing and display capabilities. It is used to display flight and weather data, system status, aeronautical maps, maps and ops procedures.

CCWS provides the Situation Display (also called SIT Display, Radar SIT Display or RSD). It provides the main functional interface for the ATC. The Situation Display presents aeronautical, geographical, and meteorological data by depicting graphical objects on the SIT window. A graphical object refers to a graphical entity that is displayed within a SIT Display

U-5 controller was seated on a CCWS and OCC-N controller who sits adjacent to U-5 controller is provided with a General Purpose Work Station (GPWS) and shares U-5 CCWS if required.

Jurisdiction of Mumbai Approach, LAC and Area Control as per MATS Part II Volume 2 is shown in the figure below:

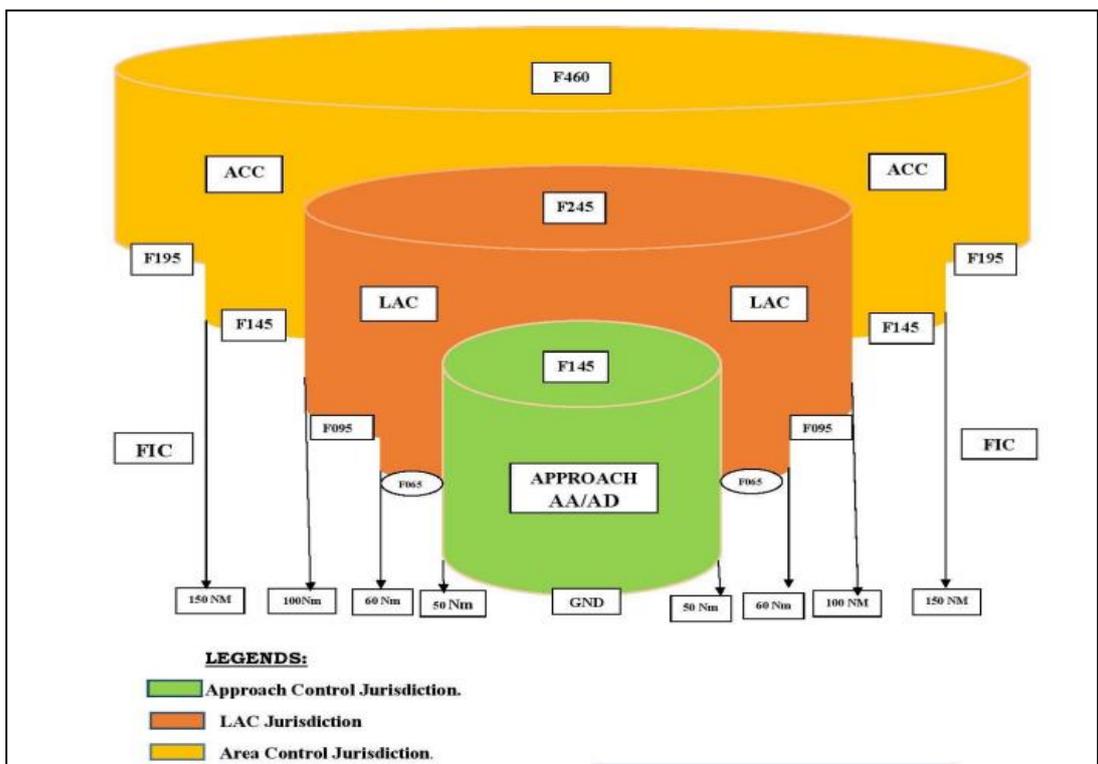


Fig 10: Jurisdiction of Mumbai Approach, LAC and Area Control

The top view of sector Map is shown in the Figure below:

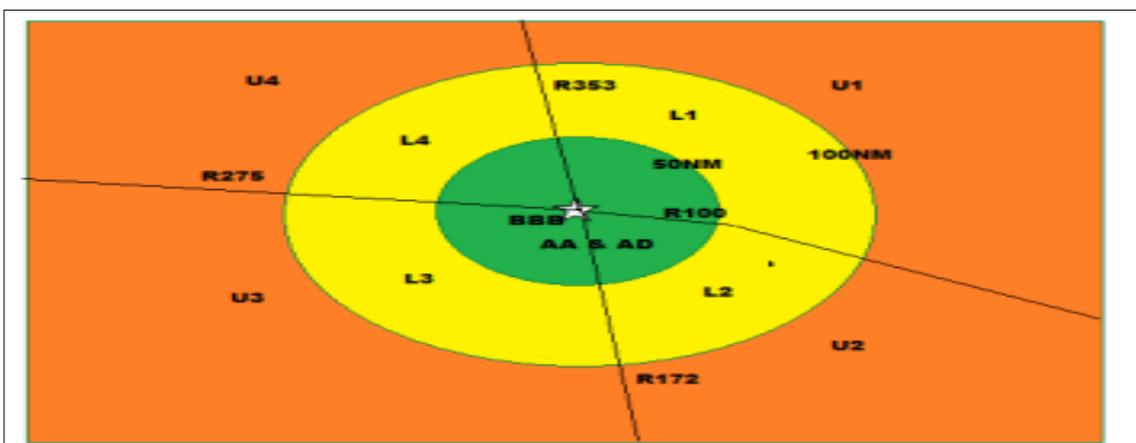


Fig 11: Top view of sector Map

As per the MATS Part II Volume 2, the provision of air traffic control service (in class E airspace), air traffic advisory service, flight information service and alerting service within Mumbai FIR, is the responsibility of Mumbai Oceanic Control Centre except those portions of controlled airspace wherein the responsibility lies with the appropriate ATS units (ACC/APP/TWR).

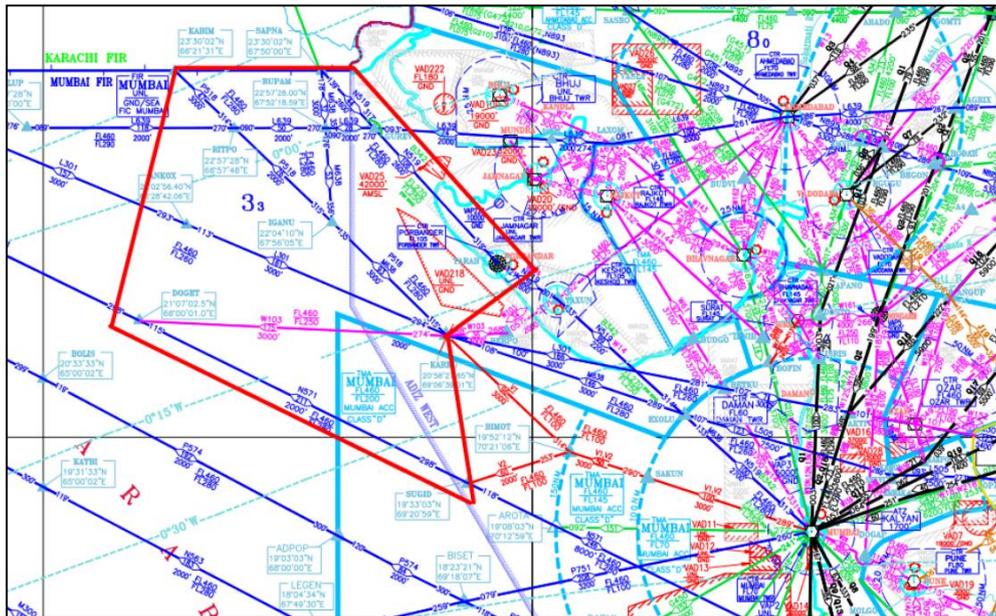


Figure 12: Sector U-5 in Mumbai Oceanic

The U-5 sector of Mumbai FIR is shown in the figure above. U-5 sector is considered extension of Area Control and U-5 controller is required to have Area Control Rating. U-5 controller sits in Mumbai Oceanic Control Centre adjacent to OCC-N controller.

Both aircraft were in Mumbai Oceanic Airspace over Arabian Sea at the time of occurrence. The following communication facilities are available at Mumbai OCC for smooth coordination with other ATS units.

- AFTN / AMSS,
- SCHMID VCCS System,
- STD / ISD/Satellite Telephone,
- HF Radio,
- VHF,
- CPDLC (Controller Pilot Data Link Communication),
- AIDC (ATS Inter-Facility Data Communication)

As per the e-AIP, India, CPDLC/ADS is available 24 Hrs within Mumbai FIR on segments of ATS routes N519, L301, L505, N571, P574, N563, M300, P570, L894, P751, UL425, UM551, P323, G450, G424, B459, T940, A474, G465, N628, R461, L875 and L756 over Arabian sea oceanic airspace. The AFN log address of Mumbai FIR is "VABF". The arriving aircraft are required to log on 10 min prior to entering Mumbai FIR.

CPDLC is the primary means of communication and VHF/HF is the secondary means of communication for the aircraft successfully logged on to ADS/CPDLC when operating in Mumbai OCC. When operating inside TMA, VHF is the primary means of communication for the aircraft.

As per the e-AIP, during the period when aircraft is logged on to ADS/CPDLC, voice position reporting will be to supplement CPDLC Position report only when requested by ATC. Both aircraft (VT-ANM and G-VBZZ) were datalink capable.

Details of ATS Route 301 as given in MATS Part II, Volume 2 is given below:

Route designator (RNP type) : L301(RNP10) VVZ-RASKI				
Name of Significant points coordinates	Track MAG (GEO) VOR RDL DIST (COP)	Upper limits Lower limits Minimum flight altitude Airspace classification	Lateral limits NM	Remarks Controlling Unit Frequency
VISHAKAPATTANA M VOR VVZ)Δ 174003.9N 0831510.0E	287/105 076 NM	F460/F260 7400FT CLASS 'E' 7200FT CLASS D	20	1.Kolkata ACC: • 132.350 MHz • 132.450 MHz 2. Nagpur ACC: • 133.650 MHz • 132.300 MHz 3. Route segment BUSBO - Aurangabad VOR (AAU) - KARKU available with following time restrictions: i. Eastbound aircraft must cross KARKU 1300 UTC or later, 0030 UTC or earlier. ii. Westbound aircraft must cross BUSBO 1300UTC or later, 0100 UTC or earlier. 4. When VED73 is active, aircraft to follow route URKOK (292DEG/111DEG, 250NM) - Point 'A' [180833.7N 0830253.1E] - (268 DEG/087DEG, 60NM) – MEPOK. 5. Mumbai ACC: 133.300 MHz 132.700 MHz 6. Mumbai OCC: 10018 KHz 10084 KHz 8879 KHz 6661 KHz 658 KHz 3476 KHz
MEPOKΔ 180412.7N 0815953.6E	290/108 232 NM	3300FT 4700FT 5400FT		
BUSBOΔ 191458.2N 0780730.3E	285/105 075 NM	3000FT 2000FT 2000FT CLASS 'E'		
ASOGAAΔ 193233N 0764955.9E	285/104 085 NM			
AURANGABAD VOR (AAU)Δ 195153.0N 0752333.6E	283/102 123 NM			
AKTIVAΔ 201502.8N 0731457.6E	283/101 300 NM			
BETKUΔ 202839N 0720059E	281/100 166NM			
KARKUΔ 205827.65N 0690639.01E	294/113 161NM			
ANKOXΔ 220256.40N 0662842.06E	293/112 157 NM			
RASKIΔ 230330N 0635200E				

1.17.2 Air India Ltd.

Air India Ltd., is a scheduled airline with a fleet comprising Airbus and Boeing fleet operating flights on domestic and international sectors. The Airlines Head Quarter is located at New Delhi. The Air Operator Permit (AOP S-9) of the Airlines is valid till 30 Jun 2023. The Company is headed by Chairman & Managing Director assisted by a team of professionals in various departments.

1.18 Additional Information

1.18.1 Notification of Accidents and Incidents

Rule 4 of Aircraft (Investigation of Accidents and Incidents) Rules, 2017 contains provision for notification of accident and incidents to AAIB. As per Rule 4 (4) the notification of an accident or incident shall also be submitted to the Aircraft Accident Investigation Bureau by:

- (a) Aerodrome operator;
- (b) Air Traffic services in-charge concerned;
- (c) DGCA, wherever applicable.

Further, CAR Section 5 Series C, Part I lays down requirement for operators to send notification of an accident or an incident to AAIB at Para 4. The reportable occurrences are listed in the Appendix A of the CAR and the occurrences where CVR is required to be removed for the purpose of Investigation are listed in Para 9 of the CAR.

Notwithstanding the requirements contained in Aircraft (Investigation of Accidents and Incidents) Rules, 2017 or CAR Section 5 Series C, Part I, AAIB was not notified about the occurrence by DGCA or the Airline and neither was CVR removal from involved aircraft ensured before releasing the aircraft for operating next sector.

1.19 Useful or Effective Investigation Techniques

Not relevant to present case

2. ANALYSIS

2.1 Aircraft Serviceability and Crew qualification

Both aircraft were meeting the airworthiness requirements and did not have any MEL, CDL or deferred maintenance actions that could have contributed to the incident. Crew of both aircraft had valid licenses and ratings to operate their respective flights and had adequate rest before operating the flight.

2.2 Air Traffics Services

The OCC-N controller and U-5 controller were having valid license and ratings to perform their duties. They had adequate rest period before joining shift duty on the day of incident. All automation and HF were reported to be operating normal at the time of incident. Both aircraft were ADS-CPDLC equipped and were logged on to VABF at the time of Incident.

The limits of U-5 sector in the Mumbai OCC lies close to way point ANKOX. The VHF coverage in the area is reported to be inadequate as per the statement of the flight crew. In order to corroborate the statements made by the flight crew, Investigation team compared the

transmissions recorded in the CVR of VT-ANM with the transcript of ATC recording obtained from Mumbai ATC. Relevant calls recorded in CVR or ATC voice recordings are consolidated in the following table.

Time (UTC) of calls available in ATC Transcript	Narrator	Narration	CVR Elapsed time for calls available in VT-ANM CVR
	FIN 126	MUMBAI OCEANIC CONTROL FIN 126 MAINTAINING FL340	28:14
	AIC912	MUMBAI, MUMBAI AIR INDIA 912	28:20
	AIC912	MUMBAI RADIO, MUMBAI RADIO AIR INDIA 912	28:31
02:30:47	FIN 126	MUMBAI OCEANIC CONTROL FIN 126 MAINTAINING FL340	28:36
	AIC912	MUMBAI, MUMBAI AIR INDIA 912	28:49
	SVA 754	OCEANIC SAUDIA 754 GOOD MORNING LEVEL 410	28:58
	AIC912	MUMBAI, MUMBAI AIR INDIA 912 166	29:01
02:31:21	QATAR 836	SAY AGAIN QATAR AIR 836 YOUR TRANSMISSION WAS BLOCKED	29:10
02:36:25	U-5	FEDEX 5030 RADAR IDENTIFIED CONFIRM FLIGHT LEVEL 3400	34:19
02:36:32	U-5	ROGER REPORT ANKOX NEXT	
02:36:50	FDX5030	REPORT VAXIM FEDEX 5030	
02:39:05	U5	FINNAIR126 RADAR	
02:39:08	FIN126	GOAHEADFINNAIR126	
02:39:11	U5	FINNAIR126RADARSERVICETERMINATEDAPPROACHINGKABIMKARACHI CONTROLON133.025	
02:39:18	FIN126	FIN126GO AHEAD	
02:39:23	U5	FINAIR 126 APPROACHING KABIM KARACHI CONTROL ON133.025	37:17
02:39:35	FIN126	133.025 FINAIR BY BYE	37:24
02:39:38	U5	133025	
02:40:02	U5	VIRGIN 354RADAR	
02:40:05	U5	VIRGIN354RADAR	
02:40:10	U5	VIRGIN354RADAR	
02:40:29	U5	VIRGIN 354RADAR	38:19

The calls or portion highlighted in colour was available either in the CVR recording or the ATC transcript but not in both, indicating communication loss in transmission. The portion highlighted in green was available in ATC transcript, but not recorded in the CVR of VT-ANM and portion highlighted in yellow was available in CVR of VT-ANM, but not available in ATC Transcript. This indicates that the VHF coverage in the area was poor. It is possible that G-VBZZ would also have faced similar issue as it was trailing VT-ANM.

2.3 Circumstances leading to the Incident

PIC of G-VBZZ was undertaking controlled in-flight rest in the crew rest bunk and the cockpit was being manned by the Co-Pilot as Pilot Flying in the right seat and Relief Pilot as Pilot Monitoring on the left seat. The aircraft was in U-5 sector of Mumbai Oceanic Control and maintaining FL410. The U-5 sector is said to have poor VHF coverage as per the statements of the crew.

Both aircraft (VT-ANM and G-VBZZ) were data link capable and had logged on to VABF. As per the e-AIP, India, CPDLC is the primary means of communication and VHF/HF is the secondary means

of communication for the aircraft successfully logged on to ADS/CPDLC when operating in Mumbai OCC.

The Relief Pilot who was PM left cockpit to use the bathroom and PF donned the Headset. The PF stated to have received descent clearance to FL 340. This coincided with clearance to increase speed to 0.84 MACH sent by CPDLC at 02:37:58 UTC.

No descent clearance was given by Mumbai and in fact descent clearance at this stage was unexpected and unplanned. Neither was descent clearance given to any other aircraft as evident from the ATC Transcript.

There is possibility that PF of G-VBZZ mistook broken transmission over VHF as descent clearance and started descent ignoring the fact that no such clearance was issued on CPDLC which was the primary means of communication in the Mumbai OCC.

The PF set the FL to 340 and aircraft started descent. The aircraft continued to descent until it was pointed by OCC-N controller to maintain FL400 over CPDLC.

The minimum vertical separation was reduced to zero as G-VBZZ descended and later climbed back to assigned flight level while lateral separation reduced to 03 NM. None of the aircraft reported receiving TCAS RA alert. Since U-5 controller had not acquired G-VBZZ & VT-ANM, there was no automation generated conflict warning triggered on the CCWS as well.

3. CONCLUSION

3.1 Findings

3.1.1 The Pilot Flying was in the flight deck of G-VBZZ operating alone at the time of incident

3.1.2 The Pilot Flying of G-VBZZ cited getting descent clearance to FL340, however, the same could not be substantiated by the recordings available from ATC and CVR of VT-ANM.

3.1.3 A similar call sign SVA754 was operating in the vicinity, but did not receive any descent clearance either.

3.1.4 The Pilot Flying of G-VBZZ initiated descent without obtaining any instruction on CPDLC, which was the primary mode of communication in Mumbai Oceanic Control Region.

3.1.5 The U-5 controller had not acquired G-VBZZ & VTANM at the time of incident and hence no automation generated warning was triggered on the CCWS.

3.1.6 There was no TCAS RA alert reported by any of the aircraft.

3.1.7 Communications between the VIR354/G-VBZZ and ATC were noted to be confusing with; poor VHF coverage, a frequency change that was not required, and a request to be at FL410 by a time not in line with the timings of this flight.

3.1.8 The vertical separation was reduced to zero and lateral separation was reduced to 03 Nm against required vertical and lateral separation of 1000 ft and 10 Nm respectively.

3.1.9 The aircraft was released by DGCA without ensuring that CVR is removed for investigation in accordance with CAR Section 5 Series C, Part II.

3.1.10 The notification of occurrence was received from the Aerodrome Operator, ATS provider. However, DGCA or the Airline did not report the incident to AAIB.

3.2 Probable Cause of the Serious Incident

The incident was probably caused by confirmation bias on part of crew that a descent may be expected, given that traffic below was ahead and higher MACH has been requested. A broken VHF communication was possibly mistaken for descent clearance and descent was initiated by G-VBZZ without obtaining confirmation over CPDLC.

4. SAFETY RECOMMENDATIONS

It is recommended that

4.1 The risk of poor VHF communication in Mumbai Oceanic be reviewed by the airline in its briefing material and, if required, amplified to highlight the risks of poor VHF coverage.

4.2 Airport Authority of India may take feasible action to ensure effective VHF coverage in its area of control in the Mumbai Oceanic.

4.3 DGCA should re-iterate to its officers the requirement to notify AAIB of any accident or incident without fail as required by Rule 4(4) of Aircraft (Investigation of Accidents and Incidents) Rules, 2017.

4.4 DGCA should ensure that foreign airline operators operating in Indian airspace notify AAIB of any accident or incident without fail as required by Rule 4(4) of Aircraft (Investigation of Accidents and Incidents) Rules, 2017.

4.4 DGCA should issue directions to all its officers that in case of an accident or incident the crew or aircraft should not be released for subsequent flight without clearance from AAIB and without ensuring preservation of Flight Recorders data as required by Para 9 of CAR Section 5, Series C, Part II.



Jasbir Singh Larhga
Investigator-in-Charge

Date: 08 Feb 2023