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

Oman Transport Safety Bureau

Final Report

OTSB Case File No: AIFN-002/02/2024

B777 TCAS Resolution between Etihad Airways-Boeing B777-3FXER and Qatar Airways-A320-232 in the Muscat FIR

Operator: Etihad Airways
Make and Model: Boeing 777-3FXER
Nationality and Registration Marks: United Arab Emirates, A6-ETP
Operator: Qatar Airways
Make and Model: Airbus A320-232
Nationality and Registration Marks: State of Qatar, A7-AHP
Location of the Occurrence: Muscat FIR, 20°32'58.39''N059°59'05.57E
State of Occurrence: Sultanate of Oman
Date of Occurrence: 10th February 2024, 23:55 UTC
Date of Publication: 3rd November 2024

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Purpose of the Investigation

The investigation was conducted by Oman Transport Safety Bureau pursuant to Civil Aviation Law (CAL) 76/2019 Chapter 10, and in compliance with the Civil Aviation Regulation CAR-13 -, Sub Part CAR 13.070: Instituting and Conducting of Investigations as State of Occurrence, Accidents or Incidents in the Sultanate of Oman.

The sole objective of the investigation is to prevent future aircraft accidents and incidents and not to apportion blame or liability. Oman Transport Safety Bureau issued this Draft Final Report in accordance with the National and International standards, and Industry best practice.

Unless otherwise mentioned, all times in this Report are UTC time. Local Time in The Sultanate of Oman is UTC plus (+) 4 hours. Photos and figures used in this report were taken from different sources and adjusted from the original for the sole purpose of improving clarity of the report.

Abbreviations Descriptions

AAIS	Air Accident Investigation Section
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	ATC Airway
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	Flight Plan
FPM	Feet Per Minute
FT	Feet
GCAA	General Civil Aviation Authority
ICAO	International Civil Aviation Organization
IIC	Investigator-in-Charge
LB	Level Burst
LoA	Letter of Agreement
LPC	License Proficiency Check
MATSOP	Manual of Air Traffic Services Operational Procedures

MC	Medium Term Conflict Detection
MCT	Muscat
MSAW	Minimum Safe Altitude Warning
NM	Nautical Mile
NTSB	National Transportation Safety Board
OCC	Oceanic Control Centre
OOMS	Muscat International Airport
OPC	Operator Proficiency Check
OTSB	Oman Transport Safety Bureau
PF	Pilot Flying
PM	Pilot Monitoring
QAAI	Qatar Air Accident Investigation
QTR	Qatar Airways
RA	Resolution Advisory
RBL	Right Bearing Line
RDR	Radar
ROC	Rate of Climb
ROD	Rate of Descent
RVSM	Reduced Vertical Separation Minima
RPA	Radioactive Protection Advisor
SEP	Separation
SOP	Standard Operating Procedures
STCA	Short Term Conflict Alert
SQK	Squawk
SQ	SSR Code Conformance alert
TA	Traffic Advisory
TCAS	Traffic Collision Avoidance system

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 occurrence 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 the 11th of February 2024 at 12:34 Local Time.

The serious incident involved Etihad Airways ETD455 aircraft with registration marks A6-ETP, Boeing 777-300 (ER) and Qatar Airways aircraft QTR71N Registration marks A7-AHP, Airbus 320.The aircraft entered Muscat Flight Information Region (FIR) as aircraft QTR71N was maintaining FL350 flying on an easterly direction and reciprocal traffic aircraft ETD455 was maintaining FL340 flying on a westerly direction on (bidirectional) Airway P570 between waypoints KITAL and GOLNI. Middle Sector Air Traffic Controller (ATCO) cleared aircraft QTR71N to descend from FL350 to FL330 which is through the level of aircraft ETD455 maintaining FL340. At the time 23:55:39 UTC as aircraft QTR71N was descending through FL341, with a rate of descent of 400 feet per minute (FPM) and aircraft ETD455 was maintaining FL340, both aircraft were at FL340 head-on, with a closing distance of 7.38 NM between them, the Traffic Collision Avoidance System and Resolution Advisory TCAS-RA were activated on both aircraft. By the time the controller instructed both the flight crew of aircraft QTR71N and aircraft ETD455 to turn right 50 degrees to avoid the conflict, both flight crew of aircraft QTR71N and aircraft ETD455 reported TCAS RA and applied the TCAS-RA avoidance manoeuvre. The flight crew of aircraft ETD455 resumed FL340 once it was clear of conflict and the flight crew of aircraft QTRN71 continued to descend to FL310 as instructed by ATCO. Thereafter, both aircraft continued to their destinations and landed safely without any further incident.

OTSB established that the probable cause of the incident was as result of the ATCO instructing the crew of aircraft QTR71N to descend from FL350 to FL330, while there was opposite conflicting traffic from aircraft ETD455 which was maintaining FL 340, as a result both aircraft received TCAS RA warning, and procedures were followed to avoid potential collision of both aircraft.

The OTSB instituted and decided to conduct an investigation and classified the occurrence as a serious incident requiring investigation. The following parties were notified:

- State of Operator and Registry United Arab Emirates General Civil Aviation Authority- Air Accident Investigations (GCAA-AAI)
- State of Operator and Registry Qatar Air Accident Investigation (QAAI)

- State of Design and Manufacturer of Boeing 777-300ER United States of America National Transportation Safety Board (NTSB)
- State of Design and Manufacturer of Airbus A320 France-Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile French Safety Investigation Authority (BEA)
- International Civil Aviation Organization (ICAO)
- Sultanate of OMAN Civil Aviation Authority (CAA)

In line with OTSB Investigation procedures, the Director of OTSB appointed an Investigator-In-Charge (IIC) and an investigation team to assist the IIC with the investigation. Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile (French Safety Investigation Authority -BEA)-France did not appoint an accredited representative. The following investigation authorities are involved in the investigation by appointing accredited representatives and advisor to the investigation: -

- National Transportation Safety Board (NTSB) of United State of America Boeing: Organization responsible for type design and final assembly of the aircraft.
- State of Operator, and Registry United Arab Emirates General Civil Aviation Authority- Air Accident Investigations (GCAA-AAI)
- State of Operator and Registry Qatar Air Accident Investigation (QAAI)

After the investigation is completed, OTSB will release and publish the Final Report. The Final Report will be made public at the below link:
http://www.mtcit.gov.om.

1. Factual Information.

1.1. History of the Flight.

1.1.1. On the 10th February 2024, Etihad Airways aircraft with registration marks A6-ETP, a Boeing 777-300 ER departed from Sydney Kingsford Smith Airport (YSSY) on an international scheduled flight aircraft ETD455 with intended destination Zayed International Airport (OMAA). While Qatar Airways aircraft with a registration marks A7-AHP, an Airbus A320-200 on the same day departed from Hamad International Airport (OTHH) on an international scheduled flight aircraft QTR71N with intended landing destination at Valena International Airport (VRMM).

1.1.2. Both aircraft QTR71N and aircraft ETD455 had a flight plan through Muscat flight information region (FIR) on a bidirectional airway P570 where aircraft QTR71N entered MCT airspace at FL350 eastbound from waypoint LABRI N318 then TOLDA P570 to KITAL and aircraft ETD455 entered MCT airspace at FL340 westbound from waypoint KITAL to SODEX. The incident occurred over Muscat FIR, Middle Sector during night time between waypoints KITAL and GOLNI. At the time of the incident, the ATCO controlled 15 aircraft in the Middle sector.

1.1.3. At the time 23:47:30, the flight crew of aircraft QTR71N established contact with the ATCO while maintaining FL350 and was radar identified. At the time 23:47:56 the flight crew of aircraft ETD455 initially called ATCO but didn't get any response, then they made another call to establish contact with ATCO and was given to squawk (SQK) 4026 and instructed to continue flight plan route after being radar identified at FL340. At the time 23:52:03, ATCO called the flight crew of aircraft QTR71N to descend FL330 with no response, it was discovered that ATCO was actually calling the wrong call sign ETD71N.

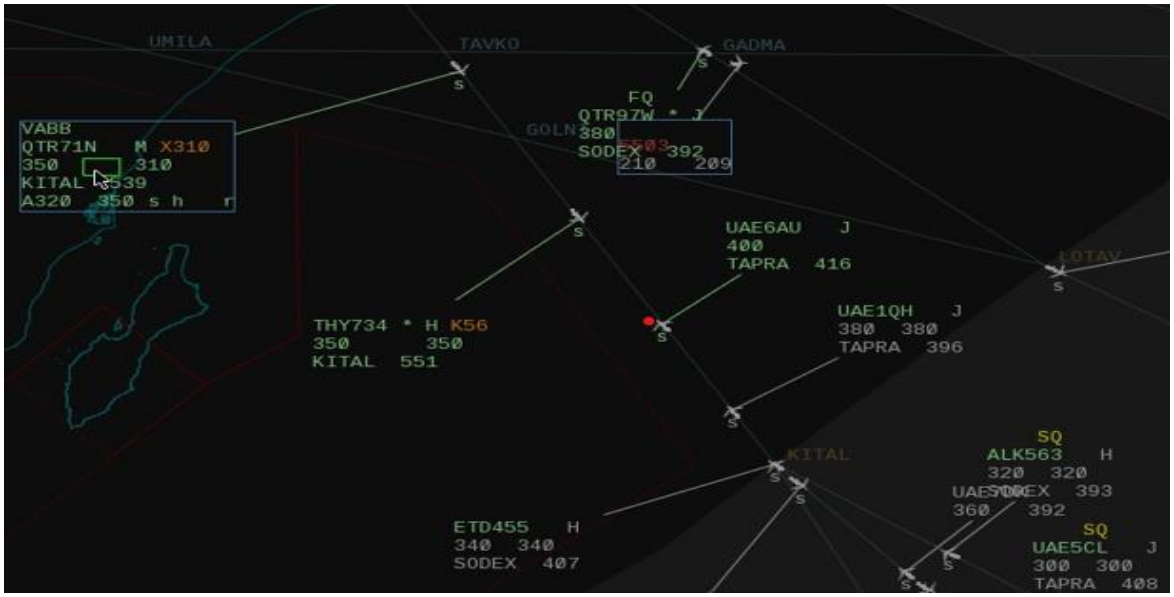

Figure 1: Aircraft QTR71N passed waypoint TAVKO maintaining FL350 and aircraft ETD455 over KITAL maintaining FL340

1.1.4. At the time 23:53:01, ATCO called the flight crew of aircraft QTR71N with a clearance to descend to FL330, the flight crew of aircraft QTR71N read back and acknowledged. At the time 23:53:18 the flight crew of aircraft QTR71N called ATCO to confirm if FL330 is going to be the final level, and ATCO replied negative expect FL310 once clear from traffic and to initially descend to FL330.The flight crew of aircraft QTR71N acknowledged the clearance to descend to FL330 and to expect FL310.

1.1.5. At the time 23:53:45, ATC Radar MC (Medium term conflict detection) warning was activated between aircraft QTR71N and aircraft ETD455 and at the time 23:53:53 the yellow STCA (Short Term Conflict Alert) was activated between aircraft QTR71N while on descent passing through FL348 with a ROD 500 FPM and aircraft ETD455 maintaining FL340.

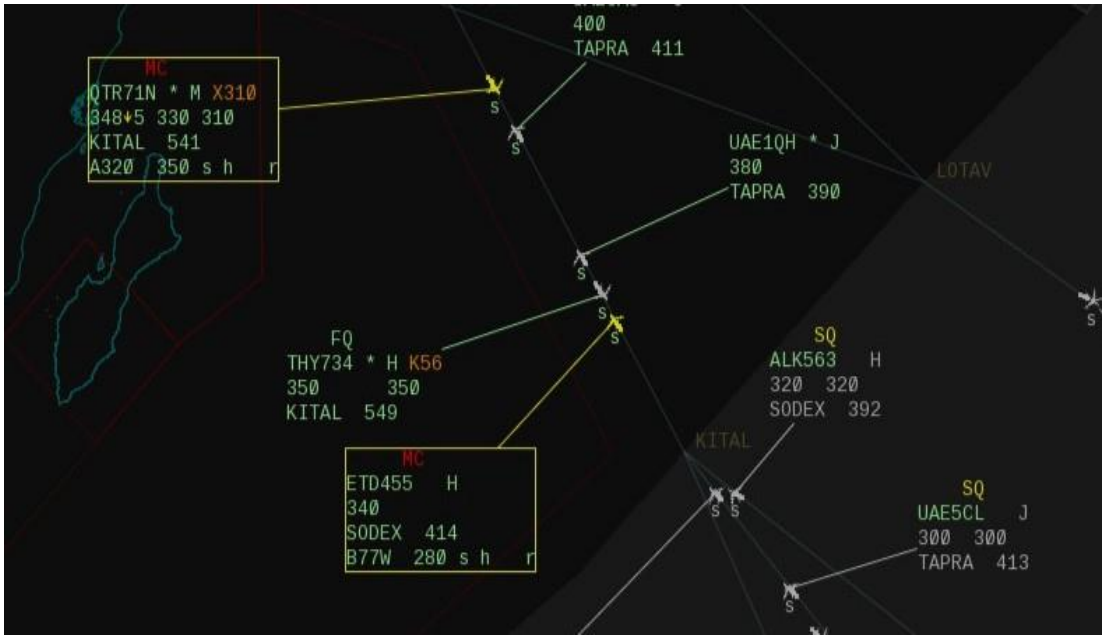

Figure 2: At the time 23:53:53 ATC Radar screen showing aircraft QTR71N leaving FL350 on descend to FL330 passing thru FL348 -rate of descent 500FPM and aircraft ETD455 maintaining FL340 with MC and STCA both activated.

1.1.6 At the time 23:54:15, it was observed on radar the ATCO using the cursor in relocating and moving the labels for both aircraft ETD455 and aircraft QTR71N. At the time 23:54:24 the ATCO instructed the flight crew of aircraft QTR71N to maintain when reaching FL330, which was acknowledged by the flight crew of aircraft QTR71N and by this time the RBL distance between aircraft QTR71N and aircraft ETD455 was 27.23NM closing.

1.1.7 At the time 23:54:53 the distance between the 2 aircraft reduced from 27.23 to 19.83NM and thereafter at the time 23:55:21 the distance between the 2 aircraft reduced to 12.55NM.

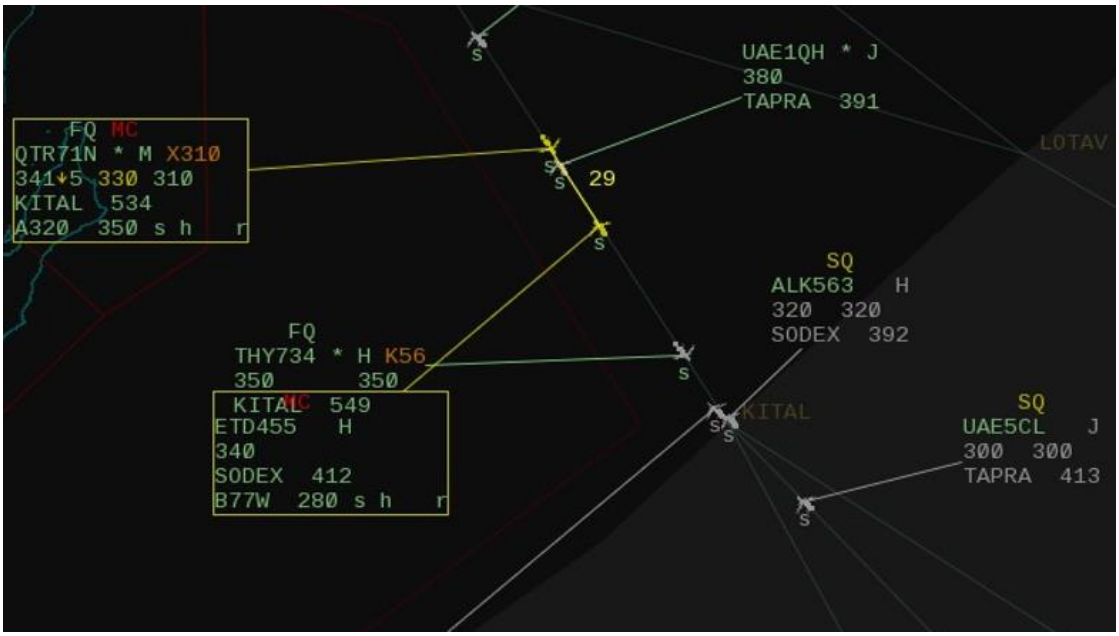

Figure 3: Aircraft QTR71N passing thru` FL341 on descent to FL330 ROD of 500 FPM speed 534 knots and aircraft ETD455 maintaining FL340 speed 412 knots with a separation of 29 seconds head-on closing rapidly.

1.1.8 At the time 23:55:24, the flight crew of aircraft ETD455 reported to the ATCO having traffic ahead of them while aircraft QTR71N was on descend passing through FL341, ROD of 500 FPM and ETD455 maintaining FL340 with an RBL distance of 11.58NM)

1.1.9 Six seconds later at the time 23:55:30 after aircraft ETD455 reported to ATCO having traffic ahead, the ATCO issued an avoiding heading to the flight crew of aircraft QTR71N to immediately turn to the right 50 degrees while the aircraft QTR71N was on descent passing through FL341 for FL330 with a rate of descent 400ft and aircraft ETD455 was maintaining FL340 with an RBL closing distance of 9. 41NM and aircraft QTR71N only readback the callsign.

1.1.10 Thereafter, at the time 23:55:35, the flight crew of aircraft QTR71N reported to the ATCO traffic RA.

Figure 4: At the time 23:55:38 aircraft QTR71N passing through FL341 descending to FL330 and aircraft ETD455 maintaining FL340 with a separation of 13 seconds head-on closing rapidly at 8.42 NM.

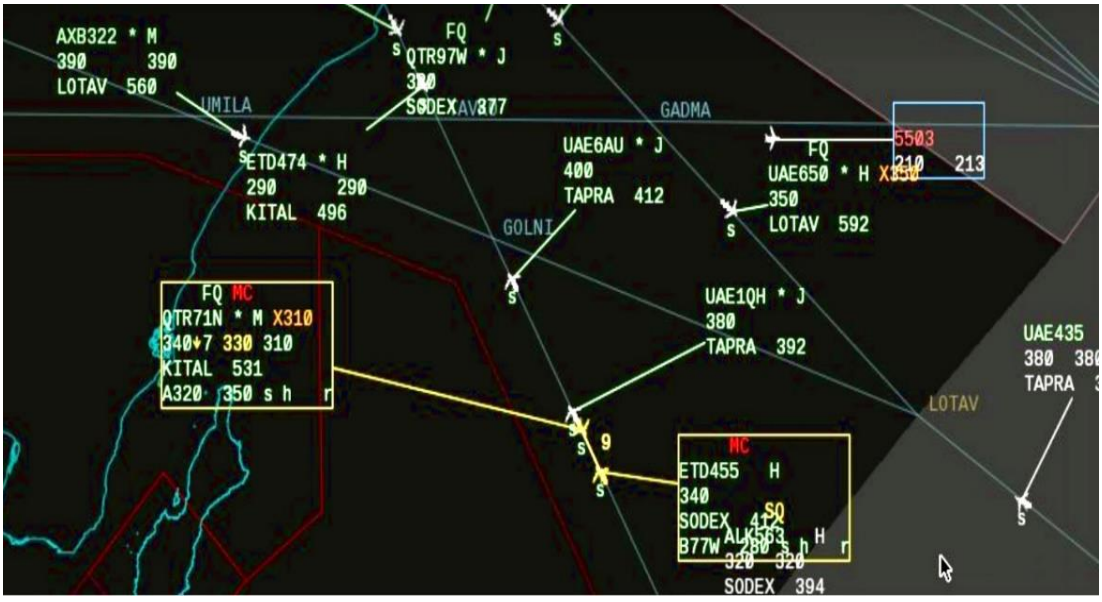

Figure 5: At the time 23:55:39 aircraft QTR71N and aircraft ETD455 both at FL340, with a distance of 7.38 NM and 9 seconds head-on closing rapidly.

1.1.11 At the time 23:55:41, ATCO instructed the crew of ETD455 to immediately turn right 50 degrees while aircraft QTR71N was descending through FL340 and aircraft ETD455 was climbing through FL342.

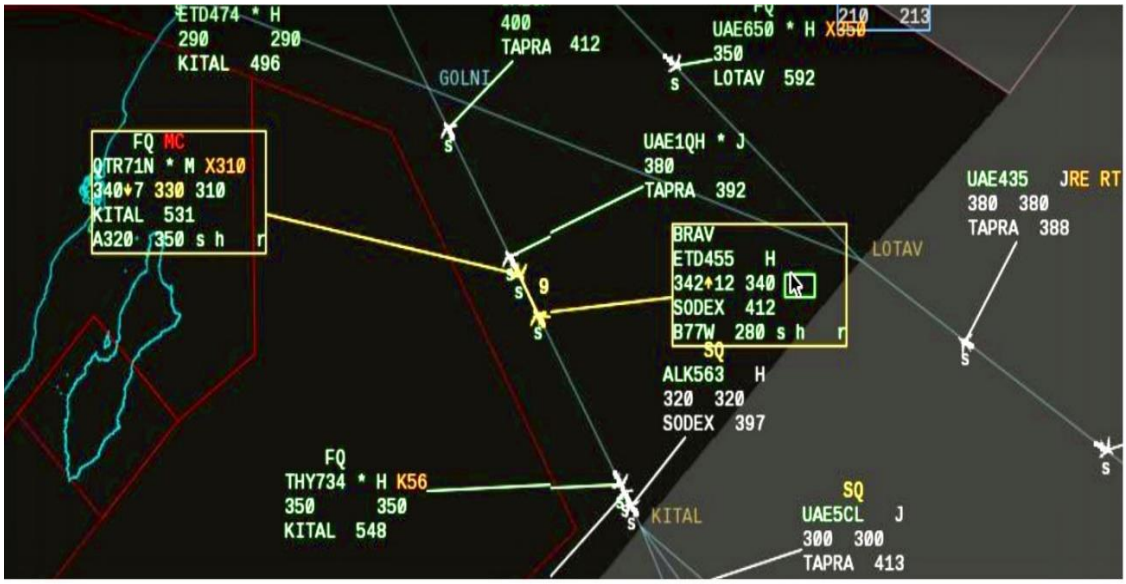

Figure 6: At the time 23:55:41 aircraft QTR71N descending through FL340 for FL330 ROD 700 FPM and aircraft ETD455 climbing through FL342 ROC 1200 FPM. The distance between both traffic was 9 seconds 6.36 NM head-on.

1.1.12 At the time 23:55:48 the flight crew of aircraft ETD455 readback that they are turning right 50 degrees and performing TCAS RA. At the time 23:55:51(RED STCA was activated between aircraft QTR71N on descent passing through FL337, ROD of 1800 FPM and aircraft ETD455 climbing through FL344, ROC1900 FPM. The distance between the two aircraft reduced to 3.22 NM.

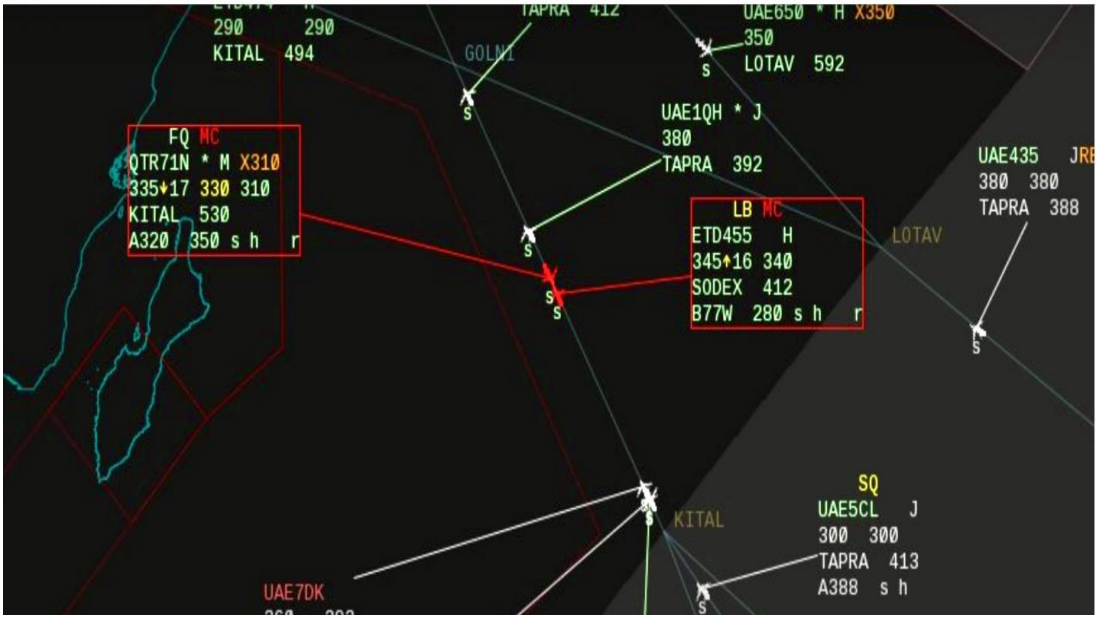

Figure 7: At the time 23:55:55 Vertical separation of 1000FT was achieved while aircraft QTR71N was descending through FL335, ROD1700 FPM and aircraft ETD455 climbing through FL345 ROC 1600 FPM with a distance of 2.16 NM and 5 seconds.

1.1.13 At the time 23:56:07, once the conflict was clear and the vertical separation was achieved between both aircraft ETD455 and aircraft QTR71N, the RED STCA cleared from the radar screen as aircraft QTR71N was descending through FL332 ROD 1700 FPM and aircraft ETD455 climbing through FL346 ROC 500 FPM and both traffic have passed each other.

1.1.14 At 23:56:32, the flight crew of aircraft QTR71N reported to the ATCO clear of conflict and thereafter requested to maintain FL330 and the ATCO instructed QTR71N to maintain FL330 due to opposite direction traffic maintaining FL320 and flight crew of aircraft QTR71N acknowledged to maintain FL330.

1.1.15 At the time 23:56:53, the flight crew of aircraft ETD455 reported to ATCO resuming FL340 and proceeding to their next way point GOLNI and the ATCO acknowledged.

1.1.16 At the time 23:58:30, the ATCO instructed the flight crew of aircraft QTR71N to descend to FL310 and to expedite but there was no response. At the time 23:59:42, as aircraft QTR71N was approaching exit point KITAL, the ATCO again called aircraft QTR71N and confirmed if they are descending to FL310.The flight crew of aircraft QTR71N replied (Negative sir you asked us to maintain 330). At the time 23:59:52, the ATCO replied (I told you to descend FL310 descend now FL310 expedite reaching) then the flight crew of aircraft QTR71N replied (Expedite reaching FL310 QTR71N descending now).

1.1.17 At the time 00:01:08, the flight crew of aircraft QTR71N called the ATCO but there was no response then at the time 00:01:52 the flight crew of aircraft QTR71N again called the ATCO and at the time 00:01:58 the flight crew of QTR71N reported maintaining FL310 and the ATCO acknowledged.

Figure 8: At the time 00:01:35 aircraft QTR71N reaching FL310 after passing waypoint KITAL in MUMBAI FIR.

1.1.18 At the time 00:01:56, another ATCO took over from the ATCO who was providing navigational services.

1.1.19 At the time 02:00:00, the ATCO instructed the flight crew of aircraft QTR71N to contact Mumbai and the flight crew of aircraft QTR71N acknowledged.

1.1.20 The flight crew of aircraft ETD455 resumed descending and maintained FL340 once aircraft ETD455 was clear of the conflict and aircraft QTRN71 continued to descend to FL310 and maintained FL310 as instructed by ATCO. Both aircraft continued to their destinations and landed safely without any further incident.

1.1.21 During the interview the ATCO mentioned the following:

(a) ATCO was not feeling well and did not have enough rest sleep the night prior to the day of the incident, however this was never reported to the Supervisor on the day. ATCO's attention was taken away by lots of things that have been happening at work including working conditions that were recently changed which affected him.

(b) the ATCO did not take sick leave as he thought there will be short of staff as they didn't have stand by personnel to cover for shortage.

(c) During the interview, the ATCO stated that the ATCO saw the Short-Term Collision Alert (STCA) warning, however in the ATCO`s mind the ATCO thought that it's a system error and everything is fine.

1.2 Injuries to Persons Aircraft ETD455.

Injuries	Pilot	Cabin Crew	Passengers	**Total on Board**	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	**-**	-	**-**	-
No Injuries	4	12	349	**365**	-
Total	**4**	**12**	**349**	**365**	-

Note: Other, means people on ground.

Injuries to Persons Aircraft QTRN71

Injuries	Pilot	Cabin Crew	Passengers	**Total on Board**	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	**-**	-	**-**	-
No Injuries	4	8	253	**265**	-
Total	**4**	**8**	**253**	**265**	-

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 ETD445**

Nationality	Thai		
Medical validity	Expiry: 31/12/2024	Licence type	Airline Transport
Licence validity	Expiry: 24/08/2024	Type endorsed	Yes
Ratings	Instrument rating, Multi-Engine, B787, MPA, B777		
Latest LPC	22/01/2024	Latest OPC	07/12/2023

Flying experience:

Total hours	10215.5
Last 24 hrs	Not applicable
Last 7 days	13:32
Last 30 days	60:57
Last 90 days	204:09

Note: No flying hours in the last 24 hours Prior to the incident as the crew was on crew rest period.

1.5.1.1 The PIC was initially issued an Airline Transport Pilot license (ATPL) on the 22nd June 2011. The license was valid with an expiry date of the 24th August 2024.

1.5.1.2 The PIC was issued a Class (one) 1 medical certificate on the 21st November 2023 with an expiry date of the 31st December 2024. The last medical assessment date was conducted on the 20th November 2023 with limitations.

1.5.2 **First Officer (FO) Aircraft ETD445**

Nationality	Czech		
Medical valid	Expiry: 13/07/2024	Licence type	Airline Transport
Licence valid	Expiry: 18/08/ 2030	Type endorsed	Yes
Ratings	Instrument rating, Multi-Engine, B777, B787, MPA		
Latest LPC	02/02/2024	Latest OPC	14/02/2024

Flying experience:

Total hours	6645.5
Last 24 hrs	Not applicable
Last 7 days	13:46
Last 30 days	85:24
Last 90 days	254:19

1.5.2.1 The FO was initially issued with the license on the 28th September 2014 and a validation was conducted on the 31st March 2022 with an expiry date of the 18th August 2030.

1.5.2.2 The FO was issued a Class 1 medical certificate on the 19th June 2023 with an expiry date of the 13th December 2024. The last medical assessment date was conducted on the 16th June 2023.

1.5.3 **Captain (PIC) Aircraft QTR71N:**

Nationality	Indian		
Medical validity	Expiry: 14/06/2024	Licence type	Airline Transport pilot licence
Licence validity	Expiry: 31/01/2025	Type endorsed	Yes
Ratings	Instrument rating, Multi-Engine, A320		
Latest LPC	22/01/24	Latest OPC	23/01/24

Flying experience:

Total hours	8235:47
Last 24 hrs	10:49
Last 7 days	19:44
Last 30 days	46:49
Last 90 days	152:51

1.5.3.1 The Captain license was initially issued on the 30th September 2014 with an expiry date of the 06th April 2030.

1.5.3.2 The Captain was issued a Class 1 medical certificate on 14th June 2023 with an expiry date of the 14th June 2024. The last medical assessment date was conducted on the 14th June 2023. The medical certificate had a limitation (VML) to wear corrective distant, intermediate and near vision and carry spare set spectacles.

1.5.4. **First Officer (FO) Aircraft QTR71N**

Nationality	Brazilian		
Medical validity	Expiry: 24/12/2024	Licence type	Commercial pilot licence
Licence validity	Expiry: 31/12/2024	Type endorsed	Yes
Ratings	Instrument rating, Multi-Engine, A320		
Latest LPC	17/12/2023	Latest OPC	18/12/2023

Flying experience:

Total hours	4234:51
Last 24 hrs	1:29
Last 7 days	9:24
Last 30 days	66:04
Last 90 days	136:47

1.5.4.1 The FO was issued with license on the 22nd January 2023 and a validation was conducted on the 17th December 2023 with an expiry date of the 31st December 2024.

1.5.4.2 The FO was issued a Class 1 medical certificate on 13th November 2023 with an expiry date of the 24th December 2024. The last medical assessment date was conducted on 13th November 2023.

1.5.5 **Air Traffic Controller:**

Nationality	Omani		
Medical valid	24/02/2024	Licence type	Air Traffic Controller
Licence valid	31/03/2024	Type endorsed	Yes
Ratings	ACC RDR	LPR	Level 4

1.5.5.1 The ATCO license was issued on the 22nd March 2009. The license proficiency check was conducted on the 20th November 2023 with an expiry date of the 31st March 2024.

1.5.5.2 ATCO was also issued with English language proficiency rating LEVEL 4 on the 22nd March 2009, tested and renewed on the 13th October 2022 with an expiry date of the 13th October 2025.

1.5.5.3 The medical of ATCO was assessed on the 21st February 2023 and ATCO was issued a Class three (3) medical certificate on 23rd February 2023 with an expiry date of 24th February 2024.

1.5.5.4 The ATCO was issued with ratings to allow operating as a controller at OOMS as Area RDR/INDRA. The last Air Traffic Control Rating Proficiency check was conducted on the 20th November 2023.

1.6 Aircraft Information:

1.6.1 Airframe Information (ETD445)

Manufacturer/Model	The Boeing Company Boeing 777-3FXER	
Serial Number	41699	
Year of Manufacture	2013	
Total Airframe Hours (At Time of Incident)	50119:06	
Last Inspection (Date & Hours (TSN))	10 February 2024	50119:06
Last Inspection Airframe Cycles (CSN)	6933	
Hours Since Last Inspection	TBA	
Type of inspection preformed	Transit Check	
CRS Issue Date	10th February 2024	
C of A (First/initial Issue Date)	25th June 2013	
C of A (Expiry Date)	24th June 24	
C of R (Issue Date) (Present Owner)	25th June 2013	
Type of Fuel Used	Jet A1	
Operating Category	Transport (passenger)	
Previous Accidents	NIL	

Engine 1:

Manufacturer/Model	GE/GE90-115B
Serial Number	907472
Part Number	GE90-115BG03
Hours Since New	30283:40
Hours Since Overhaul	11560:42
Hours since last shop visit	11560:42
Cycles Available Before Next Shop Visit	2165
Oil type	BP/Eastman Turbo Oil 2197

Engine 2:

Manufacturer/Model	GE/GE90-115B
Serial Number	907403
Part Number	GE90-115BG03
Hours Since New	44357:12
Hours Since Overhaul	22239:49
Hours since last shop visit	22239:49
Cycles Available Before Next Shop Visit	628
Oil type	BP/Eastman Turbo Oil 2197

1.6.2 **Aircraft Information (QTR71N):**

Manufacturer/Model	Airbus A320-232
Serial Number	4858
Year of Manufacture	2011
Total Airframe Hours (At Time of Incident)	49091:31 (as of 10 Feb)
Last Inspection (Date & Hours (TSN))	Date 13th December 2023 Hours 48438
Last Inspection Airframe Cycles (CSN)	Last A & C Check Date 13 December 2023 Cycles 13733
Hours Since Last Inspection	12970:16
Type of inspection preformed	Combined A & C Check
CRS Issue Date	13th December 2023
C of A (First/initial Issue Date)	04th October 2022
C of A (Expiry Date)	Nil
C of R (Issue Date) (Present Owner)	15th March 2020 JPA No. 146 Co., Ltd.
Type of Fuel Used	Jet A1
Operating Category	Commercial Air Transport Operation (CAT)
Previous Occurrences	Attached list of TORs related to A7-AHP

Engine 1:

Manufacturer/Model	V2500
Serial Number	V15977
Part Number	V2527-A5
Hours Since New	41389:41
Hours Since Overhaul	41389:41
Hours since last shop visit	486:13
Cycles Available Before Next Shop Visit	Estimated date before next shop visit 17 January 2029 based on the MTBER
Oil type	EASTMAN Turbo Oil 2197

Engine 2:

Manufacturer/Model	V2500
Serial Number	V15902
Part Number	V2527-A5
Hours Since New	43888:31
Hours Since Overhaul	43888:31
Hours since last shop visit	486:13
Cycles Available Before Next Shop Visit	Estimated date before next shop visit 17th January 2029 based on the MTBER
Oil type	EASTMAN Turbo Oil 2197

1.7 Meteorological Information:

1.7.1 The at the time of the occurrence, no evidence of cloud presence in the area of Muscat FIR. The Post Flight Report did not record any system failure relevant to the event. The Weather Radar System for both aircraft was operating normal throughout the flight.

1.8 Aids to Navigation:

1.8.1 Both aircraft were equipped with standard navigational equipment as approved by the GCAA and Qatar CAA. There were no records indicating that the navigation system was unserviceable prior to the incident.

1.9 Communications.

1.9.1 Both aircraft were equipped with a standard communication system as approved by the United Arab Emirates GCAA and Qatar CAA. No defects that could render the communication system unserviceable were recorded prior to the incident flight.

1.10 Aerodrome Information.

1.10.1 Departure Aerodrome aircraft (ETD455):

ICAO designation	YSSY (Kingsford Smith, Sydney, NSW, Australia)		
Aerodrome co-ordinates	S33°56.8' E151°10.6'		
Aerodrome elevation	21feet (ft) above mean sea level (AMSL)		
Runway designations	34L/16R	34R/16L	07/25
Runway dimensions	3962M x 45M	2438M x 45M	2530M x 45M
Runway used	16R		
Category for Rescue Fire Fighting	10		
Approach facilities	Radar Control, ILS Approach, HIALS/PAPI		
Aerodrome status	Licensed Airport (Open)		

Destination Aerodrome aircraft (ETD455):

ICAO designation	OMAA (Zayed International, Abu Dhabi, UAE)	
Aerodrome co-ordinates	N24°26.0' E054°39.1'	
Aerodrome elevation	83ft above mean sea level (AMSL)	
Runway designations	31L/13R	31R/13L
Runway dimensions	4100M x 60M	4106M x 60M
Category for Rescue Fire Fighting	10	
Approach facilities	Radar Control, ILS Approach, HIALS/PAPI	
Aerodrome status	Licensed Airport (Open)	

1.10.2 **Aerodrome Information (QTR71N):**

Departure Aerodrome aircraft (QTR71N):

ICAO designation	OTHH (Hamad International Air-port,Doha,Qatar)	
Aerodrome Coordinates	N25.27 E051.61	
Aerodrome elevation	13 FT/42°C	
Runway designations	16L / 34R	16R / 34L
Runway dimensions	4850 X 60	4250 X 60
Runway used	N/A	
Category for Rescue Fire Fighting	CAT 10	
Approach facilities	ILS, RNP, GVA, Runway Lights, PAPI's	
Aerodrome status	Licensed	

Destination Aerodrome aircraft (QTR71N):

ICAO designation	Valena International Airport (VRMM)
Aerodrome co-ordinates	N04.19 E073.53
Aerodrome elevation	6 FT / 31.7°C
Runway designations	18/36
Runway dimensions	3200 X 45
Category for Rescue Fire Fighting	CAT 9
Approach facilities	ILS, RNP, VOR, Runway Lights, PAPI's
Aerodrome status	Licensed

1.11 Flight Recorders.

1.11.1 Both aircraft were fitted with both the Flight Data Recording (FDR) and the Cockpit Voice Recording (CVR) however, OTSB determined that there was no need to remove both FDR and CVR for downloads. OTSB relied on flight information data such Air Traffic Services (ATC) communication (See Appendix A under 5.1 ATC transcript) 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 occurrence.

1.14 Fire.

1.14.1 Not relevant to the occurrence.

1.15 Survival Aspects.

1.15.1. The investigation concluded that the serious incident was survivable due to the fact that both aircraft were installed with TCAS system, as such the TCAS system was triggered in both aircraft and appropriate resolution procedure was taken by both flight crew to avoid conflict and collision with each other.

1.16 Tests and Research.

1.16.1 Not applicable for this investigation

1.17 Organizational and Management Information.

1.17.1 Both flights were scheduled international commercial flights, operated under Part 121.

1.17.2 The operator (Etihad Airways-ETD) was issued an Air Operating Certificate (AOC) by the State of Registry and State of Operator, UAE-GCAA, issued on the 5th September 2023 with an expiry date of the 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.

1.17.3 The operator (QATAR Airways and Cargo-QTR) was issued an Air Operating Certificate (AOC) by the State of Registry and State of Operator, QATAR CAA, issued on the 25th December 2023 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.

1.17.4 The Sultanate of Oman PACA Muscat ACC and Republic of India AAI Mumbai OCC have a Letter of Agreement (LoA). The purpose of the agreement is to define the co-ordination procedures to be applied between Muscat ACC and Mumbai OCC when providing ATS to air traffic operating between Muscat ACC and Mumbai OCC. These procedures are supplementary to those specified in ICAO Standard and Recommended Practices and/or national documents.

1.17.5 SAFETY COMMUNICATION Effective communication is crucial for the successful implementation and maintenance of an SMS (Source: Ans Safety Management System Manual).

In compliance with ICAO requirements; DGAN & SLL AND has an SMS communication plan that:

1. Explains SMS policies, objectives, procedures, responsibilities, and the current status of the organization's safety activities and significant events to all stakeholders, whilst providing accessible methods of upwards communication in an environment of openness; and

2. Describes communication channels used to gather and disseminate SMS- related information.

DGAN & SLL AND has already established processes and procedures that allow for such communication among operational personnel and with management.

The SMS training programs are clearly an important part of the communication plan. However, training generally occurs at fairly long intervals (for example annually). In addition, there needs to be ongoing communication with stakeholders about the activities and safety performance of the SMS, to keep safety 'on the radar' and encourage the continuing commitment of all stakeholders. A variety of types of communication can be used, including electronic media (websites, on-line forums, e-mail), newsletters, bulletins, seminars, periodic poster campaigns in strategic locations, etc.

Communications about the activities and safety performance of the SMS (from the Quality and Safety Action Group or other designated management) need to be clear, timely and credible, i.e., consistent with the facts and with previous statements. The information provided also needs to be tailored to the needs and roles of different stakeholder groups, so that people are not swamped by large quantities of information that has little relevance to them.

Communications from DGAN & SLL AND personnel are vital for safety hazard identification, for feedback on the effectiveness of controls and mitigations, and in providing information for SMS safety performance indicators (for example, by participating in surveys and safety monitoring studies). For these communications to be open and honest, all SMS stakeholders need to have a clear understanding of the policies governing data confidentiality and the ethical use of information provided by DGAN & SLL AND personnel. There also needs to be clarity about the thresholds that separate non-culpable safety-related safety events from deliberate violations that could attract penalties.

Timely feedback to DGAN & SLL AND personnel who submit safety reports is vital. Feedback does not require completion of a full investigation. Every personnel should receive a timely response to their report with some indication of the planned follow-up activity. For example - “To Ms. Smyth; thank you for your safety report. This report will be forwarded to the Quality and Safety Action Group (QSAG). The QSAG is composed of management, and personnel, with other specialists as required. The group meets quarterly to identify adverse trends in safety reports, evaluate potential mitigation strategies, and make recommendations to management at the local and national level”.

The communication plan needs to be described in the SMS documentation and assessed periodically as part of SMS safety assurance processes.

Successful Safety Management Systems are marked by good communication between all interested parties. This enhances safety, lifts morale, and improves productivity, efficiency, and profitability.

As communication failures are commonly identified as a source of problems for organizations, it is our intention to maintain a focus on improving communication so that we can improve performance at all levels. Communication with respect to safety within DGAN & SLL AND is in multiple directions:

❖ From DGAN & SLL and personnel to external parties and vice versa (horizontal).

❖ Between personnel (horizontal); and

❖ Between management (horizontal);

❖ From personnel to management (bottom up);

❖ From management to personnel (top to bottom);

❖ Communication is either formal or informal.

Formal communication includes instructions, procedures, documents, records, reports, minutes and data.

Instructions and procedures are typically communicated top down by means of manuals, procedures or otherwise. Minutes, documents and records are typically used for horizontal communication. Reports, records and data are typically used for bottom-up communication.

When it concerns communication that is critical for safety, only formal means of communication.

1.18 Additional Information

1.18.1 ETIHAD Airways: Boeing 777 Flight Crew Operations Manual

Traffic Avoidance:

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with RA if there is a conflict between RA and air traffic control.

WARNING: Once as RA has been issued, safe separation can be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II to TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA.

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

For Traffic Advisory (TA):

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic	
If traffic is sighted, maneuver if needed	

Note: Maneuvers based solely on a TA may result in reduced separation and are not recommended.

Resolution Advisory (RA)

An RA commands one of the 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. No 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 clearance.

e. Promptly comply with modified RAs.

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

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

h. Notify ATC when returning to the current clearance.

Note: For any type specific procedures refer to type specific OM-B

When a TCAS RA is activated the flight crew shall use standard ICAO phraseology TCAS RA to notify ATC. Once an aircraft departs from its ATC clearance or instruction in compliance with an RA, or a pilot reports and 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 “CLEAR OF CONFLICT”.

Nothing in the above procedures or those specified in the respective type OM B 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 QATAR Airways: A318/A319/A320/A321 Flight Crew Operating Manual:

(MEM) TCAS WARNING-RESOLUTION ADVISORY

Always follow RA orders, even if this results in crossing the intruder altitude, because these orders ensure the best altitude separation.

CAUTION: Be aware that the intruder may have a TCAS, and may maneuver in response to a coordinated RA order. Therefore, not following an RA order could compromise safe separation.

- All RA, except any CLIMB RA during approach in CONF 3 or FULL:

AP (if engaged) ……OFF
BOTH FDs……OFF

Respond promptly and smoothly

VERTICAL SPEED……ADJUST or MAINTAIN

L2

Adjust or maintain the vertical speed as required, to reach the green area and/or avoid the red area of vertical speed scale

L1

Note: Avoid excessive maneuvers while attempting to maintain the vertical speed just outside the red area of the vertical speed scale, and within the green area. If necessary, use the full speed range between Vαmax and VMAX

- Any CLIMB RA during approach in CONF 3 or FULL:

GO-AROUND…… PERFORM

Follow the SRS GA mode.

VERTICAL SPEED…….. MONITOR

L2

Check that the vertical speed remains out of the red area of the vertical speed scale and take over if necessary.

L1

Respect stall, GPWS, or wind shear warnings.

ATC……NOTIFY

- When the “CLEAR OF CONFLICT” aural alert sounds:

ATC……NOTIFY LATERAL AND VERTICAL GUIDENCE……ADJUST

L2

Adjust the lateral and vertical guidance to resume normal navigation, in accordance with ATC clearance.

L1

AP/FD……AS RQRD

L2

If necessary, reengage the AP/FD.

1.18.3 The Vertical Separation Minimum (VSM) specified in ICAO Doc4444 (PANS ATM) at para 5.3.2 states that,

1.18.3.1 ***"The vertical separation minimum (VSM) shall be:***
(a) A nominal 300 m (1000 ft) below FL 290 and a nominal 600 m (2000 ft) at or above this level, except as provided for in b) below; and
(b) Within designated airspace, subject to a regional air navigation agreement: a nominal 300 m (1000 ft) below FL 410 or a higher level where so prescribed for use under specified conditions, and a nominal 600 m (2000 ft) at or above this level"

1.18.3.2 Traffic Information:

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."

1.18.3.3 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 Read-back of clearances and safety-related information.

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). 12.1.2. 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 clearances and instructions always include read backs when they pertain to:

ATC route clearances;

clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

(3) transition levels.

(4) 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 APP/SRV ATCO 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 read back is incorrect or incomplete, ATCOs shall take immediate action to correct any discrepancies revealed by the read-back;

(d) 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).

1.19 Useful or Effective Investigation Techniques.

1.19.1 Not applicable for this incident

2. Analysis

2.1 General (Organisation):

2.1.1 Both operators Etihad Airways and Qatar Airways were properly licenced by their respective Aviation Authorities being UAE GCAA and QCAA respectively. The Investigation noted that both airlines have implemented safety management system, where by occurrence are reported to the relevant authorities as an when they occur and occurrences are reviewed internally at the organisational. There were no anomalies identified with the safety culture of reporting occurrences from both airlines. The investigation concluded that the organisational factor of both operators was not a factor into the serious incident. It was both operators who alerted the ATC of the potential danger following both flight crews receiving TCAS RA warning.

2.2. Flight Operations

2.2.1 Flight crew qualifications

The flight crew of both aircraft were properly licensed to operate the aircraft and their medical records didn’t show any short comings or abnormal situation. At the time of this occurrence, both crew medical certificates were valid for the flights conducted. There was no issue with regard to the rest period of both flight crew prior to undertaking the operation of the flights.

2.2.2 Operations procedures

Both crew of the flights followed established procedures when they received TCAS RA warning, there was no deviation from laid down procedures for TCAS RA. The investigation concluded that the flight crew operation was not a factor to the incident as the crew followed procedures during the conduct of the flight. It was the TCAS RA procedures that the crew complied with following the receipt of TCAS RA. The crew action ensured that conflict is avoided and any possible collision was avoided by complying with TCAS RA.

2.2.3 Weather:

2.2.3.1 Weather was considered to be fine at the time of the incident neither any of the flight crew re ported challenges with enroute weather. Investigation concluded that weather was not a factor to the occurrence.

2.2.4 Air traffic control

2.2.4.1 The ATCO held the required licence and medical which was valid at the time of the incident issued by Oman CAA. ATCO provided pertinent information to the crew in relation to the flight and the track. OTSB determined that the ATCO qualifications were not a factor to the incident.

2.2.5. Communications

2.2.5.1 The communication between the flight crew and the ATCO was characterised by errors and none responsive to the imminent danger of loss of separation, therefore communication was a factor to the incident due to the following:

2.2.5.2. At the time 23:47:30, the flight crew of aircraft QTR71N established contact with the ATCO while maintaining FL350 and was radar identified. At the time 23:47:56 the flight crew of aircraft ETD455 initially called ATCO but no response followed by another call to establish contact with ATCO and was given to squawk (SQK) 4026 and instructed to continue flight plan route after being radar identified at FL340. At the time 23:52:03, ATCO called the flight crew of aircraft QTR71N to descend FL330 with no response, it was discovered that ATCO was actually calling the wrong call sign ETD71N, hence there was no response from the flight crew of aircraft QTR71N.

2.2.5.3. At the time 23:53:01, ATCO called the flight crew of aircraft QTR71N with a clearance to descend to FL330, the flight crew of aircraft QTR71N read back and acknowledged.

2.2.5.4. At the time 23:53:18 the flight crew of aircraft QTR71N called ATCO to confirm if FL330 is going to be the final level, and ATCO replied negative expect FL310 once clear from traffic and to initially descend to FL330.The flight crew of aircraft QTR71N acknowledged the clearance to descend to FL330 and to expect FL310. (the potential conflicting traffic effecting the descent of aircraft QTR71N to FL310 was ALK563 maintaining FL320). So therefore, as per the ATCOs clearance, the only conflicting traffic is below FL330 while actually there was also aircraft ETD455 maintaining FL340.

2.2.5.5. At the time 23:53:45, ATC Radar MC (Medium term conflict detection) warning was activated between aircraft QTR71N and aircraft ETD455. The MC is a feature designed as safety barrier within the ATCO`s INDRA RDR system as the first stage of predicting a conflict. At the time 23:53:53 the yellow STCA (Short Term Conflict Alert) was activated between aircraft QTR71N while on descent passing through FL348 with a ROD 500 FPM and aircraft ETD455 maintaining FL340. The STCA is another safety barrier within the radar system that is used to warn the ATCO regarding a potential loss of separation by marking the 2 aircraft label targets in yellow.

2.2.5.6. At the time 23:55:24, the flight crew of aircraft ETD455 reported to the ATCO having traffic ahead of them while aircraft QTR71N was on descend passing through FL341, ROD of 400 FPM and ETD455 maintaining FL340 with an RBL distance of 11.58NM.

2.2.5.7.Six seconds later at the time 23:55:30 after aircraft ETD455 reported to ATCO having traffic ahead, the ATCO issued an avoiding heading to the flight crew of aircraft QTR71N to immediately turn to the right 50 degrees while the aircraft QTR71N was on descent passing through FL341 for FL330 with a rate of descent 400 FPM and aircraft ETD455 was maintaining FL340 with an RBL closing distance of 9. 41NM and the flight crew of aircraft QTR71N only readback the callsign. At the time 23:55:35 the flight crew of aircraft QTR71N reported to the ATCO traffic RA.

2.2.5.8 At the time 23:55:41, ATCO instructed the crew of aircraft ETD455 to immediately turn right 50 degrees and the crew of aircraft ETD455 readback. Thereafter immediately at the time 23:55:48 the flight crew of aircraft ETD455 reported performing TCAS RA. Neither of the aircraft turned the 50 degrees turns that were instructed by the controller as both aircraft were performing RA.

2.2.5.9. At the time 23:55:55 the vertical separation was achieved while aircraft QTR71N was on descend passing through FL335, ROD1700 FPM and aircraft ETD455 climbing through FL345 ROC 1600 FPM with a distance of 2.16 NM and 5 seconds.

2.2.5.10. At the time 23:58:30, the ATCO instructed the flight crew of aircraft QTR71N to descend to FL310 and to expedite but there was no response and the ATCO did not challenge the readback from the crew of aircraft QTR71N. At the time 23:59:42,as aircraft QTR71N was approaching exit point KITAL, the ATCO again called aircraft QTR71N and confirmed if they are descending to FL310.The flight crew of aircraft QTR71N replied (Negative sir you asked us to maintain FL330).At the time 23:59:52,the ATCO replied (I told you to descend FL310 descend now FL310 expedite reaching) then the flight crew of aircraft QTR71N replied (Expedite reaching FL310 QTR71N descending now).Therefore, the ATCO confirmed with flight crew QTR71N if they were descending to FL310 though the flight crew of aircraft QTR71N did not readback the ATCO`s initial clearance that was given to them to descend to FL310.

2.2.5.11.The investigation concluded that the communication between the ATCO and the flight crew of aircraft QTR71N was a factor to the incident, at the time the aircraft QTR71N was supposed to descent to FL330, the ATCO made an error and called the wrong call sign ETD71N and did not challenge the readback, as a result the descent was delayed by 58 seconds and by the time aircraft QTR71N initiated the descent from FL350 ,it caused potential conflict with the opposite aircraft ETD455 that was maintaining FL340.

2.2.6. Aids to navigation

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

2.2.7. Aerodrome

2.2.7.1.The incident happened in flight while in cruise, therefore, OTSB determined that the aero drome was not a factor to the incident.

2.3 Aircraft

2.3.1 Both aircraft ETD455 and QTR71N were issued with valid certificate of airworthiness and registration certificate, the maintenance records tech log of both aircraft didn't reveal any abnormally or deviation from the maintenance standard requirements. The Investigation concluded that aircraft maintenance is not relevant to the occurrence and was not considered a factor to this occurrence.

2.4 Human Factors

2.4.1 The OTSB investigation team conducted interview with the Air Traffic Controller (ATCO) that was on duty at the time of the incident. It was discovered that the ATCO was very busy on the day of the incident, and ATCO never had enough rest sleep the night prior to resuming duty, however this was never reported to the Supervisor on the day. ATCO's attention was taken away by lots of things that have been happening at work including working conditions that were recently changed which affected him.

2.4.2 Although the ATCO was not feeling well on the day of the incident, the ATCO did not take sick leave as he thought there will be short of staff as they didn't have stand by personnel to cover for shortage.

2.4.3 The ATCO called the call sign of aircraft ETD71N thinking that he is establishing contact with the flight crew of aircraft QTR71N, while he was actually calling the wrong call sign ETD71N, this resulted in the flight crew of aircraft QTR71N not responding to ATCO. The descend for aircraft QTR71N was delayed from the time 23:52:03 to the time 23:53:01 due to ATCO calling wrong call sign.

2.4.4 By the time ATCO issued the clearance to the flight crew of aircraft QTR71N to descend from FL350 to FL330 which is through the level of aircraft ETD455 that was maintaining FL340 on the same airway opposite direction, created a potential loss of separation between aircraft QTR71N and aircraft ETD455 as the RBL distance during the time of the clearance was 38.64NM closing rapidly and the speed of aircraft QTR71N was 541 kts – aircraft ETD455 was 414 kts.

2.4.5 At the time 23:53:45 as soon as the ATCO entered on the Indra RDR input field the cleared flight level FL330 to the aircraft QTR71N, the red MC (red medium term conflict detection) warning was immediately activated on the ATCOs radar screen display on the targets of aircraft QTR71N and aircraft ETD455 predicting that there is a conflict between the 2 aircraft.

2.4.6 Thereafter, at the time 23:53:53 since the conflict still existed and the distance between aircraft QTR71N and aircraft ETD455 was reducing rapidly, the yellow STCA (Short Term Conflict Alert) warning was also activated in conjunction with the MC warning between aircraft QTR71N on descent passing through FL348 for FL330 with a ROD 500 FPM and the opposite direction aircraft ETD455 maintaining FL340 with an RBL distance of 33.39NM.

2.4.7 During the interview, the ATCO stated that the ATCO saw the Short-Term Collision Alert (STCA) warning, however in the ATCO`s mind the ATCO thought that it's a system error and everything is fine. The ATCO was incorrect to think everything was fine while there were warnings regarding a potential loss of separation requiring his attention.

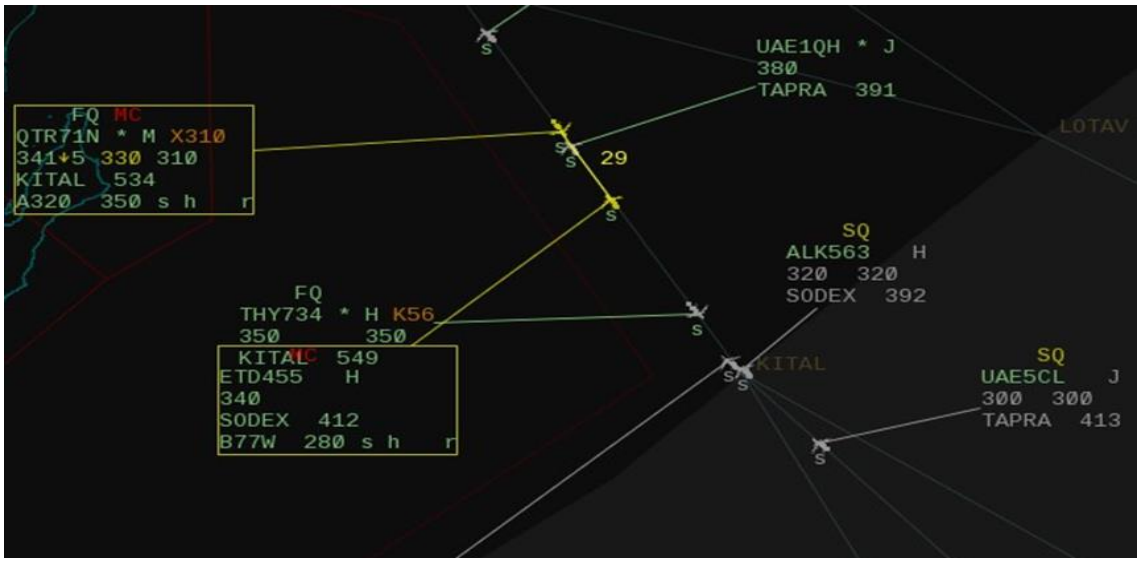

Figure 9: Aircraft QTR71N at FL341 on descent to FL330 ROD 500 FPM speed 534 knots and aircraft ETD455 maintaining FL340 speed 412 knots with a separation of 29 seconds head-on closing rapidly.

2.4.8 After the MC and STCA yellow warnings were both activated between aircraft QTR71N and aircraft ETD455, the ATCO was observed taking the following actions:

- At the time 23:54:15, it was observed on radar the ATCO using the cursor in relocating and moving the labels for both aircraft ETD455 and aircraft QTR71N without any further action.
- At the time 23:54:24 the ATCO instructed the flight crew of aircraft QTR71N to maintain FL330 when reaching FL330, which was acknowledged by the flight crew of aircraft QTR71N. At this time the Right Bearing Line (RBL) distance between aircraft QTR71N and aircraft ETD455 was 27.23NM closing.
- At the time 23:54:53 the distance between the 2 aircraft QTR71N and aircraft ETD455 reduced from 27.23 to 19.83NM and thereafter at the time 23:55:21 the distance reduced to 12. 55NM.Therefore, despite the warnings, at this stage, the ATCO did not act to resolve the conflict as the ATCO thought everything was fine.

2.4.9 During the interview, the ATCO informed the investigation team that though the Bravo Sector ATCO did shout across the ACC room regarding the conflicting traffic but the ATCO`s mind was blocked and could not see the conflict.

2.4.10 At the time 23:55:24, the flight crew of aircraft ETD455 reported to the ATCO having traffic ahead of them while aircraft QTR71N was descending through FL341, ROD=400 and aircraft ETD455 maintaining FL340 with an RBL distance of 11.58NM) The ATCO was again observed shifting the direction of the target labels for both aircraft ETD455 and aircraft QTR71N.

2.4.11 Six seconds later at the time 23:55:30 after aircraft ETD455 reported to ATCO having traffic ahead, the ATCO issued an avoiding heading to the flight crew of aircraft QTR71N to immediately turn to the right 50 degrees while the aircraft QTR71N was on descent passing through FL341 for FL330 with a rate of descent 400 FPM and aircraft ETD455 was maintaining FL340 with an RBL closing distance of 9. 41NM. The ATCO did not instruct aircraft QTR71N to expedite the descent to FL330.

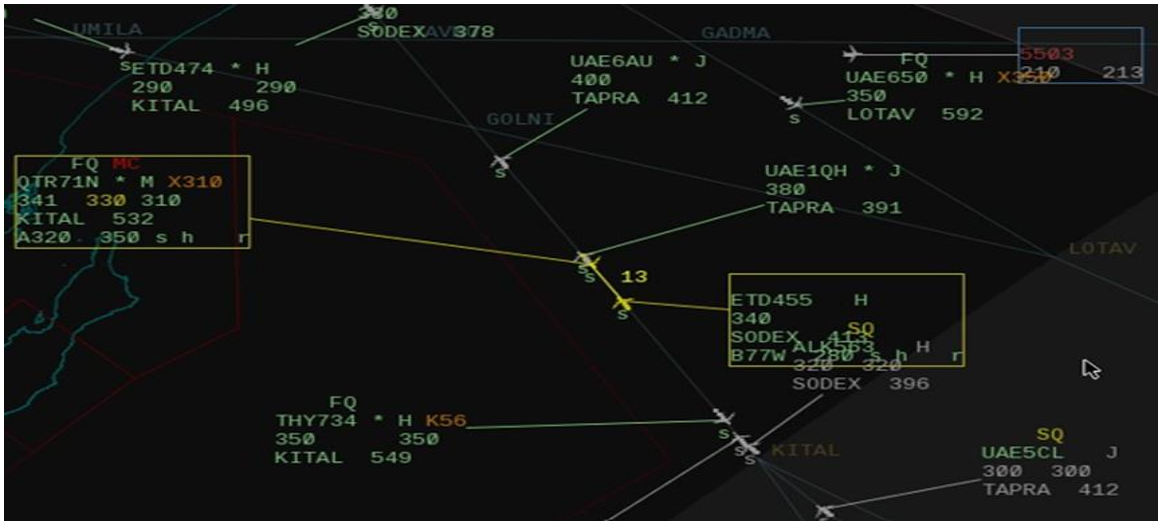

Figure10: At the time 23:55:31 aircraft QTR71N at FL341 descending to FL330 and aircraft ETD455 maintaining FL340 with a separation of 13 seconds head-on closing rapidly.

2.4.12Thereafter, at the time 23:55:35, the flight crew of aircraft QTR71N reported to the ATCO traffic RA. At the time 23:55:39, it was observed on radar both aircraft ETD455 and aircraft QTR71N were at the same level FL340 with an RBL distance of 7.38NM head-on between them.

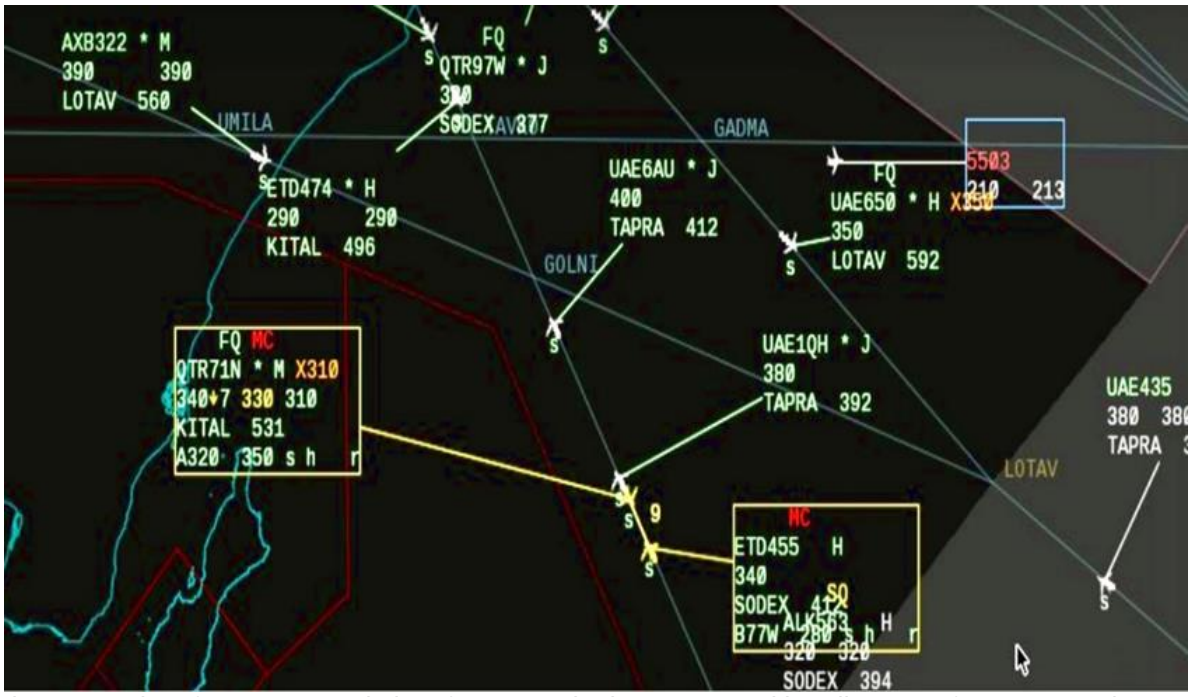

Figure 11: Aircraft QTR71N and aircraft ETD455 both at FL340, with a distance of 7.38 NM and 9 seconds head-on closing rapidly.

2.4.13 During the interview, the ATCO stated that it was seconds prior to both aircraft reporting TCAS RA, that is when the ATCO noticed that the ATCO has been wrongly interpreting the warning as the ATCO`s mind was blocked and the warning was indeed real time warning and not a false warning. The ATCO immediately at the time 23:55:41 instructed both the crew of aircraft ETD455 and aircraft QTR71N to turn 50 degrees to avoid conflict, it was at this time that both the crew reported to the ATCO that they have received TCAS RA and they followed the procedure to avoid conflict. None of the aircraft turned the 50 degrees turn that was given by the ATCO as they complied with RA.

2.4.14 At the time 23:55:41, the ATCO issued an avoiding heading to the flight crew of aircraft ETD455 to immediately turn right 50 degrees while aircraft QTR71N was descending through FL340, ROD 700 FPM and aircraft ETD455 started climbing out of FL340 passing through FL342, ROC 1200 FPM. The distance between both aircraft was 9 seconds RBL 6.36 NM head-on closing. The ATCO did not provide traffic information on the conflicting traffic to the flight crew of aircraft ETD455.

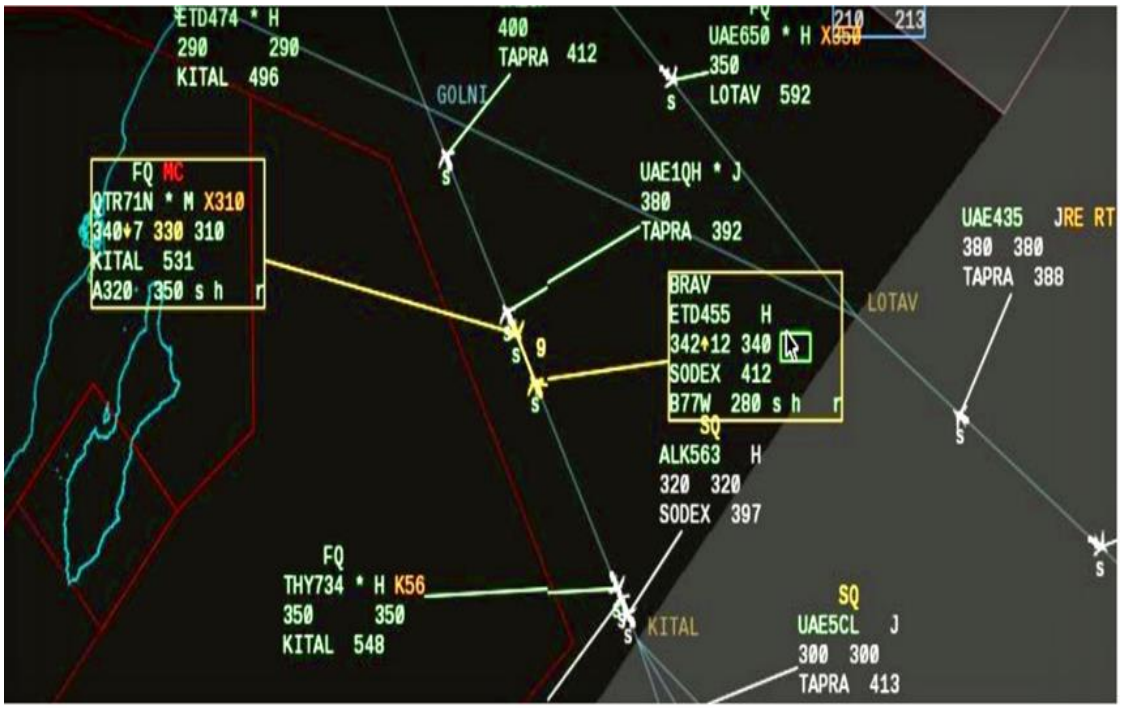

Figure 12: At the time 23:55:42 aircraft QTR71N descending through FL340 for FL330 ROD 700 FPM and aircraft ETD455 climbing thru FL342 ROC 1200 FPM

2.4.15 At the time 23:55:47, it was observed on radar, the flight crew of aircraft QTR71N increasing the rate of descend from 700 to 1200 FPM while passing through FL339 for FL330 while aircraft ETD455 was on climb passing through FL342 with a rate of climb 1400FPM with a closing RBL distance of 5.3NM between the 2 aircraft.

2.4.16 Immediately after that at the time 23:55:51 while the loss of separation was in progress, the RED STCA was activated between aircraft QTR71N while on descent passing through FL337, ROD of 1800 FPM and aircraft ETD455 climbing through FL344, ROC1900 FPM. The distance between the two aircraft was 3.22 NM. The RED STCA is a feature used to warn the ATCO that a loss of separation is in progress.

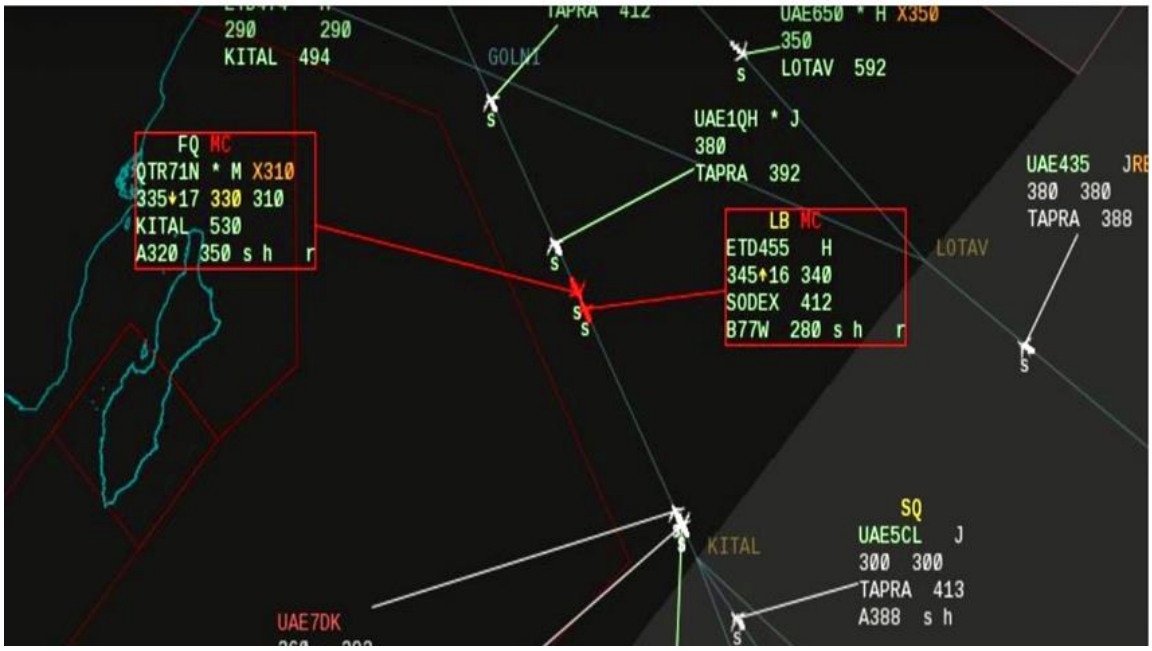

Figure 13: At the time 23:55:55 aircraft QTR71N descending through FL335, ROD1700 FPM and aircraft ETD455 climbing through FL345 ROC 1600 FPM with a distance of 2.16 NM and 5 seconds with a vertical separation of 1000ft.

2.4.17 At the time 23:56:07, once the conflict was clear and the vertical separation was achieved between both aircraft ETD455 and aircraft QTR71N the RED STCA cleared from the radar screen as aircraft QTR71N was descending through FL332 ROD 1700 FPM and aircraft ETD455 climbing through FL346 ROC 500 FPM and both aircraft have passed each other.

2.4.18 At the time 23:56:32, the flight crew of aircraft QTR71N reported to the ATCO clear of conflict and thereafter requested to maintain FL330 and the ATCO instructed the flight crew of aircraft QTR71N to maintain FL330 due to opposite direction traffic maintaining FL320 and the flight crew of aircraft QTR71N acknowledged to maintain FL330. (the conflicting aircraft was an opposite direction aircraft ALK563 maintaining FL320).

2.4.19 At the time 23:56:53, the flight crew of aircraft ETD455 reported to ATCO resuming FL340 and proceeding to their next way point GOLNI and the ATCO acknowledged.

2.4.20 At the time 23:59:30, the ATCO instructed the flight crew of aircraft QTR71N to expedite descend to FL310 but there was no response from the flight crew of aircraft QTR71N and the ATCO did not challenge the readback. At the time 23:59:42, the ATCO again called the flight crew of aircraft QTR71N and confirmed if they are descending to FL310.The flight crew of aircraft QTR71N replied (Negative sir you asked us to maintain FL330).At the time 23:59:52,the ATCO replied (I told you to descend 310 descend now 310) then the flight crew of aircraft QTR71N replied (Expedite reaching FL310 QTR71N descending now).Therefore, the ATCO confirmed with the flight crew of aircraft QTR71N if they were descending to FL310 though the flight crew of aircraft QTR71N did not readback the ATCO`s initial clearance that was given to them to descend to FL310.

2.4.21 The ATCO did not give any requirement to the flight crew of aircraft QTR71N to be levelled by the exit point KITAL neither did the ATCO coordinate with Mumbai as the accepting unit that the aircraft QTR71N will be released over exit point KITAL on descent. Therefore, the ATCO did not comply with the Letter of Agreement (LoA) between Muscat and Mumbai in coordinating with the accepting unit whenever an aircraft is on climb/descent after crossing the exit point.

2.4.22 The ATCO did inform the Supervisor regarding the loss of separation and the Supervisor arranged for another ATCO to relieve the ATCO. At the time 00:01:56 another ATCO took over control of the Middle Sector from the ATCO that had the incident. The traffic at the time of the occurrence was considered to be medium to heavy traffic on the Middle Sector airspace.

2.4.23 During the interview, the ATCO stated that the plan was to descend aircraft QTR71N earlier in order to avoid any conflict but when he contacted the crew of QTR71N there was no response. It was later discovered that, actually the ATCO thought the call sign that the ATCO called was for the flight crew of aircraft QTR71N, but the ATCO actually called aircraft ETD71N and there was no aircraft with such call sign, hence there was no response forth coming from the flight crew of aircraft QTR71N.

2.4.24 Although the warnings were visible through the radar screen display system, the ATCO couldn't notice any conflict and thought everything was still fine. It was only at the late stage when the ATCO noticed the conflict and tried to contact both aircraft which were already manoeuvring following TCAS RA instructions. Therefore, it is considered that human error (ATCO's decision to descend aircraft QTR71N from FL350 to FL330 while aircraft ETD455 was on opposite direction maintaining FL340) was the cause of the serious incident.

2.4.25 ATCO duty rosters are done by the DGAN planning department and the duty is distributed among the controllers in shifts. Daily rosters tables given to each ATCO can include morning, afternoon or night shift with designated area assigned for every ATCO for a particular controlling sector of the FIR. The ATCO first night shift started with a break at the time 20:00 to the time 21:00 UTC then was appointed on duty as acting supervisor at the time 21:00 to the time 22:00 UTC while the main Supervisor was on break then as normal ATCO North sector combined from the time 22:00 to the time 23:00 UTC. ATCO had a break for 30 minutes from the time 23:00 to the time 23:30 UTC to join duty middle sector combined at the time 23:30 to the time 01:00. He was then appointed as acting Supervisor at time 01:00 to the time03:00. It was observed on the roster that 13 controllers and 1 Supervisor attended the night shift on the 10th of February 2024.

2.4.26 The investigation concluded that, fatigue on ATCO contributed to the incident. The ATCO didn't have enough rest the night before the incident, ATCO was unable to sleep well however ATCO proceeded to go to work under the circumstances.

2.5 Survivability

2.5.1 The investigation concluded that the serious incident was survivable due to the fact that both aircraft were installed with TCAS system, as such the TCAS system was triggered in both aircraft QTR71N and aircraft ETD455 and appropriate resolution was taken by both aircraft to avoid collusion with each other. There was no fire rescue required as the aircraft were both cleared off the potential danger by following TCAS RA procedures.

3 Conclusions

3.1 General from the evidence available, 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 particular organization or individual.

3.2 Findings

3.2.1 The PIC of aircraft ETD455 was initially issued an Airline Transport Pilot license (ATPL) on the 22nd June 2011. The license was valid with an expiry date of the 24th August 2024. The license was issued by UAE GCAA.

3.2.2 The PIC of aircraft ETD455 was issued a Class (one) 1 medical certificate on the 21st November 2023 with an expiry date of 31st December 2024. The last medical assessment date was conducted on the 20th November 2023 with no limitations (VNL). The medical was issued by UAE GCAA.

3.2.3 The FO of aircraft ETD455 was initially issued with the license on the 28th September 2014 and a validation was conducted on the 31st March 2022 with an expiry date of the 18th August 2030. The license was issued by UAE GCAA.

3.2.4 The FO of aircraft ETD455 was issued a Class 1 medical certificate on the 19th June 2023 with an expiry date of the 13th December 2024. The last medical assessment date was conducted on the 16th June 2023. The medical was issued by UAE GCAA.

3.2.5 The PIC of aircraft QTR71N, license was initially issued on the 30th September 2014 with an expiry date of the 06th April 2030. The license was issued by QCAA.

3.2.6 The PIC of aircraft QTR71N was issued a Class 1 medical certificate on the 14th June 2023 with an expiry date of the 14th June 2024. The last medical assessment date was conducted on the 14th June 2023. The medical certificate had a limitations (VML) to wear corrective distant, intermediate and near vision and carry spare set spectacles. The medical was issued by QCAA.

3.2.7 The FO of aircraft QTR71N was issued with license on the 22nd January 2023 and a validation was conducted on the 17th December 2023 with an expiry date of the 31st December 2024. The license was issued by QCAA.

3.2.8 The FO of aircraft QTR71N was issued a Class 1 medical certificate on the 13th November 2023 with an expiry date of the 24th December 2024. The last medical assessment date was conducted on the 13th November 2023. The medical was issued by QCAA.

3.2.9 The flight crew of aircraft QTR71N were properly licensed to conduct the flight, their licenses were issued by the QCAA.

3.2.10 The flight crew of aircraft ETD455 were properly licensed to conduct the flight, their licenses were issued by the UAE GCAA.

3.2.11 Aircraft ETD455 was properly registered and issued with the Certificate of Airworthiness which was valid at the time of the incident, the Certificate of Airworthiness was issued by UAE GCAA.

3.2.12 Aircraft QTR71N was properly registered and issued with Certificate of Airworthiness issued by QCAA.

3.2.13 The ATCO was properly licensed to provide navigational services, the license was issued by Oman CAA.

3.2.14 ATCO held the required medical which was valid at the time of the incident, the medical was issued by Oman CAA.

3.2.15 The ATCO has been an acting Supervisor for about 7 to 8 years.

3.2.16 As soon as the ATCO issued a clearance to the flight crew of aircraft QTR71N to descend from FL350 to FL330 which is through the level of aircraft ETD455 that was maintaining FL340 on the same airway opposite direction, this created a potential loss of separation between aircraft QTR71N and aircraft ETD455 as the RBL distance during the time of the clearance was 43.44NM closing rapidly.

3.2.17 At the time 23:53:45 as the ATCO entered on the Indra RDR input field the cleared flight level FL330 to the aircraft QTR71N, the activation of the MC (red medium term conflict detection) initial warning was observed on the ATCOs radar screen display on the targets of aircraft QTR71N and aircraft ETD455 but no further action was taken by the controller.

3.2.18 Though at the time 23:55:24, the flight crew of aircraft ETD455 reported traffic ahead of them the ATCO instructed the flight crew of aircraft QTR71N to immediately turn 50 degrees right without instructing aircraft QTR71N to expedite descent and did not provide traffic information.

3.2.19 Loss of situational awareness by ATCO, when the STCA warning was displayed on radar about the conflicting aircraft, the ATCO was not aware of the eminent danger as the radar screen display changed from yellow (alert) to red (warning), while ATCO was still of the view that everything was fine and there's no problem requiring ATCO's immediate attention. ATCO thought maybe the radar screen display is giving false warning.

3.2.20 The ATCO was fatigued on the day of the incident, ATCO did not have sufficient rest prior to resuming duties on the day of the incident,

3.2.21 The flight crew of aircraft QTR71N followed the procedures following receiving TCAS RA warning, the procedures were followed to avoid potential collision with the aircraft ETD455.

3.2.22 The flight crew of aircraft ETD455 followed the procedures following the receipt of TCAS RA warning, the procedures were followed to avoid the conflict and potential collision with aircraft QTR71N.

3.2.23 The ATCO did not give the requirement to the flight crew of aircraft QTR71N to reach FL310 by point KITAL neither did the ATCO coordinate with Mumbai ATC as the accepting unit that the aircraft will be released on climb over point KITAL as per the LoA.

3.2.24 Lack of communication between ATCO and the flight crew of aircraft QTR71N, when the crew did not readback the instruction.

3.2.25 3.2.25 The ATCO erroneously called a wrong call sign (ETD71N) while trying to contact the flight crew of aircraft QTR71N.

3.3 Probable Causes

3.3.1 The ATCO instructed the crew of aircraft QTR71N to descend from FL350 to FL330, while there was opposite conflicting traffic from aircraft ETD455 which was maintaining FL 340, as a result both aircraft received TCAS RA warning, and procedures were followed to avoid potential collision of both aircraft.

3.4 Contributing Factors

3.4.1 Loss of situational awareness by ATCO, when the STCA yellow prediction alert about conflicting aircraft was displayed on the radar screen, the ATCO was not aware of the eminent danger as the STCA alert changed from yellow to red warning of a violation, while ATCO was still of the view that there is nothing wrong happening.

3.4.2The ATCO was fatigued on the day of the incident, ATCO did not have sufficient rest prior to resuming duties on the day of the incident resulting in the use of incorrect callsign to convey the descent clearance and misjudgment about the status of alerts.

4 Safety Recommendations

4.1 It is recommended to provide the ATCO with remedial training in complying with LoA requirements in coordinating aircraft that are still on climb/descent after crossing the exit point and challenging readbacks from aircraft.

4.2 It is recommended that DGAN to conduct a fatigue assessment on ATCOs to ascertain any signs of fatigue among personnel. This measure will help mitigate situations where ATCOs might be rostered for duty while experiencing fatigue.

4.3 It is recommended that DGAN to offer support to ATCOs who may be facing challenges in adapting to changes within the work environment. It was observed that the ATCO on duty during this incident was struggling with work-related issues, indicating the importance of providing assistance in such cases.

5. APPENDICES

5.1 **Appendix A**-ATC Middle Sector (MR) Transcript:

23:49:44 – ETD455: MCT radar ETD455 heavy asalam alaykum
23:49:58 – ETD455: MCT ETD455
23:50:00 – MR: ETD455 MCT control squawk 4026
23:50:06 – ETD455: Reset squawk 4026 ETD455
23:52:03 – MR: **ETD71N** descend FL330 (in correct callsign)
-MR: QTR71N MCT (no joy)
23:52:23 – MR: ETD455 identified continue as flight plan route
23:52:29 – ETD455: flight plan route ETD455
23:52:31 – Radar Observation: (QTR71N was over GOLNI)
23:53:01 – MR: QTR71N MCT
23:53:05 – QTR71N: Go ahead
-MR: QTR71N descend FL330
23:53:12 – QTR71N: Descend flight level 330 QTR71N
23:53:17 – Radar Observation: (the controller was observed using the cursor to shift the label for ETD455)
23:53:18 – QTR71N: Confirm if it's gonna be final for us QTR71N FL330
23:53:25 – MR: Negative expect 310 once clear of traffic initially descend 330
23:53:31 – QTR71N: Roger initially descend FL330 standing by for level 310 QTR71N
23:53:33 – Radar Observation: (QTR71N left FL350 on descent to FL330)
23:53:45 – Radar Observation: MC (red medium term conflict detection) warning was activated on QTR71N and ETD455)
23:53:53 – (STCA yellow (Short Term Conflict Alert) was activated between QTR71N while on descend passing through FL348, ROD 500 and ETD455 was maintaining FL340. The range bearing distance between the two aircraft was 35NM)
23:54:15 – Radar Observation: (the controller was observed relocating and moving the labels for both ETD455 and QTR71N)
23:54:24 – MR: QTR71N maintain FL330 on reaching
Radar Observation: (The distance between ETD455 and QTR71N was 27.23NM)
23:54:30 – QTR71N: Maintain 330 upon reaching QTR71N
Radar Observation: 23:54:53, the distance between ETD455 and QTR71N was 19.83NM
Radar Observation: 23:55:21, the distance between ETD455 and QTR71N reduced to 12.55NM
23:55:24 – ETD455: radar ETD455 we have traffic ahead of us
Radar Observation: QTR71N was descending through FL341, ROD400 and ETD455 maintaining FL340. Radar Observation: The distance between both traffic was 11.58NM)
23:55:25 – Radar Observation: (the controller was shifting the labels on the radar for both ETD455 and QTR71N)
23:55:30 – MR: QTR71N immediately turn to the right 50 degrees
At the same time ETD455 reported RA to the ATCO but it was stepped down
-QTR71N:QTR71N
23:55:31 – Radar Observation: (QTR71N was observed on radar halting at FL341. The separation distance between ETD455 and QTR71N was 9.41nm)
23:55:35 – QTR71N: Traffic RA QTR71N
23:55:39 – Radar Observation: (ETD455 and QTR71N both aircraft were at FL340, with a distance of 7.38nm between them)

23:55:41 – MR: ETD455 immediately to the right 50 degrees
23:55:42 – Radar Observation: (QTR71N descending through FL340, ROD700 and ETD455 climbing through FL342, ROC1200. The distance between ETD455 and QTR71N was 6.36nm)
23:55:47 – Radar Observation: (QTR71N was descending through FL339, ROD1200 and ETD455 was climbing through FL342, ROC1400-distance between ETD455 and QTR71N was 5.3nm)
23:55:48 – ETD455: To the right 50 degrees we have TCAS RA we are performing TCAS RA ETD455
MR: roger
23:55:51 – Radar Observation: (The RED STCA was activated between QTR71N descending through FL337, ROD=1800 and ETD455 climbing through FL344, ROC1900-distance between the two aircraft was 3.22nm)
23:55:55 – Radar Observation: (QTR71N was descending through FL335, ROD1700 and ETD455 climbing through FL345, ROC1600. distance between ETD455 and QTR71N was 2.16 nm)
23:56:07 – Radar Observation: (The RED STCA was deactivated between QTR71N descending through FL332, ROD1700 and ETD455 climbing through FL346, ROC500. Both aircraft crossed each other)
23:56:14 – Radar Observation: (QTR71N was descending through FL330, ROD1600 and ETD455 stopped at FL346)
23:56:21 – Radar Observation: (ETD455 descended below FL346)
23:56:32 – QTR71N: MCT QTR71N clear of conflict request maintain FL330
23:56:40 – MR: Maintain 330 QTR71N I have opposite traffic maintaining 320
23:56:47 – QTR71N: Roger QTR71N maintain level 330
23:56:50 – Radar Observation: (ETD455 reached FL340)
23:56:53 – ETD455: RDR ETD455 resuming level 340 proceeding GOLNI
23:57:00 – MR: Roger
23:58:30 – MR: QTR71N descend FL310 expedite (no joy)
23:59:42 – MR: QTR71N MCT
23:59:45 – QTR71N: Go ahead for QTR71N
23:59:46 – MR: Confirm descending 310
23:59:50 – QTR71N: Negative sir you asked us to maintain 330
23:59:52 – MR: I told you to descend 310 descend now 310 expedite reaching
23:59:57 – Radar Observation: (QTR71N was over KITAL maintaining FL330)
23:59:58 – QTR71N: Expedite reaching FL310 QTR71N descending now
00:00:13 – QTR71N: We are passing KITAL QTR71N
00:01:08 – QTR71N: MCT QTR71N
00:01:34 – Radar Observation: (QTR71N reached level 310)
00:01:52 – QTR71N: MCT QTR71N
00:01:56 – MR: QTR71N go ahead
00:01:58 – QTR71N: Maintaining flight level 310
00:02:00 – MR: QTR71N radar service terminated continue with VABB good day
00:02:03 – QTR71N: Continue with radio HF QTR71N thank you bye bye
MR: ETD455 contact 12655
ETD455:12655 ETD455 good bye