سلطنة عُمان
وزارة النقل والاتصالات وتقنية المعلومات
Sultanate of Oman
Ministry of Transport, Communications and Information Technology

Oman Transport Safety Bureau (OTSB)

Final Report

OTSB Case File No: AIFN-004/06/2024

TCAS Resolution Advisory between Etihad Airways-Airbus 321-231 and Air India Express Boeing 737-800NG over Muscat FIR

Name of The Operator: Etihad Airways
Make and Model of The Aircraft: Airbus A321-231
Nationality and Registration Marks: United Arab Emirates, A6-AEJ

Name of The Operator: Air India Express
Make and Model of The Aircraft: Boeing 737-800NG
Nationality and Registration Marks: India, VT-AXT

Location of the Occurrence: Muscat FIR BRAVO sector abeam position BONOM, 20°32'58.39''N059°59'05.57E
State of Occurrence: Sultanate of Oman
Date and Time of Occurrence: 15th June 2024, 06:12 UTC

Purpose of the Investigation

The investigation was conducted by the Air Accident Investigation Section of the Oman Transport Safety Bureau (OTSB) pursuant to Civil Aviation Law 76/2019 Chapter 10, and in compliance with the Civil Aviation Regulation CAR-13.011 - Aircraft Accident & Incident Investigation & Reporting Procedures. The investigation was in conformance with the standards and recommended practices in Annex 13 - Aircraft Accident and Incident Investigation to the Convention on International Civil Aviation Organization (ICAO).

The sole objective of the investigation of an accident and incident is to prevent future aircraft accidents and incidents and not to apportion blame or liability.

Oman Transport Safety Bureau issues this Final Report in accordance with the national and international standards, and industry best practice.

The Final Report will be publicly available when issued at:

http://www.mtcit.gov.om

Oman Transport Safety Bureau

Ministry of Transport Communications and Information Technology

The Sultanate of Oman

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Muscat

Sultanate of Oman

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Abbreviation	Description
AAIS	Air Accident Investigation Section
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
AMSL	Above Mean Sea level
AFL	Actual Flight Level
AAI	Air Accident Investigations
AIP	Aeronautical Information Publication
ANSIC	Air Navigation Service Incident Coordination
APW	Area Proximity Warning
ATC	Air Traffic Control
ATCO	Air Traffic Controller
AWY	Airway
AXB	Air India Express
BEA	Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile
CAA	Civil Aviation Authority
CAL	Civil Aviation Law
CFL	Cleared Flight Level
CR	Central Radar
CVR	Cockpit Voice Recorder
ETD	Etihad Airways
FIR	Flight Information Region
FL	Flight Level
FMS	Flight Management System
FO	First Officer
FPL	Filed Flight Plan
FPM	Feet Per Minute
FT	Feet
GCAA	General Civil Aviation Authority
ICAO	International Civil Aviation Organization
IIC	Investigator-In-Charge
LB	Level Bust
LNAV	Lateral Navigation
LPC	License Proficiency Check
LPR	Language Proficiency Requirements
MATSOP	Manual of Air Traffic Standard Operating Procedures
MTCD	Medium Term Conflict Detection

MCP SPD	Mode Control Panel Speed button
MCT	Muscat
MSAW	Minimum Safe Altitude Warning
NM	Nautical Mile
NTSB	National Transportation Safety Board
OJT	On Job Training
OOMS	Muscat International Airport
OPC	Operator Proficiency Check
OTSB	Oman Transport Safety Bureau
PF	Pilot Flying
PM	Pilot Monitoring
RA	Resolution Advisory
RDR	Radar
RO	Route Off
ROC	Rate of Climb
ROD	Rate of Descent
RVSM	Reduced Vertical Separation Minimum
RPA	Radioactive Protection Advisor
SATCO	Senior Air Traffic Controller
SEP	Separation
SOP	Standard Operating Procedures
STCA	Short Term Conflict Alert
SQK	Squawk
TA	Traffic Advisory
TCAS	Traffic Alert and Collision Avoidance System
UTC	Universal Time Coordinated
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Radio Range
VHF	Very High Frequency
WPT	Way-Point
XFL	Exit Flight Level

Indra System Safety net Alert Abbreviation		
STCA	Short Term Conflict Alert	"Yellow" Prediction "Red" Violation
AW	Minimum Safe Altitude Warning (MSAW)	
W	RVSM	
LB	Level Burst	"Yellow" CFL not matching AFL "Red" CFL not matching Mode-S flight level
HG	Heading conformance	
MC	Medium Term Conflict Detection	
RO	Route off	
SQ	SSR Code Conformance alert	

Synopsis

Oman Transport Safety Bureau (OTSB) was notified of the serious incident by the Sultanate of Oman Civil Aviation Authority (CAA) - Directorate General of Air Navigation (DGAN) - Air Navigation Service Incident Coordination (ANSIC through OTSB email on 16th June 2024 at 12:34 UTC). The incident occurred on 15th June 2024 at 06:12 UTC.

Following the review of the occurrence, the OTSB classified the occurrence as a Serious Incident and the Director of OTSB appointed investigator in charge (IIC) and investigation team to institute and conduct investigation. The following parties were notified:

- State of Design and Manufacturer of Airbus - France-Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile French Safety Investigation Authority (BEA)
- State of Design and Manufacturer of Boeing - United States of America National Transportation safety Board (NTSB)
- State of Operator and Registry United Arab Emirates General Civil Aviation Authority- Air Accident Investigations (GCAA-AAI)
- State of Operator, and Registry India - Aircraft Accident Investigation Bureau (AAIB)
- International Civil Aviation Organization (ICAO)
- Sultanate of Oman Civil Aviation Authority (CAA)

An investigation team was appointed and investigation was conducted in conformance with the ICAO Annex13, CAR 13 and OTSB Investigation procedures. The Sultanate of Oman is the State of Occurrence. The following parties were involved in the investigation through their appointed accredited representatives and advisers:

- State of Design and Manufacturer of Airbus - France-Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile French Safety Investigation Authority (BEA)
- State of Design and Manufacturer of Boeing - United States of America National Transportation safety Board (NTSB)
- State of Operator and Registry United Arab Emirates General Civil Aviation Authority- Air Accident Investigations (GCAA-AAI)
- State of Operator, and Registry India - Aircraft Accident Investigation Bureau (AAIB)

This is the Final Report issued on 04th March 2025 it is made public at the below link: www.mtcit.gov.om

Unless otherwise mentioned, all times in this report are UTC. Local Time in The Sultanate of Oman is UTC plus +4 hours. Photos and figures used in this report were obtained from DGAN and Directorate General Meteorology (DGMET) adjusted from the original for the sole purpose of improving the clarity of the report). Modifications to images used in this Report are limited to cropping, magnification, file compression, or enhancement of colour, brightness, contrast or insertion of text boxes, arrows or lines. The serious incident involved Etihad Airways ETD390 aircraft with registration marks A6- AEJ, Airbus 321-231 and Air India Express AXB817 aircraft with registration marks VT-AXT, Boeing 737-800NG. Aircraft AXB817 entered Muscat Flight Information Region (FIR) via point LOTAV maintaining flight level (FL) 320 flying on westerly direction destination Muscat International Airport (OOMS) while aircraft ETD390 entered via point LABRI maintaining FL310 flying on an easterly direction to exit waypoint LOTAV intended destination Colombo-Bandaranaike International Airport (VCBI), Sri Lanka. As aircraft ETD390 was on Airway (AWY) M300 between waypoint (WPT) EMURU and WPT GOLBA whilst aircraft AXB817 was on AWY M300 (bidirectional) between WPT GOLBA and WPT EMURU on descent from FL340 to FL320, Bravo sector Air Traffic Controller (ATCO) identified aircraft AXB817.

The Bravo sector ATCO cleared aircraft AXB713 that entered MCT FIR via WPT TOTOX destination OOMS to descend to FL160.The flight crew of aircraft AXB713 did not read back the descent clearance and instead the flight crew of aircraft AXB817 readback to descend to FL160.Aircraft AXB817 continued descending to FL160 on AWY M300 which was through the flight level of aircraft ETD390 that was maintaining FL310. Aircraft ETD390 and aircraft AXB817 were on the same AWY head-on, with a closing distance of 30 seconds between them. Thereafter, the yellow Short-Term Conflict Alert (STCA) was triggered on the Middle sector ATCO radar screen between conflicting traffic aircraft ETD390 and aircraft AXB817 and the Traffic Collision Avoidance System (TCAS)

Resolution Advisory (RA) were activated on both aircraft.
At the time the Middle sector ATCO issued a clearance to the flight crew of aircraft AXB817 to maintain FL320 and to turn right 20° in order to avoid the conflict with aircraft ETD390 both the flight crew of aircraft AXB817 and aircraft ETD390 reported to the Middle sector ATCO applying the TCAS-RA avoidance manoeuvre respectively. Once aircraft AXB817 and aircraft ETD390 were clear of conflict, aircraft ETD390 climbed back to FL310 and aircraft AXB817 climbed to FL320 as instructed by Middle sector ATCO. Furthermore, both aircraft continued to their destinations and landed safely without any further incident.

The closing distance between the two aircraft separation was 700FT and distance in time of 30 seconds. The loss of separation was due to the flight crew of aircraft AXB817 executing a descent meant for other aircraft AXB713.

The OTSB investigation team concluded that the incident was as a result of the loss of separation between aircraft AXB817 and aircraft ETD390 which was on AWY M300 descending through the flight level of aircraft ETD390 that was maintaining FL310. This loss of separation was caused by the flight crew of aircraft AXB817 responding to the descend instruction meant for aircraft AXB713 and the Middle sector ATCO could not verify the correct readback call sign.

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On the 15th of June 2024, Etihad Airways aircraft with registration marks A6-AEJ, an Airbus 321-231 departed from Zayed International Airport (OMAA) on an international scheduled flight ETD390 with intended destination Colombo-Bandaranaike International Airport (VCBI), Sri Lanka. While Air India Express aircraft with a registration marks VT-AXT, a Boeing B737-800NG on the same day departed from Mangalore International Airport (VOML) on an international scheduled flight AXB817 with intended destination Muscat International Airport (OOMS).

1.1.2. Both aircraft had a flight plan over Muscat FIR on a bidirectional airway M300 where aircraft ETD390 entered MCT FIR Central Sector from WPT LABRI on AWY N318 TOLDA P570 EUMRU M300 on eastbound direction to exit via WPT LOTAV. While aircraft AXB817 entered MCT FIR Middle sector through WPT LOTAV to the destination OOMS maintaining FL340 following M300 EMURU T505 MCT flying westbound direction.

1.1.3. Alpha and Bravo Sectors were combined. Bravo sector ATCO was very busy handling 25 aircraft in the sector. The incident occurred at the boundary between Bravo sector and Middle sector. At the time 05:57:50, aircraft AXB817 entered MCT FIR at LOTAV AWY maintaining FL340. At the time 05:59:21, Bravo sector ATCO accepted a traffic hand over on ETD390 from central sector. At the time 06:00:10, aircraft ETD390 entered Bravo sector maintaining FL310.

1.1.4 At the time 06:02:32, aircraft ETD390 was abeam position AWY N318 TOLDA maintaining FL310. At the time 06:03:30, Middle sector ATCO requested Bravo ATCO to descend aircraft OMA212 from FL380 to FL320. At the time 06:04:28, Middle sector ATCO requested Bravo ATCO to descend aircraft AXB817 from FL340 to FL320.

1.1.5 At the time 06:04:35 Bravo sector ATCO accepted FL320 for aircraft AXB817. At the time 06:04:38, Bravo sector ATCO accepted Oman Air aircraft OMA212 maintaining FL320.

1.1.6 At point WPT LOTAV aircraft AXB817 was identified by the Middle sector ATCO and at the time 06:05:42 the Middle sector ATCO issued a clearance to aircraft AXB817 to descend to FL320 to be level at WPT GOLBA. At the time 06:06:35, aircraft ETD390 was seen on the Middle sector ATCO radar screen over EMURU maintaining FL310. At the time 06:06:52, the flight crew of aircraft AXB817 advised the Middle sector ATCO that there was a distortion and background noise on the radio transmission.

1.1.7 At the time 06:07:15, the flight crew of aircraft AXB817 commenced the descend leaving FL340 for FL320. At the time 06:08:50, Bravo sector ATCO became busy with aircraft Saudi aircraft SVA843 who was checking out at TOKRA and was not radio transferred to Middle sector. Thereafter, the Middle sector ATCO transferred aircraft AXB817 to the Bravo sector ATCO. At the time 06:09:10 Bravo sector ATCO accepted a radar hand over on aircraft AXB817 from Middle sector ATCO.

1.1.8 At the time 06:09:42, the flight crew of aircraft AXB817 established contact with MCT Bravo sector ATCO and reported descending through FL327 for FL320. There was no response from the Bravo sector ATCO as the Bravo sector ATCO was busy coordinating with the Middle Sector ATCO regarding frequency change for a Saudi aircraft (SVA843) that was approaching Jeddah`s FIR. According to Bravo Sector position audio playback there was a lot of distortion

background noise from the frequency, step down(block) of transmissions and echo during the radio calls made to the Bravo sector ATCO.

1.1.9 At the time 06:10:09, another aircraft AXB713 entered MCT FIR from WPT TOTOX on AWY A775 destination OOMS requested Bravo Sector ATCO to descend from FL380 to FL160 and the ATCO instructed the flight crew of aircraft AXB713 to stand by.

1.1.10 At the time 06:10:30 approaching the Bravo sector, the flight crew of aircraft AXB817 established contact with Bravo sector ATCO and the ATCO identified aircraft AXB817. The radio calls transmission was distorted by another aircraft and some background noise.

1.1.11 At the time 06:10:53, Bravo sector ATCO instructed the flight crew of aircraft AXB713 to descend to FL160. The flight crew of aircraft AXB713 did not readback nor descend. At the time 06:10:58, the flight crew of aircraft AXB817 replied, “descend FL160 AXB817”. At the time 06:11:00, aircraft AXB817 entered Bravo sector through way point (WPT) GOLBA and continued with the descent passing through FL322 for FL160 and at the time, aircraft ETD390 was less than 40NM on the same AWY M300 opposite direction maintaining FL310.

1.1.12 During this time in accordance to the statement of the flight crew of aircraft ETD390, one of the flight crew seats was not occupied as one of the flight crew of aircraft ETD390 was away for the lavatory and when the flight crew of aircraft ETD390 felt the descent of the aircraft and immediately return to the seat and took over control.

1.1.13 At the time 06:11:10, Level Burst (LB) alert was activated on the ATCO Indra radar display screen as aircraft AXB817 was on descent passing through FL322 with a Rate of Descent (ROD) 500 feet per minute (FPM) and aircraft ETD390 was maintaining FL310 as indicated in figure 1 below.

Figure 1: indicating Level Burst (LB) on aircraft AXB817 while descending through FL322 for FL160 with ROD 500FPM.

1.1.14. At the time 06:11:45, the Medium-Term Conflict Detection (MC) alert along with the LB was activated on aircraft AXB817 displayed on Middle sector ATCO radar screen while the Medium-Term Conflict Detection (MC) alert was activated on aircraft ETD390 which was maintaining FL310. The aircraft AXB817 was descending through FL317 for FL160 at a ROD 1000FPM as indicated on the below figure 2.

Figure 2: indicates Medium Term Conflict Detection activated on both aircraft ETD390 and aircraft AXB817.

1.1.15 At the time 06:11:50, yellow Short-Term Conflict Alert (STCA) was activated on the Middle sector ATCO radar screen between aircraft ETD390 and aircraft AXB817 with a distance of 12.27 Nautical Mile (NM) and distance in time of 30 Seconds apart as per the below figure 3.

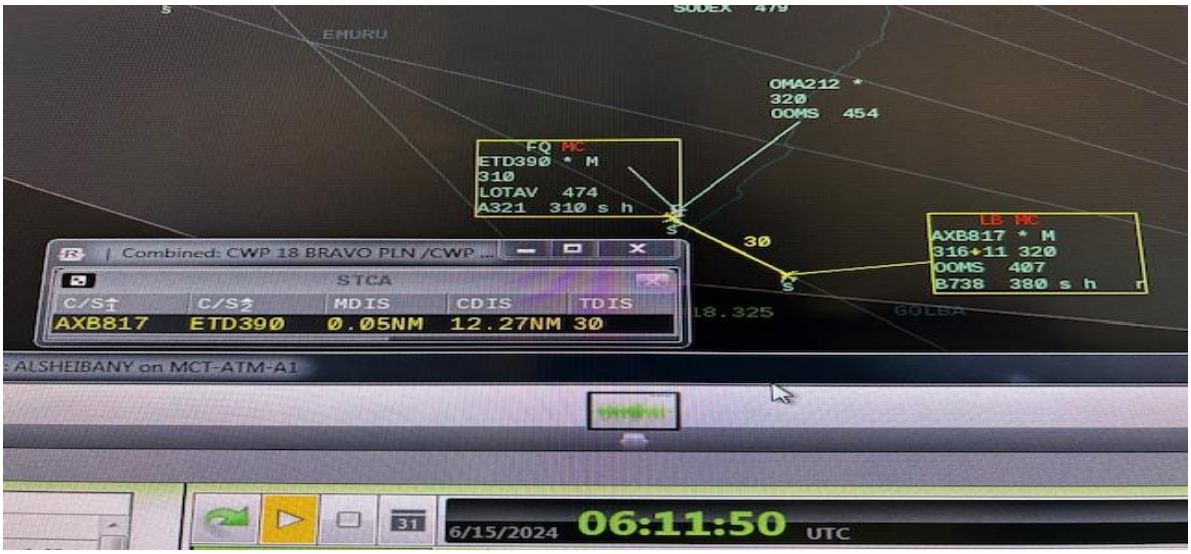

Figure. 3: STCA alert activated on Middle sector ATCO radar screen between aircraft ETD390 and aircraft AXB817

1.1.16 At the time 06:12:01 the Bravo Sector ATCO issued clearance by calling the flight crew of aircraft AXB817 to maintain FL320 and to turn right twenty degrees.

1.1.17 At the time 06:12:10, the flight crew of aircraft AXB817 replied to the Middle sector ATCO that they are on Resolution Advisory (RA) and to stand by. At the time 06:12:11, the Middle sector ATCO called again the flight crew of aircraft AXB817 to maintain FL320 and the flight crew of aircraft AXB817 replied “Standby one Sir we are on RA”.

1.1.18 At the time 06:12:14, during radar playback both aircraft ETD390 and aircraft AXB817 were observed responding to TCAS RA, aircraft AXB817 was climbing through FL315 to FL320 with ROC 300FPM and aircraft ETD390 was descending through FL309 and leaving FL310 with ROD 300FPM as shown in the below figure 4.

Figure 4: shows aircraft AXB817 was observed on the radar climbing through FL315 to FL320 with ROC 300FPM while aircraft ETD390 was descending through FL309 and leaving FL310 with a ROD 300FPM.

1.1.19 At the time 06:12:22, the distance between the two aircraft AXB817 and aircraft ETD390 was reduced to 4.52NM and vertical separation was 800 feet the STCA turned Red. At the time 06:12:25, red alert (STCA) displayed on the Middle sector ATCO radar screen between aircraft AXB817 while on climb passing through FL317 to FL320 with ROC 1000FPM and aircraft ETD390 descending through FL308 from FL310 with ROD 800FPM with a closing head-on distance of 4.52NM apart prior to both aircraft passing each other as shown in figure 5 below.

Figure 5: showing aircraft AXB817 while on climb passing through FL317 ROC 1000FPM and aircraft ETD390 on descent passing through FL308 ROD 800FPM with closing distance 4.52NM.

1.1.20 At the time 06:12:31, a 1000FT separation achieved by the two traffic, aircraft AXB817 and aircraft ETD390 complying to RA. At the time 06:12:33, Bravo Sector ATCO called the flight crew of aircraft ETD390 "ETD390 MCT "and the flight crew of aircraft ETD390 replied "ETD390 TCAS RA".

1.1.21 At the time 06:12:59, the flight crew of aircraft AXB817 reported to Bravo Sector ATCO "clear of conflict and climbing back to FL320. The Bravo sector ATCO asked the flight crew of aircraft AXB817 "Who gave you clearance to descend 300". The flight crew of aircraft AXB817 replied "Ah Sir you gave us clearance I repeated back and you acknowledged" then the Bravo sector ATCO replied "Negative we descend AXB713". Then AXB817 replied "Sir you said 817, I acknow… I asked you twice and you acknowledged anyway we are back to 320 now Sir 817" then the Bravo sector ATCO said "Negative we descend AXB713".

1.1.22 At the time 06:13:05, the red STCA was still activated on the Middle sector ATCO Radar display screen even after both aircraft passed each other safely while aircraft AXB817 was maintaining FL315 and aircraft ETD390 was maintaining FL308 as shown in Figure 6 below.

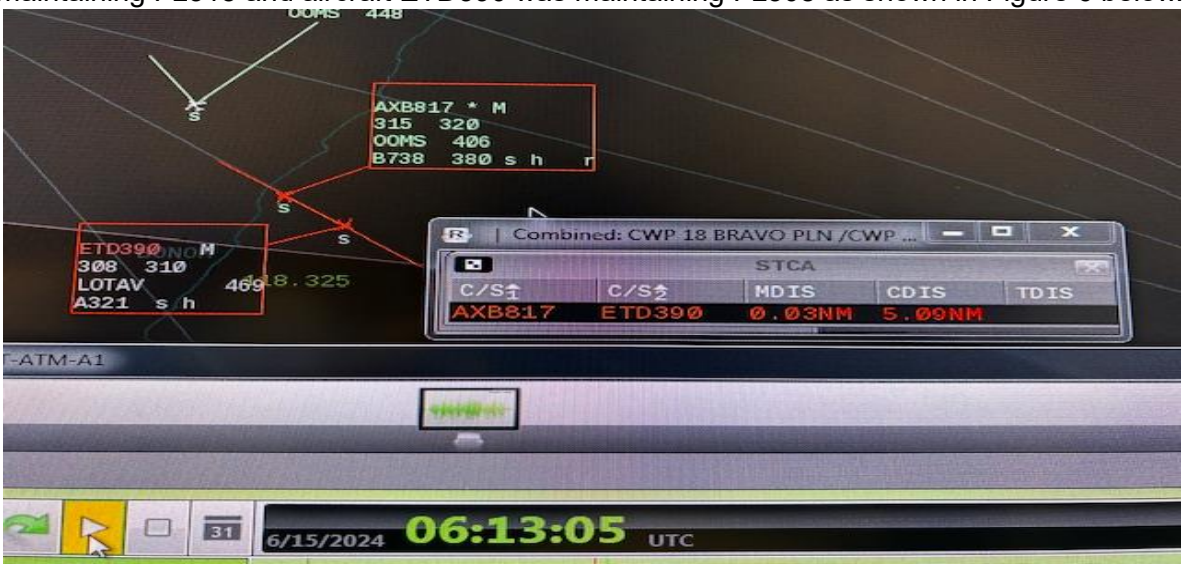

Figure 6: shows the red STCA was still activated on the Middle sector ATCO Radar display screen even after both aircraft passed each other safely.

1.1.23 At the time 06:22:42, Middle sector ATCO transferred aircraft AXB817 to Approach ATCO on frequency 121.2MHz. Both aircraft AXB817 and aircraft ETD390 continued to their destinations and landed safely without any further incident.

1.1.24 During the interview, the flight crew of aircraft AXB817 stated that while they were 130NM short of MCT on radial 148°, they were cleared to descend to FL160 which was acknowledged. The flight crew of aircraft AXB817 further indicated that there was some traffic observed on the TCAS display, however aircraft ETD390 was not observed. The TCAS of aircraft AXB817 was working as expected indicating the surrounding traffic and that the flight crew of aircraft AXB817 reacted when TA/RA was activated.

1.1.25 Following the incident, Bravo sector ATCO reported that two frequencies (Alpha and Bravo sectors) were combined and bad radio coverage was reported at some points by the flight crews. This caused radio interferences affecting pilots as the flight crew could not hear each other due to the background noise. The flight crew then kept calling which caused the blocking of the frequencies. The Bravo sector ATCO also reported that in an attempt to unblock the frequency, the coupling function to unblock the frequency did not work as required.

1.1.26 During the interview, the Bravo sector ATCO stated that the ATCO cleared the flight crew of aircraft AXB713 which was already identified to descend to FL160, however the flight crew of aircraft AXB817 readback and entered the Bravo sector. The Bravo sector ATCO further stated that he did not realise on time to correct it and only once aircraft AXB817 started to descend through FL320 and the STCA triggered with aircraft ETD390 which was at FL310 and the distance in time between both aircraft was 14 seconds. The flight crew of aircraft AXB817 informed the Bravo sector ATCO about the TCAS alert and TCAS procedures.

1.2. Injuries to Persons

1.2.1 Injuries to Persons aircraft ETD390.

Injuries	Pilot	Crew	Pass.	Total on Board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
No Injuries	2	5	196	203	-
Total	2	5	196	203	**-**

Note: Other means people on ground.

Injuries to Persons aircraft AXB817

Injuries	Pilot	Crew	Pass.	Total on Board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
No Injuries	2	4	79	85	-
Total	2	4	79	85	**-**

Note: Other means people on ground.

1.3. Damage to Aircraft

1.3.1. No damages were reported.

1.4. Other Damage

1.4.1 No other damages were reported.

1.5. Personnel Information

1.5.1 Captain aircraft ETD390 Pilot Monitoring (PM)

Nationality	United Arab Emirates		
Medical Validity	15th June 2025	Licence Type	ATPL-A
Licence Validity	27th June 2032	Type Endorsed	A320
Ratings	A320, A330, A350, A380, IR		
English Language Proficiency Level, Issue and Expiry Date	Level-5 Exp: 2nd Jan 2029		
LPC Issue Date	6th May 2024	OPC Issue Date	6th May 2024
LPC Expiry Date	31st May 2025	OPC Expiry Date	30th Nov 2024
Restrictions	Nil		
Previous Accidents	Nil		

Note: Previous accidents/incidents refer to past accidents/incidents the pilot was involved in, when relevant.

Flying Experience:

Total Hours	5703
Total Flying Hours On Type	1241
Total Past 24 Hours	1:01
Total Past 7 Days	10:48
Total Past 30 Days	54:14
Total Past 90 Days	96:19

1.5.1.1 The PIC was issued an Airline Transport Pilot license (ATPL) which is rated for A320, A330, A350 and A380. The license was valid with an expiry date of 27th July 2032. He is holding level 5 English Language proficiency that is expire on 2nd Jan 2029.

1.5.1.2 The PIC was issued a Class (one) 1 medical certificate with an expiry date of 15th June 2025. The last medical assessment date was conducted with no limitations.

1.5.2 First Officer (FO) aircraft ETD390 Pilot Flying (PF)

Nationality	India		
Medical Validity	09th May 2025	Licence type	ATPL-A
Licence Validity	10th Dec 2026	Type Endorsed	A320
Ratings	A320, IR		
English Language Proficiency Level, Issue and Expiry Date	Level 4 Expiry: 25th Dec 2024		
LPC Issue Date	29th Apr 2024	OPC Issue Date	29th Apr 2024
LPC Expiry Date	30th Apr-2025	OPC Expiry Date	31st Oct 2024
Restrictions	Nil		
Previous Accidents	Nil		

Note: Previous accidents/incidents refer to past accidents/incidents the pilot was involved in, when relevant.

Flying Experience:

Total Hours	3098
Total Flying Hours on Type	2997
Total Past 24 Hours	01:01
Total Past 7 Days	08:20
Total Past 30 Days	34:30
Total Past 90 Days	119:25

1.5.2.1 The FO is holding an ATPL -A and rated A320. The license is valid till 10th December 2026 and holding level 4 of English Language proficiency which will expire on 25th Dec2024.

1.5.2.2 The FO was issued a Class 1 medical certificate that's expire on 9th May 2025.

1.5.3 **Captain aircraft AXB817 PF**

Nationality	Indian		
Medical Validity	3rd Mar 2025	Licence Type	ATPL
Licence Validity	18th Jul 2027	Type Endorsed	B737 300-900
Ratings	BOEING 737 300-900, BE 200, PA 34, PA 28, IR		
English Language Proficiency Level, Issue and Expiry Date			Level 5 Expire on 7th Feb 2025
LPC Issue Date	10th Apr 2024	OPC Issue Date	13th Dec 2023
LPC Expiry Date	9th Oct 2024	OPC Expiry Date	12th Dec 2024
Restrictions	Nil		
Previous Accidents	Nil		

Note: Previous accidents/incidents refer to past accidents/incidents the pilot was involved in, when relevant.

Flying Experience:

Total Hours	5350
Total Flying Hours On Type	2650
Total Past 24 Hours	03:24
Total Past 7 Days	11:57
Total Past 30 Days	67:02
Total Past 90 Days	185:06

1.5.4 **First Officer (FO) aircraft AXB817 PM**

Nationality	Indian		
Medical Validity	3rd Aug 2025	Licence type	ATPL
Licence Validity	26th Dec 2033	Type Endorsed	B737 300-900 MAX
Ratings	B737 300-900 MAX, C172, PA 34, IR		
English Language Proficiency Level, Issue and Expiry Date			Level 5, which expire on 3rd Mar 2026
LPC Issue Date	12th Apr 2024	OPC Issue Date	17th Jan 2024
LPC Expiry Date	21st May 2025	OPC Expiry Date	16th Jan 2025
Restrictions	Nil		
Previous Accidents	Nil		

Note: Previous accidents/incidents refer to past accidents/incidents the pilot was involved in, when relevant.

Flying Experience:

Total Hours	4800
Total Flying Hours On Type	4500
Total Past 24 Hours	07:54
Total Past 7 Days	28:28
Total Past 30 Days	46:38
Total Past 90 Days	150:41

1.5.4.1 The FO is holding an ATPL-A and rated B737 300-900 MAX. The license was valid till 26th December 2033 and holding level 5 of English Language proficiency that expire on 03rd Mar 2026.

1.5.4.2 The FO was issued a Class 1 medical certificate that's expire on 03rd Aug 2025.

1.5.5 **Bravo Sector Air Traffic Controller (ATCO)**

Nationality	Omani			
Medical valid	2nd Jun 2025	Licence type	AREA-AIR TRAFFIC CONTROLLER	
Licence valid	31st Dec 2026		Type endorsed	YES
Ratings	ACC RDR		LPR	LEVEL 5
Restrictions	Nil			

1.5.5.1 The ATCO license was issued on 20th Dec 2011. The license proficiency check was conducted on 16th Oct 2023 with an expiry date of 15th Oct 2024.

1.5.5.2 ATCO was also issued with English language proficiency rating LEVEL 5 that's valid and expiry date of 18th Aug 2026.

1.5.5.3 The ATCO medical was assessed on 29th May 2023 and issued a Class three (3) medical certificate with expiry date of 2nd June 2025.

1.5.5.4 The ATCO was issued with ratings to allow operating as a controller at OOMM as Area RDR/INDRA. The last Air Traffic Control Rating Proficiency check was conducted on 16th Oct 2023.

1.5.6 **Middle Sector Air Traffic Controller (ATCO)**

Nationality	Omani			
Medical valid	15th Jun 2025	Licence type	AREA AIR TRAFFIC CONTROLLER	
Licence valid	31st Oct 2025		Type endorsed	Yes
Ratings	ACC RDR		LPR	Level 5 Extended
Restrictions	Nil			

1.5.6.1 The ATCO license was issued on 08th Oct 2015. The license proficiency check was conducted on 18th Feb 2024 with an expiry date of 17th Feb 2025.

1.5.6.2 ATCO was also issued with English language proficiency rating LEVEL 5 Extended that's valid and expiry date of 31st Oct 2028.

1.5.6.3 The ATCO medical was assessed on 06th Jun 2024 and issued a Class three (3) medical certificate with expiry date of 15th Jun 2025.

1.6. Aircraft Information

1.6.1 Airframe Information aircraft (ETD390)

Manufacturer/Model	Airbus A321-231	
Serial Number	6842	
Year of Manufacture	2015	
Total Airframe Hours (At Time of Accident)	29790:53	
Last Inspection (Date & Hours (TSN))	11th Apr 2024	28978:59
Last Inspection Airframe Cycles (CSN)	9752	
Hours Since Last Inspection	811:54	
Type of inspection performed	32 A-Check	
CRS Issue Date	11th Apr 2024	
C of A (First/initial Issue Date)	16th Nov 2015	
C of A (Expiry Date)	ARC Expiry 15th Nov 24	
C of R (Issue Date) (Present Owner)	16th Nov-2016 Sonic Leasing Co. LTD.	
Type of Fuel Used	Jet A1	
Operating Category	Transport (passenger)	
Previous Accidents	None	

Engine 1:

Manufacturer/Model	V2500
Serial Number	V18253
Part Number	V2533A5
Hours Since New	22151
Hours Since Overhaul	9730
Hours since last shop visit	9730
Cycles Available Before Next Shop Visit	343
Oil type	Eastman Turbo Oil 2197

Engine 2:

Manufacturer/Model	V2500
Serial Number	V16917
Part Number	V2533A5
Hours Since New	31290
Hours Since Overhaul	2724
Hours since last shop visit	2724
Cycles Available Before Next Shop Visit	3147
Oil type	Eastman Turbo Oil 2197

1.6.2 Airframe Information aircraft (AXB817)

Manufacturer/Model	Boeing/737-800NG	
Serial Number	36331	
Year of Manufacture	2007	
Total Airframe Hours (At Time of Serious Incidents)	57968:11	
Last Inspection (Date & Hours)	25th May 2024	TSN: 57685:15
Last Inspection Airframe Cycles (CSN)	CSN:19111	
Airframe Hours Since Last Inspection	282:56 FH	
Type of inspection preformed	Scheduled Maintenance PH-49	
CRS Issue Date	25th May 2024	
C of A (Issue Date & Expiry Date)	29th Jul 2007	29th Jul 2007
C of R (Issue Date)	TBN	
Operating Category	18th Jan 2022	
Type of Fuel Used	Jet A1	
Operating Category	Transport (passenger)	
Previous accidents/incidents/serious incidents	None	

Note: Previous accidents/incidents refer to past accidents/incidents the aircraft was involved in, when relevant to this incident.

Engine 1:

Manufacturer/Model	CFM56-7B
Serial Number	896967
Part Number	CFM56-7B27-3
Hours Since New	52388 FH
Hours Since Overhaul	21282 FH
Hours since last shop visit	21282 FH
Cycles Available Before Next Shop Visit	2862 FC
Oil type	Mobil jet oil II

Engine 2:

Manufacturer/Model	CFM56-7B
Serial Number	894445
Part Number	CFM56-7B27
Hours Since New	51852 FH
Hours Since Overhaul	15928 FH
Hours since last shop visit	15928 FH
Cycles Available Before Next Shop Visit	2458 FC
Oil type	Mobil jet oil II

1.7. Meteorological Information

1.7.1 The flight plan (India Express) showed the wind speed of 15 knots.

1.7.2 According to the Oman Directorate General of Meteorology (DGMET) office there was no significant weather and the wind indicated south westerly at 5 Knots as it shown in figure 7.

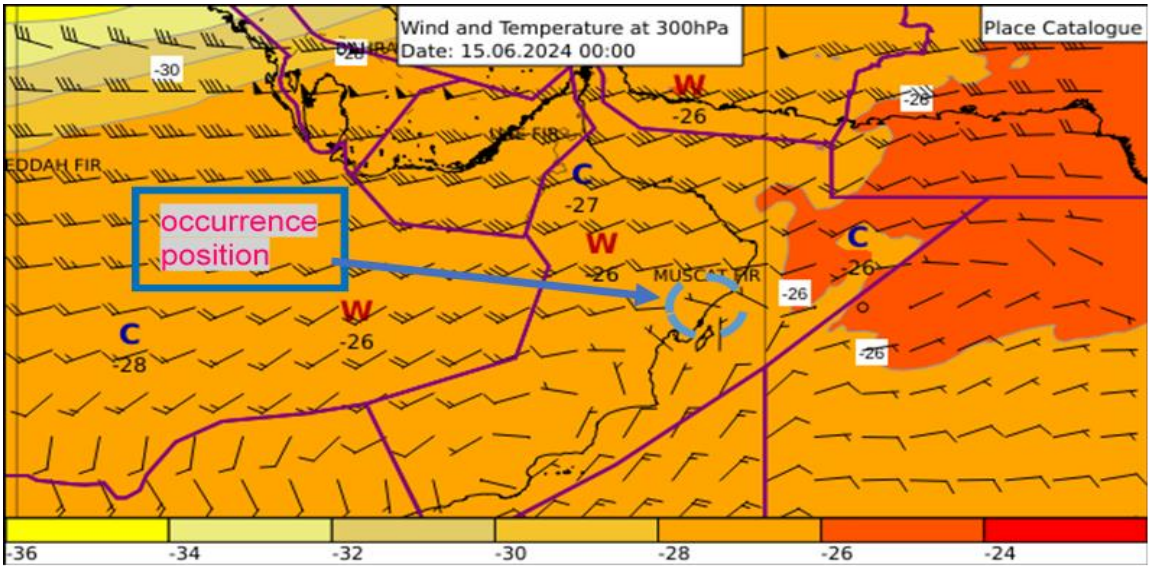

Figure 7: showing the weather conditions at the time and date of the occurrence.

1.8. Aids to Navigation

1.8.1. Both aircraft ETD390 and aircraft AXB817 were equipped with standard navigational equipment as approved respectively by the United Arab Emirates GCAA and India CAA. There were no records indicating that the navigation system was unserviceable prior to the serious incident.

1.8.2 The aircraft AXB817 is equipped with TCAS-II version 7.1 that gives the crew alert of the aircraft around that have Mode S transponder as intruder aircraft.

1.9. Communication

1.9.1 Both aircraft ETD390 and aircraft AXB817 were equipped with a standard communication system as approved respectively by the United Arab Emirates GCAA and India CAA. No defects that could render the communication system unserviceable were recorded before to the serious incident.

1.9.2 The ATC radio calls were distorted with back noise and sometimes stepped over transmissions and receivers. Moreover, an there was echo on the radio frequency during the occurrence.

1.10. Airport Information

1.10.1. Departure Aerodrome aircraft (ETD390):

Aerodrome Location	OMAA (Abu Dhabi Zayed International Airport, UAE)	
Aerodrome Status	Licenced (Operational)	
Aerodrome GPS coordinates	N24 27.51 E054 38.60	
Aerodrome Elevation	83 ft MSL	
Runway Headings/Designations	RWY 31L/13R	RWY31R/13L
Dimensions of Runway Used	4106m / 60m	4100m / 60m
Heading of Runway Used	13L	
Surface of Runway Used	Asphalt	
Approach Facilities	ILS	
Category for Rescue Fire Fighting	10	

Destination Aerodrome aircraft (ETD390):

Aerodrome Location	VCBI (Colombo Bandaranaike international airport)
Aerodrome Status	Licenced– (Operational)
Aerodrome GPS coordinates	N07 10.97 E079 53.09
Aerodrome Elevation	29 feet (ft)
Runway Headings/Designations	22/04
Dimensions of Runway Used	3350m x 45 M
Heading of Runway Used	22
Surface of Runway Used	Asphalt
Approach Facilities	ILS
Category for Rescue Fire Fighting	9

1.10.2 Departure Aerodrome (AXB817):

ICAO designation	Mangalore International Airport (VOML)
Aerodrome Coordinates	12° 57' 43.42" N 74° 53' 23.23" E
Aerodrome elevation	318 Ft
Runway designations	06/24
Runway dimensions	2450 m X 46 M
Runway used	24
Surface of Runway Used	Asphalt
Category for Rescue Fire Fighting	CAT 7
Approach facilities	HIRL
Aerodrome status	Licensed (Operational)

Destination Aerodrome aircraft (AXB817):

Aerodrome Location	OOMS (Muscat International Airport)	
Aerodrome Status	Licenced (Operational)	
Aerodrome GPS coordinates	23°35′36″N 058°17′04″E	
Aerodrome Elevation	25FT	
Runway Headings/Designations	08R/26L	08L/26R
Dimensions of Runway Used	4080M x 60 M	4000M X 45 M
Heading of Runway Used	08 L	
Surface of Runway Used	Asphalt	
Approach Facilities	ILS, RNP, VOR, Runway Lights, PAPI's	
Category for Rescue Fire Fighting	10	

1.11. Flight Recorders

1.11.1 Both aircraft AXB817 and aircraft ETD390 were fitted with the Digital Flight Data Recorder (DFDR), Flight Data Management (FDM), and the Cockpit Voice Recorder (CVR), however, OTSB determined that there was no necessity to remove the DFDR and download the FDM and the CVR. The OTSB investigation team relied on flight information data from Air Traffic Control communication records to assist in the investigation.

1.12. Wreckage and Impact Information

1.12.1. Not relevant to the occurrence.

1.13. Medical and Pathological Information

1.13.1. Not relevant to the serious incident.

1.14. Fire

1.14.1. Not relevant to the serious incident.

1.15. Survival Aspects

1.15.1. Not relevant to the serious incident.

1.16. Tests and Research

1.16.1. Not relevant to the serious incident.

1.17. Organizational and Management Information

1.17.1 **Etihad Airways:**

1.17.1.1The aircraft ETD390 was scheduled for international passenger flight, operated under Part 121.

1.17.1.2 The operator, Etihad Airways was issued an Air Operating Certificate (AOC) by the State of Registry and State of Operator, UAE-GCAA, issued on 5th September 2023 with an expiry date of 31st October 2025. The certificate authorized the operator to perform Air carrier operations as specified in the operator's operations specifications, in accordance with the operations manual and UAE Civil Aviation Regulations.

1.17.1.3 The operator Etihad Airways, aircraft ETD390 bearing registration A6-AEJ was operating under lease agreement with SINOC leasing CO LTD who are the owners of the aircraft.

1.17.1.4 The Operator, Etihad Airways has implemented Safety Management System (SMS), whereby occurrences are reported to the relevant authorities as and when they occur and they are reviewed, categorized, classified and investigated to identify the need for any gaps, risk assessment and risk management, remedial action that are required to be taken by the organization.

1.17.2 Air India Express

1.17.2.1 The aircraft AXB817 was scheduled for international passenger flight, operated under Part 121.

1.17.2.2 The operator, Air India Express aircraft AXB817 bearing registration VT-AXT was issued an Air Operating Certificate (AOC) by the State of Registry and State of Operator, India CAA, reissued on 25th April 2024 and valid until suspended or revoked. The certificate authorized the operator to perform commercial air operations as defined in the operator's operations specifications, in accordance with the operations manual, Law No. 15 OF 2002, as amended and its ensuing Regulations.

1.17.2.3 The Operator, Air India Express has implemented Safety Management System (SMS), whereby occurrences are reported to the relevant authorities as and when they occur and they are reviewed, categorized, classified and investigated to identify the need for any gaps, risk assessment and risk management, remedial action that are required to be taken by the organization.

1.17.3 Director General Air Navigation (DGAN):

1.17.3.1 The service provider (DGAN) have implemented Safety Management System (SMS) which includes all its ATS unit's, whereby occurrences are reported to the relevant authorities as and when they occur and they are reviewed, categorized, classified and investigated to identify the need for any gaps, risk assessment and risk management remedial actions that are required to be taken by the organization.

1.18. Additional Information

1.18.1 ETIHAD Airways: Airbus 321 Flight Crew Operations Manual Traffic Avoidance:

1.18.1.1 Policy

TCAS shall always be used when airborne, in a mode that enables RA indications when undue proximity to another aircraft is detected, unless its inhibition is called for by the OM-B, abnormal procedures or a performance limiting condition.

1.18.1.2Crew procedures.

TCAS is an aircraft system which alerts crew to collision hazards, independent of any ground-based aids. TCAS is capable of issuing two types of alerts to flight crew.

• TA Traffic Advisory

• RA Resolution Advisory

1.18.1.3Traffic Advisory (TA)

A TA gives indicate the approximate position of a nearby aircraft that is a potential threat a threat.

Respond to TA's by attempting to establish visual contact with the intruder aircraft and any other aircraft that might be in the vicinity. Co-ordinate with other crew members to assist in search of traffic. Pilots shall not deviate from an assigned clearance or maneuver their aircraft in response to TA information only. When traffic is acquired visually, continue to maintain safe separation until the traffic is clear

1.18.1.4Resolution Advisory (RA)

An RA commands one of two maneuvers to the flight crew recommending:

• a maneuver intended to provide separation from all threats; or

• a maneuver restriction intended to maintain existing separation.

In the event of an TCAS RA, without undue delay the pilot shall:

a. Respond immediately by following the RA, as indicated in the respective fleet OM-B, unless doing so would jeopardize the safety of the aircraft.

b. Follow the RA even if there is a conflict between the RA and an ATC instruction to maneuver.

c. Do not maneuver in the opposite sense to an RA.

d. Workload permitting but as soon as possible, notify ATC of any RA which requires a deviation from the current ATC instruction or clearance.

e. Promptly comply with any modified RAs.

f. Limit the alterations of the flight path to the minimum extent necessary to comply with the RAs.

g. Promptly returns to the ATC instruction or clearance when the conflict is resolved.

h. Notify ATC when returning to the current clearance.

Once an aircraft departs from its ATC clearance or instruction in compliance with an RA, or a pilot reports and TCAS RA, the controller ceases to be responsible for providing separation between that aircraft and any other aircraft affected as a direct consequence of the maneuver induced by the RA. The controller will resume responsibility for providing separation to all the affected aircraft when the flight crew report they are clear of conflict.

1.18.1.5TCAS phraseology

-When a TCAS RA is activated the flight crew shall use standard ICAO phraseology to notify ATC: (Callsign) TCAS RA.

- when returning the flight to the assigned the crew report: (Callsign) CLEAR OF CONFLICT, RETURNING TO (assigned clearance).
- When the assigned ATC clearance has been resumed the flight crew report (Callsign) CLEAR OF CONFLICT (assigned clearance) RESUMED.
- When an ATC clearance contradictory to the TCAS RA is received the flight crew report (Callsign) UNABLE, TCAS RA.

Nothing in the above procedures or those specified in the respective type TCAS RA shall prevent the commander from exercising his best judgement and full authority in the choice of the best course of action to resolve a traffic conflict or avert a potential collision.

Whenever an aircraft has maneuvered in response to TCAS RA, the commander shall submit a mandatory ASR.

1.18.2 Air India Express: Boeing 737-800NG Flight Crew Operations Manual Traffic Avoidance: AIRBONE COLLISION AVOIDANCE SYSTEM (ACAS):

1.18.2.1 Policy & Compliance:

1. TCAS/ACAS description and procedures are given in the aircraft specific FCOM/FCTM/QRH pages.

2. Associated procedures for collision avoidance are given in aircraft specific AOM/FCOM "Emergency Procedure".

3. The installation and use of TCAS-II is mandatory for all Air India Express flights. Refer DCA Ops Circular 07/2010, CAR SECTION 2-SERIES T', PART VIII, Issue 2, Rev 3, dated 04 September 2017.

4. Air India Express has the policy for collision avoidance that encourages the flight crew to maintain vigilance for conflicting visual traffic ("see and avoid")

5. As for as the TCAS II Ver 7.1 is concerned, the rule position is as follows:

a. ICAO has mandated TCAS II Ver 7.1 w.e.f 01 Jan 2014 for forward fit and by 1st Jan 2017 all retrofit should be completed.

b. Euro Control has mandated TCAS II Ver 7.1 w.e.f 1st March 2012 for forward fit and by 1st Dec 2015 retrofit should be completed.

6. A flight with an unserviceable TCAS may be conducted under the provision of the appropriate MEL. Though the CAR stipulates that the TCAS II can be unserviceable up to ten days, for the Air India Express operations, all TCAS defects under MEL shall be rectified within a maximum of 48 hours.

a. Whenever an aircraft is dispatched with an unserviceable TCAS(ACAS), the following instructions must be complied with:

b. Unserviceability is to be mentioned on the ATC Flight Plan.

7. There is no restriction on the carriage of passengers.

8. Keep a sharp lookout for traffic especially in the terminal area.

9. Whenever TCAS is under MEL, aircraft cannot be operated in RVSM airspace. This is in compliance with DGCA CAR Section 8, Series 'S', Part II which says that serviceability of TCAS is mandatory for operation in RVSM airspace.

10.All Air India Express flight shall be conducted in accordance with the above Policy.

11.TCAS shall be operated in the TA/RA mode. A PIC may, however, operate TCAS in the TA ONLY mode during takeoff and final approach to closely spaced parallel runways, in order to avoid nuisance resolution advisories or when dealing with non-normal situations as per QRH.

Note: For usage of 'TA ONLY' mode on A320 refer associated FCOM.

12. TCAS advisories shall be responded to immediately, in accordance with the procedures as described in QRH 'Non-Normal Maneuvers' / Abnormal Procedures (B737) and FCOM (A320).

13.A TCAS RA shall be followed even when there is an opposite avoiding instruction by ATC.14. All TCAS RA's shall be reported immediately after landing via:

a. Telephone to Chief of Flight Safety' and Chief of Operation.

b. Filling up the 'RA Form'. Format is attached as Annexure- A, at the end of this chapter.

Air India Express has the policy for collision avoidance that encourages the flight crew to maintain vigilance for conflicting visual traffic ("see and avoid"). Instruction & Procedure for the Avoidance of Collision.

1.18.2.2Situational Awareness

The TCAS traffic display feature gives only limited information. To provide as much information as possible, the other aircraft must be equipped with a Mode C or a Mode S transponder. Only if both aircraft are equipped with Mode S transponders, TCAS will coordinate the resolution advisories between the aircraft involved.

However, aircraft are only shown in a small airspace and no altitude information is available from aircraft equipped with Mode A transponders. Because of these limitations the TCAS display shall not be used to interfere with the ATC task to provide continuous positive separation.

1.18.2.3Traffic Advisory (TA)

1. The pilots shall not manoeuvre the aeroplane in response to a TA only. The pilots, however, shall search for approaching traffic i.e. upon receiving a TA from TCAS; the crew must try to establish visual contact with the intruder.
When in manual flight mode the PM must perform the outside search, as the first responsibility of the PF is the safe control of the aircraft. During automatic flight both pilots can perform the outside search, however, the PF shall not refrain from also monitoring instruments to check the progress of the flight.

2. In 'TA ONLY' mode, a TA can indicate a real threat to the safety of the flight. Therefore, 'TA ONLY' mode must only be selected if considered necessary to avoid Resolution

Advisories when intentionally flying close to other traffic (e.g. during approach when parallel runaways are in use).

Note: Be aware that a TA symbol without altitude tag indicates that the transponder of the intruder is Mode A only. This traffic can be at any altitude. Even when becoming a real threat, TCAS will not issue an Resolution Advisory for this traffic.
Resolution Advisory (RA)Ask Copilot

1.18.2.4 Resolution Advisory (RA)

1. An RA from TCAS indicates an imminent threat of collision if both the a/c maintains their present speed and attitude.
Compliance with the RA is mandatory.
2. On airplanes equipped with TCAS 7.1 and later, the "ADJUST VERTICAL SPEED ADJUST" RA has been changed to "LEVEL-OFF, LEVEL-OFF".
3. Because of the coordinated advisories between TCAS equipped aircraft it is prohibited to manoeuvre the aircraft in opposite direction from the RA given by TCAS.
4. To comply with an RA manoeuvre the autopilot must be disconnected.
5. The alteration of the flight path shall be limited to the minimum extent necessary to comply with the RA.
6. The deviation from the cleared flight level or altitude can be expected to be less than 1000 ft and must be notified to ATC as soon as possible.
7. Pilots, who deviate from an ATC clearance in response to an RA, shall promptly return to the terms of the previous ATC instruction or clearance when the conflict is resolved.
8. The pilots shall, as soon as practicable, notify the ATC unit of the direction of the RA, and, when the conflict is resolved, that they are returning to the terms of the current ATC clearance.

Note. When RA is initiated and in response thereof the pilot deviates from ATC clearance, he is not considered to be violating the ATC instructions.

9. TCAS warning by itself (TA or RA) is not considered a near midair collision.

10.Only if the pilot of the aircraft involved considers himself to be endangered by the close proximity of the other aircraft, the TCAS event should be designated as a near midair collision.

1.18.2.5 TCAS 'RA' compliance versus a/c performance restrictions

1.When operating at airports outside the reference TCAS performance envelope (e.g. during take-off climb or in final landing configuration at airports with elevations above 5300 FT. MSL, or temperatures outside the range of ISA + 27.8° C) precaution should be taken regarding RA compliance.

2. At present TCAS has limited capability to accept performance data from the aircraft on board systems. The TCAS 'CLIMB' and 'INCREASE CLIMB' inputs are determined based on assumptions regarding weight, altitude and temperature.

3. When operating outside these assumptions the aircraft may not have the performance to execute a climb RA, even though TCAS does not consider the aircraft as climb inhibited. In this case, pilots should be aware that the RA will still be issued and that response should still be initiated. If the pilot is unable to attain 1500'/m, he should establish a climb with the highest vertical speed practical under the given conditions. TCAS will continue to monitor the vertical separation that exists and will detect that the response is less than 1500'/m. Because of this Situation, TCAS has 3 options:

a. To leave the RA displayed for a longer period of time to ensure that the desired separation is obtained.
b. To issue a 'Reversal' RA.
c. To issue an 'Increase' RA (which obviously cannot be followed).

1.18.2.6 R/T Phraseology

The standard phraseology for communication with AT during TCAS RA event is:
After modifying vertical speed to comply with an ACAS RA
After ACAS 'Clear of conflict' is
After the response to an ACAS
After returning to clearance after responding to an ACAS RA
When unable to comply with a clearance because of an ACAS RA
RETURNING TO (assigned clearance)
TCAS CLIMB (or DESCENT), RETURNING TO (assigned clearance)
TCAS CLIMB (or DESCENT), COMPLETED (assigned clearance)
RESUMED
UNABLE, TCAS RESOLUTION ADVISORY

1.18.3 **Source (DGAN): Objectives of the Air Traffic Services (General Provisions and Responsibilities of MUSCAT Area Control Center (ACC): (MUSCAT ACC MATSOP):**

1.18.1.3.1 Muscat ACC shall issue information and clearances to air traffic within, entering and leaving its area of responsibility with the objective of:
a. Preventing collisions between aircraft under its control;
b. Expediting and maintaining an orderly flow of air traffic;
c. Provide advice and information useful for the safe and efficient conduct of flights;
d. Notify SAR organization (RCC) regarding aircraft in need of search and rescue aid, and assist such organization as required.

1.18.1.3.2 Provision of Alerting Service

a. Alerting service shall be provided to:
b. All aircraft provided with air traffic control service;
c. As practicable, all other aircraft having filed a flight plan or otherwise
d. Known to the ATCO; and
e. Any aircraft known or believed to be the subject of unlawful interference.

1.18.1.3.3 Muscat ACC Role:

a. Serve as the central point for collecting all information relevant to a state of emergency of an aircraft operating within the Muscat Flight Information Region.
b. Forwarding such information to the appropriate Rescue Coordination Centre.
c. Muscat ACC WSO shall coordinate with the Rescue Coordination Center to send an AFTN message when required.

1.18.1.3.4 ATCO Role:

a. Take the necessary steps to set in motion the local rescue services and emergency organisations as described in the Muscat Emergency Response Plan; and
b. In the event of a state of emergency arising to an aircraft while it is under Muscat ACC control, ATCO Shall notify immediately Muscat ACC WSO.
c. WSO shall in turn notify the rescue coordination centre.
d. Nevertheless, whenever the urgency of the situation so requires, the ACC shall first alert

and take other necessary steps to set in motion all appropriate local rescue and emergency organisations which can give the immediate assistance required; as described in the Muscat airport Emergency Plan; and notify the Watch Supervisor Officer at the Muscat ACC.

Read-back/Hear-back Requirements:
Definition: Read back is defined as a procedure whereby the receiving station repeats a received message or an appropriate part thereof back to the transmitting station so as to obtain confirmation of correct reception. (ICAO Annex 10 Vol II). ICAO requirements for the Read-back of clearances and safety-related information:

- ICAO Annex 11 requires that the flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

a. ATC route clearances;
b. clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and
c. runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.

- Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

Read-back of Air-Ground Voice Communications:
The ACC controllers shall:

a. listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back;

b. When issuing clearances, instructions, or information, ensure acknowledgment by the pilot. If no acknowledgment is received, attempt to re-establish contact;

c. If readback is incorrect or incomplete, make corrections as appropriate.

Read-back of a clearance should never be replaced by the use of terms such as “Roger”, "Wilco" or “Copied”. Likewise, ATCOS should not use similar terms to acknowledge a message requiring a definite answer (e.g. acknowledging a pilot’s statement that an altitude or speed restriction cannot be met).

Pilots are required to read back in full messages containing any of the following items:

a. Taxi instructions
b. Level instructions
c. Heading instructions
d. Speed instructions
e. ATS route clearances
f. Approach clearances
g. Runway-in-use

h. Clearance to land and take-off,
i. SSR operating instructions
j. Altimeter settings
k. Frequency changes

ACC ATCOs are to prompt a pilot if a read back is not immediately forthcoming.

Errors in a read back must be corrected by the ACC controller until the pilot gives an accurate read back.
Note: An uncorrected erroneous read-back (known as a hear-back error) may lead to a deviation from the intended clearance and may not be detected until the ATCOs observes the deviation on his/her situational display.

Call sign confusion
General

(a)The use of similar call signs by aircraft operating in the same area on the same RTF frequency often gives rise to potential and actual flight safety incidents. This hazard is usually referred to as “call sign confusion”.

(b)The danger of an aircraft taking and acting on a clearance intended for another due to call sign confusion could result in a loss of separation, a level bust, an AIRPROX, or a mid-air collision.

(c)Risks associated with the call sign confusion can be reduced by the harmonised application of existing ICAO provisions, increased awareness, and the adoption of best practice in air-ground communications.

(d)call sign similarity/confusion occurrence report

(e)WSOs and ATCOs are requested to take necessary measures to ensure the reporting of call sign similarity/confusion occurrences to ATC director with copy to ANSIC office.

Best practice for ATCOs
a. Use correct RTF phraseology, procedures, and discipline at all times.
b. Do not clip transmissions.
c. Ensure clearances are read back correctly. Do not use read-back time to execute other tasks.
d. Monitor flight crew compliance with RTF call sign use.
e. Take extra care when language difficulties may exist.
f. Advise adjacent sectors/positions if it is felt that potential confusion may exist between aircraft likely to enter their airspace or AoR.
g. Warn the pilots of aircraft on the same RTF frequency having similar call signs that call sign confusion may occur. If necessary, instruct one or both aircraft to use alternative call signs while they are on the frequency.

A transmission could be blocked when two or more aircraft are responding to the same clearance. Typically, the controller would hear a partial or garbled readback. If a blocked transmission is suspected, ensure that both aircraft retransmit their messages and confirm

SAFETY NETS, TOOLS AND ALERTS

Short-term conflict alert (STCA) procedures:

STCA is a predictive function, which involves the monitoring of all aircraft pairs, which are equipped with Mode C transponders. Conflict Alert warns the controller of potential collisions due to airspace violations. The Short-Term Conflict Alert (STCA) goal is to prevent conflict situations between two aircraft early enough to carry out the required controller actions.

The STCA takes both lateral and vertical motion, as well as speed and level, into account.

At least one of the STCA tracks in conflict shall be under the control of or inbound to a local sector. For STCA, conflict tracks shall be predicted to be in vertical and in horizontal conflict during a period of time.

Minimal and maximum altitude values are defined to STCA detection. STCA separation parameters for horizontal conflict may differ for different sectors. If one of the tracks in STCA conflict is in a different sector from the other track in STCA conflict, and its parameters vary, a more restrictive value is applied.

STCA exclusion is performed by several filters:
a. SSR exclusion filter
b. STCA inhibition areas
c. Airspace classification

At a VSP time before the actual short term violation (either vertically or horizontally) occurs, the STCA alert is displayed at the SDD in the prediction phase. STCA parameter values are:

d. 2min longitudinal and 800ft vertical. (Within RVSM airspace from FL290- FL410)
e. 2min longitudinal and 700ft vertical (within CVSM airspace below FL290)
f. 2min longitudinal and 1700ft vertical (within CVSM above FL410)

(a) A System Message is sent both to the CMD and SDD positions when an STCA conflict is produced. STCA predicted conflict alert (PCA) is displayed in YELLOW colour as in diagram below.

Figure 8: showing Tracks in STCA Warning

(b)When the tracks enter in an actual violation phase, Conflict alert (CA) is displayed in RED colour as in diagram below.

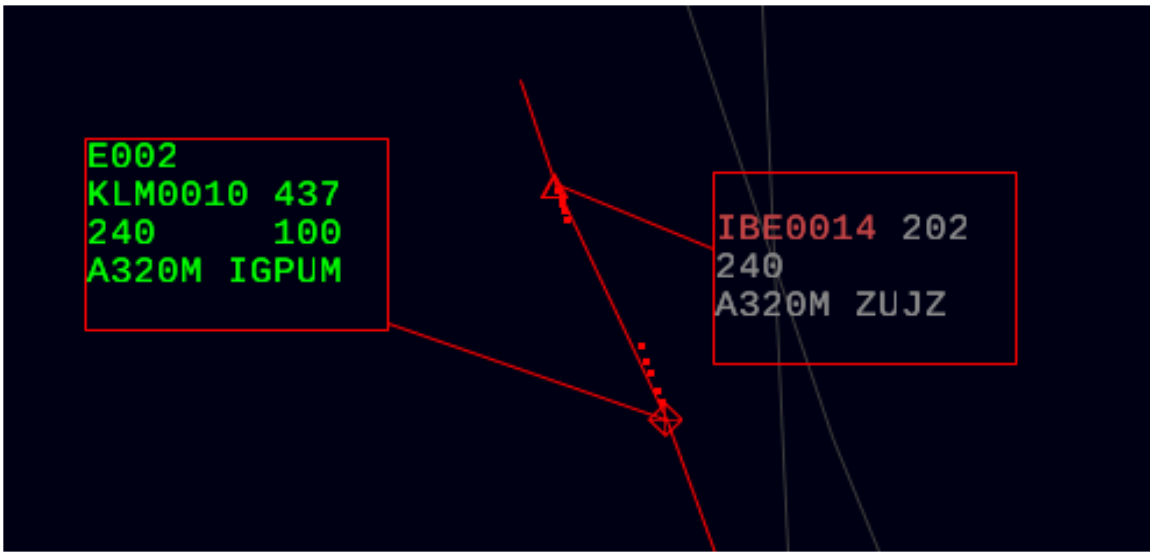

Figure 9: showing Tracks in STCA Alert – Violation phase

Any traffic involved in an STCA occurrence will be displayed in STCA Pop-Up list (sector defined). The list includes the minimum predicted distance (MDIS) between aircraft in conflict, the current distance (CDIS) between them and for STCA in prediction status, the predicted time to become an actual violation.

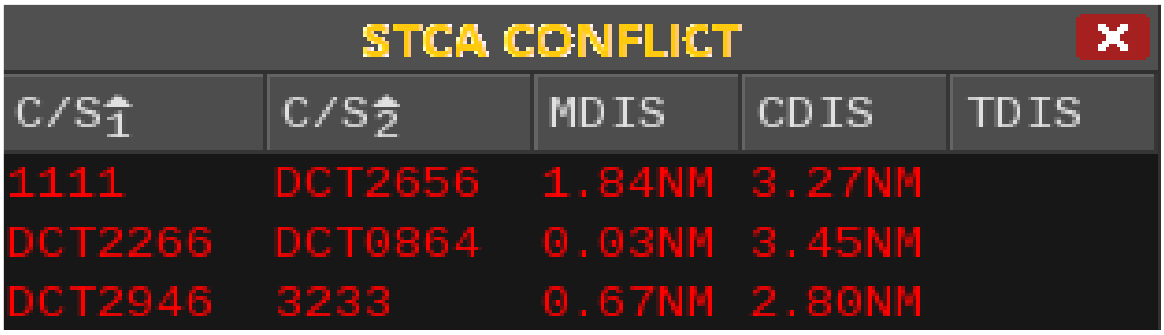

Figure 10: showing STCA List

The STCA alert includes an audible alert.
The STCA function is only available when the INDRAATM System is receiving data from the civil MSSR sensors.
STCA warnings will be generated once eligible flights are within the Area of Interest {AoI} (predefined in DBM).
STCA filter has been introduced for following areas:
g. inside GISRA box
h. Inside CTR both (MCT & SLL)
i. MUSANA area
Controllers shall acknowledge these warnings by LB click in the warning field of the track label.
Controllers are only required to notify the WSO and file an AQD e-report in the event of a "Violation Alert (i.e. separation was lost).

Area Proximity Warning (APW)
Area Proximity Warning (APW) is a ground based safety net which uses surveillance data and flight path prediction to warn the controller when an aircraft is, or is predicted to be, flying into a volume of notified airspace, such as uncontrolled airspace, danger areas, prohibited areas and restricted areas.

An APW alert will be triggered at the SDD positions when the aircraft enters (or it is predicted to enter) these areas. An APW alert will be displayed at FDD thru FPL PMQ messages when the aircraft FPL indicates that it will infringe these areas. FDEO shall either modify or confirm the route with the controller for acceptance.

A track shall be assumed by concerned sector, otherwise an APW alert will not be displayed.
An APW alert is displayed in the track label with a blinking “ZN” in the “Alarm Indicator” field of an assumed track label, and it is displayed in YELLOW (prediction phase) or RED (violation phase). The controller can acknowledge the alert by clicking left button on this alarm indicator. In such case the alarm indicator stops blinking.

An APW alert includes an audible alert that is deactivated when the controller acknowledges the APW.

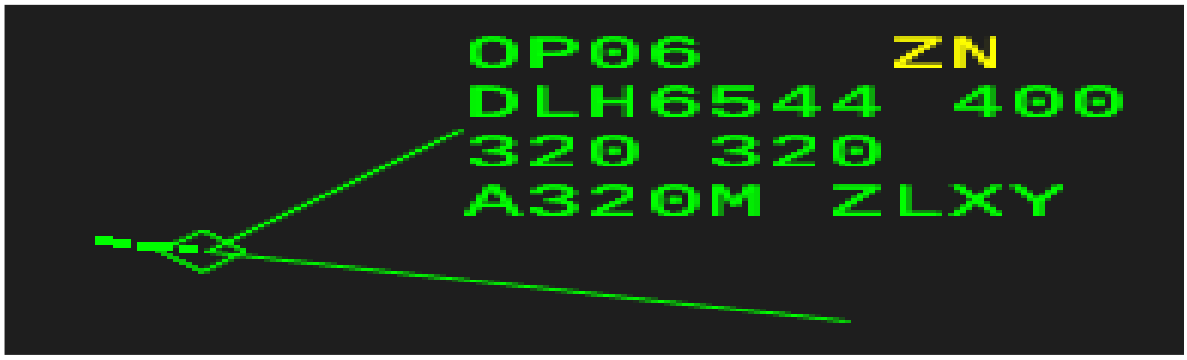

Figure 11: showing Track in APW – Prediction

Figure 12: showing Track in APW – Violation

The Area Proximity Warning (APW) List presents all the flights related to the sector that are in APW alert status. The list is automatically displayed when tracks in APW alert are detected.

Figure 13: showing APW list – Prediction

The APW List allows the users to disable APW conflict by clicking the right button on the CALLSIGN field. It can also be disabled by means of the call sign menu of the tracks in the APW alert.

Danger Area Alerts for incursions into Dangerous Areas are raised similarly to the APW ones except that the alert is raised for Danger Areas as defined in adaptation and that the following indicators are used:
j. 'DG' in YELLOW (prediction phase) or
k. 'DG' in RED (violation phase).

This kind of alerts are included also in the APW list where they are distinguished from others by means of the corresponding alert indicator.

Traffic Information:

1) ICAO Doc4444 (PANS-ATM) defines traffic information as:
"Information issued by an air traffic services unit to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of flight and to help the pilot avoid a collision."

2) Furthermore, ICAO Doc4444 Section 5.10.1.1 and 5.10.1.2 states:

"Essential traffic is that controlled traffic to which the provision of separation by ATC is applicable, but which, in relation to a particular controlled flight is not, or will not be, separated from other controlled traffic by the appropriate separation minimum." "Essential traffic information shall be given to controlled flights concerned whenever they constitute essential traffic to each other."

1.18.4 **Area surveillance control procedures**
1.18.4.1 Transfer of Surveillance Control

1.18.4.1.1 Traffic inbounds to OOMS on M300 or P570 shall enter BRAVO Sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE Sector.

a. OOMS/OOSH/OOMN DEP, FL280 or Requested Flight Level, if lower
b. UAE DEP via LABRI, FL330 or Requested Flight Level, if lower.

1.18.4.1.2 MIDDLE Executive controller is responsible for initiating the sequence (speed control or vectors) to ensure the minimum longitudinal separation standard required for arrivals to OOMS, OOSH, OOMN or UAE airports can be met by the final Muscat Sector handling the traffic. Any direct routings shall be coordinated between the MIDDLE and BRAVO/CENTRAL Executive controllers.

1.18.4.1.3 Traffic shall only be released to the BRAVO/CENTRAL Executive Controller, once there is no possible conflict with other traffic, unless otherwise coordinated.

a. OOMS/OOMN traffic on P316, FL270 by RADAX or cruising level if lower.
b. OOSH traffic on P304, FL300 by NAMVA or cruising level if lower.
c. UAE ARR on R401, FL320 by DATBU or cruising level if lower

Note: *Southern UAE Arrivals to SODEX to be kept at a lower level than Northern UAE Arrivals to MUSAP.*

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

2. ANALYSIS

2.1 General (Organization):

2.1.1 Aircraft are owned by the operators, Etihad Airways and Air India Express and both of the operators are properly licensed by their respective Civil Aviation Authorities (CAA). The OTSB investigation team noted that the Operators and the service provider (DGAN) have implemented Safety Management System (SMS), whereby occurrences are reported to the relevant authorities as and when they occur and they are reviewed, categorized, classified and investigated to identify the need for any remedial actions that are required to be taken by the organization. Both operators have TCAS procedures in place and were executed efficiently following the TCAS alert. There were no anomalies identified with the safety culture of reporting occurrences with both of the airlines. OTSB investigation team concluded that the organizational factor of the operators was not a factor into this incident.

2.2 Flight operations

2.2.1 Flight crew Qualifications
The flight crews of both aircraft were properly licensed to operate the aircraft and their medical records didn't show any limitations or restrictions. At the time of the incident, both flight crews medical certificates were valid for the flights conducted. There was no issue with regard to the rest period of both flight crews. The flight crews were well rested prior to undertaking the operation of the incident flight.

2.2.2 Operational procedures:

2.2.2.1 Both flight crews of aircraft AXB817 and aircraft ETD390 followed established procedures when they received TCAS RA warning, there was no deviation from laid down procedures for reacting on TCAS RA. The TCAS RA procedures were followed by both crews and complied with effectively.

2.2.2.2 The aircraft AXB817 entered Muscat FIR via WPT LOTAV maintaining FL340. At 06:04:35, Bravo ATCO accepted aircraft AXB817 to descend from FL340 to FL320 flying on westerly

direction destination OOMS and was head on with aircraft ETD390 that entered via WPT LABRI maintaining FL310 flying on an easterly direction to exit WPT LOTAV. Aircraft ETD390 was on AWY M300 between WPT EMURU and WPT GOLBA maintaining FL310 while aircraft AXB817 was on the same AWY M300 (bidirectional) between WPT GOLBA and WPT EMURU on FL317 with a vertical separation of 700FT in altitude.

2.2.2.3 Bravo ATCO accepted FL320 for aircraft AXB817 and aircraft OMA212 maintaining FL320 respectively. MATSOP chapter 10 Paragraph 6.1.6 traffic inbounds to MCT on M300 or P570 shall enter BRAVO sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE sector, instead they coordinated FL320. Middle sector ATCO did not descend aircraft AXB817 to FL300 before entering BRAVO sector as guided by MATSOP procedures as instead the Middle Sector coordinated with the Bravo Sector.

2.2.2.4 As the Bravo sector ATCO cleared aircraft AXB713 that entered MCT FIR via WPT TOTOX destination OOMS to descend to FL160.The flight crew of aircraft AXB713 did not read back the descent clearance and instead the flight crew of aircraft AXB817 readback to descend to FL160.

2.2.2.5 Furthermore, the Bravo sector ATCO did not correct the readback of the flight crew of aircraft AXB817, which lead the flight crew of aircraft AXB817 to descend from FL320 to FL160 on AWY M300 which was through the flight level of aircraft ETD390 that was maintaining FL310. Aircraft ETD390 and aircraft AXB817 were on the same AWY head-on, with a closing distance in time of 30 seconds. Thereafter, the yellow STCA was displayed on the ATCO radar screen between aircraft AXB817 and aircraft ETD390 while aircraft AXB817 was at FL317 and while ETD390 was maintaining FL310.

2.2.2.6 The Bravo sector ATCO issued a clearance to the flight crew of aircraft AXB817 to maintain FL320 and to turn right 20° in order to avoid the conflict with aircraft ETD390. Both the flight crew of aircraft AXB817 and aircraft ETD390 reported to the ATCO applying the TCAS-RA avoidance maneuver respectively. Once aircraft AXB817 and aircraft ETD390 were clear of conflict, aircraft ETD390 maintained FL310 and aircraft AXB817 climbed to FL320 as instructed by Bravo sector ATCO.

2.2.2.7 During the interview, the flight crew of aircraft AXB817 indicated that there was some traffic observed in the aircraft TCAS display, however aircraft ETD390 was not observed. The TCAS of aircraft AXB817 was working as expected indicating the surrounding traffic and that the flight crew of AXB817 reacted when TA/RA was activated. The operator Air India Express has a policy for collision avoidance that encourages the flight crew to maintain vigilance for conflicting visual traffic (“see and void”).Therefore, this gives an indication that the crew of AXB817 were vigilant and not concentrating in the TCAS display when establishing the descend where the company procedures advise and encourage very clear in their operational procedure the crew to establish a visual contact in the TCAS and when RA triggered to look for the traffic outside the cockpit in order to avoid it.

2.2.2.8 This serious incident could have been avoided had the flight crew of aircraft AXB817 not responded and reacted to the clearance from ATCO intended and given to the flight crew of aircraft AXB713. The OTSB investigation team determined that the flight crew of aircraft AXB817 operations were a factor to the serious incident.

2.2.2.9 Due to the background noise on the radio, it is possible that when ATCO gave clearance to AXB713, AXB817 responded thinking that ATCO called their call-sign. When the flight crew of aircraft AXB817 responded, the ATCO did not correct the flight crew and due to background noise on the radio, is possible that when ATCO gave clearance to the flight crew of aircraft AXB713, the flight crew of aircraft AXB817 responded”.

2.2.2.10 The OTSB investigation team concludes that the incident occurred as a result of both the ATCO and the flight crew of aircraft AXB817 mistaken the call sign, where ATCO thought it was AXB713 that readback for descend and the flight crew of AXB817 thought ATCO called their call sign (AXB817) to descend and that was incorrect.

2.2.3 Weather

2.2.3.1 Both the flight crews of aircraft AXB817and aircraft ETD390 did not observe any cloud on the weather radar system, and or any deviation from flight plan. Weather was considered to be fine at the time of the incident and none of the flight crews reported severe weather or challenges with en-route weather, as a result, the OTSB investigation team concluded that weather was not a factor into the serious incident.

2.2.4 Air traffic control

2.2.4.1 The ATCO held a valid licence with Class 3 medical certificate at the time of the incident. ATCO provided pertinent information to both flight crews of aircraft AXB817 and aircraft ETD390 in relation to the flight path and the track. The ATCO exercised the privileges of his ATCO license as required by CAR.ATCO.A.015 which states that, “the exercise of the privileges granted by a license shall be dependent on the validity of the license, ratings, endorsements including English Language Proficiency (ELP) and the medical certificate.”

2.2.4.2 Traffic inbounds to OOMS on M300 or P570 shall enter BRAVO Sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE Sector.

2.2.4.3 Middle sector ATCO did not descend aircraft AXB817 to the standard level of FL300 before entering BRAVO sector, (As per MATSOP chapter 10 Paragraph 6.1.6 traffic inbounds to MCT on M300 or P570 shall enter BRAVO sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE sector), instead the Middle Sector ATCO coordinated FL320 with the Bravo Sector ATCO.

2.2.5 Communications

2..2.5.1Although there were reported the background noise, overlapping transmissions and echo in frequency, there were no records or reported defects indicating that the communication system was unserviceable prior and during the incident flight, therefore communication equipment was not a factor on the serious incident. At the time 06:09:42, the flight crew of aircraft AXB817 established contact with MCT Bravo sector ATCO reported descending through FL327 for FL320. There was no reply from the ATCO as ATCO was busy coordinating with the Middle sector ATCO regarding frequency change for a Saudi aircraft (SVA843) that was approaching Jeddah`s FIR.

2.2.5.2 The ATCO cleared the flight crew of aircraft AXB713 that entered MCT FIR via WPT TOTOX destination OOMS to descend to FL160.The flight crew of aircraft AXB713 did not read back the descent clearance, instead the flight crew of aircraft AXB817 readback to descend through FL160 thinking that the ATCO has cleared aircraft AXB817 to descend to FL160.The flight crew of aircraft AXB817 continued descending to FL160 on AWY M300 which was through the flight level of aircraft ETD390 that was maintaining FL310.

2.2.5.3 According to Bravo Sector position audio playback there was a lot of distortion background noise from the frequency, step down(block) of transmissions and echo during the radio calls made to the ATCO which could have contributed to both ATCO and the flight crew of aircraft AXB817, mistaken the call sign that was cleared for descend.

2.2.5.4 The ATCO did not confirm nor correct the flight crew of aircraft AXB817 as required by the MATSOP procedures, it is possible that when the flight crew of aircraft AXB817 read back the descend to FL160, ATCO thought it was AXB713, hence ATCO did not correct the flight crew of aircraft AXB817. Both aircraft AXB713 and AXB817, had similar letters and with the frequency not being very clear with noisy background, this might have led to ATCO mistaken the call sign that responded to the clearance, that it was actually the wrong call sign that responded and not aircraft AXB713. Aircraft ETD390 and aircraft AXB817 were on the same AWY head-on, with a closing distance in time of 30 seconds between them. Thereafter, the yellow Short-Term Conflict Alert (STCA) was displayed on the ATCO radar screen between conflicting traffic aircraft ETD390 and aircraft AXB817 and the Traffic Collision Avoidance System (TCAS) Resolution Advisory (RA) were activated on both the aircraft. By the time the ATCO issued a clearance to the flight crew of aircraft AXB817 to maintain FL320 and to turn right 20 degrees in order to avoid the conflict with aircraft ETD390, both the flight crew of aircraft AXB817 and aircraft ETD390 reported to the ATCO that they were applying the TCAS-RA avoidance manoeuvre respectively.

2.2.5.5 The serious incident is attributed to the execution of descend instructions by the flight crew of aircraft AXB817 to descend from FL320 to FL160, a descend which was meant for aircraft AXB713. This resulted in reducing the separation between aircraft AXB817 and aircraft ETD390 to 300FT which was well below the 1000FT recommended separation. Aircraft ETD390 was at FL310. The above was as a result of confusion of the cleared call sign as both aircraft AXB713 and aircraft AXB817 had similar letters and this was further made difficult by a noisy background on the frequency. Therefore, the ATCO couldn't notice that it was the wrong call sign that read back to the instruction to descend to FL160 and the flight crew of aircraft AXB817 thought they were cleared by ATCO to descend hence they read back to ATCO's instruction for AXB713 to descend to FL160. It is likely that when the flight crew of aircraft AXB817 readback, the ATCO was distracted by the background frequency distortion.

2.2.5.6 The OTSB investigation team concluded that the serious incident was as a result of loss of separation of 700FT between aircraft AXB817 which was on AWY M300 and aircraft ETD390 which were both on the same AWY head-on, with a closing distance in time of 30 seconds between them. The loss of separation was caused by the confusion regarding the aircraft call sign AXB713 that was cleared to descend and instead the aircraft with call sign AXB817 descended.

2.2.5.7 This serious incident could have been avoided had the ATCO recognized that the responding aircraft AXB817 was not the intended aircraft AXB713 given the clearance which resulted on the flight crew of AXB817 acknowledging and reacting to the clearance. The above shows that there was a loss of situational awareness on the traffic management. In addition, there was the radio frequency distortion which increased the work load of the ATCO.

2.2.6 Aids to navigation

2.2.6.1 The navigational system onboard both aircraft ETD390 and aircraft AXB817 was found to be serviceable and operated as required at the time of the incident. Therefore, OTSB investigation team determined that the navigational aid was not a factor to the incident.

2.2.7 Aerodrome

2.2.7.1 The serious incident happened in cruise flight during decent of aircraft AXB817 while aircraft ETD390 was maintaining FL310, therefore, OTSB investigation team determined that the aerodrome was not a factor to the incident.

2.3 Aircraft

2.3.1 Both aircraft AXB817 and aircraft ETD390 were issued with valid certificate of airworthiness (CoA) and certificate of registration (CoR), the maintenance records of both aircraft did not reveal any abnormality in the maintenance standard requirements. Both aircraft were certified and maintained in accordance with existing regulations and approved procedures. There were no pre-existing defects or conditions that contributed to the incident. The OTSB investigation team concluded that aircraft maintenance was not relevant to the occurrence and was not considered a factor to this serious incident.

2.4 Human Factors

2.4.1 The flight crew of aircraft AXB817 stated that while they were 130NM short of MCT on radial 148°, they were cleared to descend to FL160 which was acknowledged and started descending which was followed by TA followed by RA. Necessary manoeuvres as per the TCAS procedures were followed and the aircraft AXB817 proceeded to its destination. The OTSB investigation team determined that the flight crew of aircraft AXB817 mistaken call sign AXB713 that was cleared for descend to FL160 and instead the flight crew of aircraft call sign AXB817 read back the ATCO's instruction and descended the aircraft to FL160. It is likely that the error occurred due to both aircraft call sign (AXB713 and AXB817) had similar letters and the frequency had a noisy background at the time of incident. There was no evidence that incapacitation or physiological factors affected the flight crews performance. There was no evidence that the crew suffered any sudden illness or incapacity which might have affected the crew's ability to control the aircraft.

2.4.2 Middle sector ATCO did not descend aircraft AXB817 to the standard level of FL300 before entering BRAVO sector, (As per MATSOP chapter 10 Paragraph 6.1.6 traffic inbounds to MCT on M300 or P570 shall enter BRAVO sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE sector), instead the ATCOs coordinated FL320. Previous Middle sector ATCO did not transfer some of the traffic to the next sectors after leaving BRAVO sector which added more workload and pressure to the Middle sector ATCO.

2.4.3 The Middle sector ATCO cleared the flight crew of aircraft AXB713 that entered MCT FIR via WPT TOTOX destination OOMS to descend to FL160. The flight crew of aircraft AXB817 readback to descend to FL160. The flight crew of aircraft AXB817 continued descending from FL320 to FL160 on AWY M300 which was through the flight level of aircraft ETD390 that was maintaining FL310. Aircraft AXB817and aircraft ETD390 were on the same AWY head-on, with a closing distance in time of 30 seconds apart. Thereafter, the yellow Short-Term Conflict Alert (STCA) was displayed on the Middle sector ATCO radar screen between the two-conflicting traffic, aircraft AXB817 and aircraft ETD390 and the Traffic Collision Avoidance System (TCAS) Resolution Advisory (RA) were activated on both aircraft.

2.4.4 The closing distance between the two aircraft (ETD390 and AXB817) separation was 300FT and distance in time of 30 seconds. Level burst (LB) was due to the flight crew of aircraft AXB817 executing a decent meant for other aircraft AXB713 and the Bravo sector ATCO not correcting the incorrect readback of the flight crew of aircraft AXB817.

2.5 Survivability

2.5.1 Rescue fire service response: There was no services required of Rescue fire, therefore Rescue fire was not relevant to the occurrence and not a factor to the incident as there was no fire during and after the incident.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors were made with respect to this incident. These shall not be read as apportioning blame or liability to any organization or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings —** are statements of all significant conditions, events, or circumstances in this serious incident. The findings are significant steps in this incident sequence, but they are not always causal or indicate deficiencies.

3.2. Findings

3.2.1 The flight crew of aircraft AXB817 were properly licensed to conduct the flight. Their licenses were valid and issued by India CAA.

3.2.2 The flight crew of aircraft ETD390 were properly licensed to conduct the flight. Their licenses were valid and issued by United Arab Emirates GCAA.

3.2.3 Aircraft AXB817 was properly registered and issued with Certificate of Airworthiness by India CAA and was valid at the time of the incident.

3.2.4 Aircraft ETD390 was properly registered and issued with Certificate of Airworthiness by United Arab Emirates GCAA and was valid at the time of the incident.

3.2.5 The ATCO was issued with Air Traffic Controller license by Oman CAA on the 08th Oct 2015 and a proficiency was conducted on the 18th Feb 2024 with an expiry date of the 31st December 2026.

3.2.6 At WPT LOTAV aircraft AXB817 was identified by the Middle sector ATCO and after that the Middle sector ATCO issued a clearance to aircraft AXB817 to descend to FL320 and was acknowledged by aircraft AXB817.

3.2.7 The Bravo sector ATCO did not reply back to the flight crew of aircraft AXB817 when they reported on initial contact descending through FL327 for FL320 as Bravo sector ATCO was busy coordinating with the Middle sector ATCO regarding frequency change for the Saudi aircraft (SVA843) that was approaching Jeddah`s FIR.

3.2.8 According to Bravo sector position audio playback there was a lot of distortion background noise from the frequency, step down(block) of transmissions and echo during the radio calls made to the Bravo sector ATCO and the flight crew of aircraft ETD390 and aircraft AXB817.

3.2.9 The Bravo sector ATC radio calls were distorted with background noise and sometimes stepped over transmissions and receivers. Moreover, there was an echo on the radio frequency during the occurrence. Frequency was very bad (Noisy, cutting or breaking) and overlapping (Two stations transmitting at same time).

3.2.10 There were no records or reported defects indicating that the communication system was unserviceable prior and during the incident flight, therefore communication equipment was not a factor on the serious incident.

3.2.11 Middle sector ATCO did not descend aircraft AXB817 to the standard flight level of FL300 before entering BRAVO sector, (As per MATSOP chapter 10 Paragraph 6.1.6 traffic inbounds to MCT on M300 or P570 shall enter BRAVO sector at FL300 or cruising level if lower. This level shall be updated in XFL field by MIDDLE sector coordinated with BRAVO sector ATCO), instead the Middle sector ATCO coordinated FL320 with the Bravo sector ATCO.

3.2.12 Bravo sector ATCO instructed the flight crew of aircraft AXB713 to descend to FL160 but, the flight crew of aircraft AXB713 did not readback and instead, the flight crew of aircraft AXB817 replied, “descend FL160 AXB817”. No further instructions were issued by the Bravo sector ATCO.

3.2.13 Aircraft AXB817 entered Bravo sector at way point (WPT) GOLBA while continuing the descent passing through FL322 for FL160, while aircraft ETD390 was less than 40NM on the same AWY M300 opposite direction maintaining FL310.

3.2.14 The flight crew of aircraft AXB713 was requested by Bravo sector ATCO to descend FL160 into MCT but they didn’t respond to the descent clearance when it was given to them, even though the clearance was very clear. Bravo sector ATCO became busy by other traffic which are not in his sector.

3.2.15 Level Bust (LB) alert was activated on the Bravo sector ATCO Indra radar display screen as AXB817 was on descent passing through FL322 with a Rate of Descend (ROD) 500 feet per minute (FPM) and aircraft ETD390 was maintaining FL310.

3.2.16 The flight crew of aircraft AXB817 responded and complied with the descent clearance which was not meant for aircraft AXB817. Bravo sector ATCO did not pick up the wrong readback of the flight crew of aircraft AXB817, who responded to the Bravo Sector ATCO clearance timeously resulting in late response to the Bravo sector ATCO and spotting the activation of the yellow STCA.

3.2.17 Aircraft ETD390 and aircraft AXB817 were on the same AWY head-on, with a closing distance in time of 30 seconds between them. Thereafter, the yellow Short-Term Conflict Alert (STCA) was displayed on the Bravo sector ATCO radar screen between the two-conflicting traffic, aircraft ETD390 and aircraft AXB817 and the Traffic Collision Avoidance System (TCAS) Resolution Advisory (RA) was activated on both aircraft and recovery procedures were followed by both flight crew of aircraft AXB817 and aircraft ETD390 respectively.

3.2.18 The Middle sector ATCO gave the flight crew of aircraft AXB817 instructions to maintain FL320 after the flight crew of aircraft AXB817 reported that “We are on RA standby”.

3.2.19 The OTSB investigation team concluded that the serious incident was as a result of loss of separation of 700FT between aircraft AXB817 which was on AWY M300 through the flight level of aircraft ETD390 that was maintaining FL310 on the same AWY. Aircraft ETD390 and aircraft AXB817 were on the same AWY head-on, with a closing distance in time of 30 seconds between them. The loss of separation was caused by the confusion regarding the aircraft call sign AXB713 that was cleared to descend but instead aircraft call sign AXB817 descended and aircraft AXB817 readback was not corrected by the Bravo sector ATCO. Therefore, both aircraft had similar call sign and the frequency was noisy and not clear at the time of the occurrence.

3.2.20 There was no evidence that incapacitation or physiological factors affected the flight crew and ATCOs performance to control the aircraft.

3.3. **Cause**

3.3.1 The OTSB investigation team concluded that the incident was as a result of the loss of separation between aircraft AXB817 and aircraft ETD390 which was on AWY M300 descending through the flight level of aircraft ETD390 that was maintaining FL310. This loss of separation was caused by the flight crew of aircraft AXB817 responding to the descend instruction meant for aircraft AXB713 and the Bravo sector ATCO did not pick up the incorrect readback call sign.

3.4. **Contributing Factors**

3.4.1 The flight crew of AXB713 did not readback.

3.4.2 High workload on Bravo sector ATCO.

3.4.3 Bravo sector ATCO not correcting the flight crew of aircraft AXB817 as he was on the land line with MID sector ATCO attempting to get Jeddah frequency for Saudi aircraft SVA843.

3.4.4 Radio frequency distortion and congestion.

3.4.5 Alpha and Bravo sector frequencies combined which affected the frequency.

3.4.6 Bravo sector ATCO was busy coordinating with the Middle Sector ATCO regarding frequency change for a Saudi aircraft (SVA843) that was approaching Jeddah`s FIR.

3.4.7 The Alpha and Bravo positions were combined with no ATCO planner.

3.4.8 Both aircraft AXB713 and aircraft AXB817 had almost similar callsign, and with noisy background on radio frequency, this confused both the Bravo sector ATCO and the flight crew of aircraft AXB817.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The OTSB expects that all safety issues identified by the investigation are addressed to the receiving States and organizations/entities.

4.2. Safety Recommendations

4.2.1 Air India Express safety action

4.2.1.1 Following the Serious Incident, the Operator took the following safety actions:

4.2.1.2 The crew were counselled by the Chief Pilot with the on Crew Resource Management (CRM) Class with emphasis on:
a. Communication, Situational Awareness and Work-Load Management.
b. Managing Distractions.

4.2.1.3 The crew did 2 Sectors Line Check for PIC and FO (01 Sector PF and 01 Sector PM).

4.2.2 **Directorate General Air Navigation (DGAN)**

4.2.2.1 Following the Serious Incidents, DGAN took the following safety action:

4.2.2.2 Counselling ATCO regarding the situational awareness and the importance of listening carefully when controlling aircraft that have almost similar call sign, to ensure that, correct call sign respond to ATCO's instructions.

4.2.2.3 Senior Air Traffic Controller (SATCO) held a meeting with the watch supervisors and emphasized the importance of reinforcing to the ATCOs the application of the frequency selection techniques which they acquired during On Job Training (OJT) training.

4.2.2.4 The Chief of training to include frequency selections techniques in the refresher training sessions, the aim of the training is to ensure the frequency selection techniques are consistently applied in their daily operations to improve efficiency and communication.

5. APPENDICES

5.1 None.

This report is issued by:
Oman Transport Safety Bureau (OTSB)
Sultanate of Oman