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**FINAL REPORT ON AIRPROX BETWEEN M/s SPICEJET, DH8D
(BOMBARDIER) AIRCRAFT, VT-SUL AND M/s QATAR AIRWAYS,
A320 AIRCRAFT, A7AHA IN COCHIN AIRSPACE, ON 28/08/2020**

**KUNJ LATA
INVESTIGATOR-IN-CHARGE**

**AMIT KUMAR
INVESTIGATOR**

FOREWORD

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an accident/serious incident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of the above said rules shall be separate from any judicial or administrative proceedings to apportion blame or liability.

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of various components. Consequently, the use of this report for any purpose other than for the prevention of future accidents or incidents could lead to erroneous interpretations.

ABBREVIATIONS

AAIB	Aircraft Accident Investigation Bureau
ACC	Area Control
ADC	Aerodrome Control
AA	Approach Control
FA	Approach Final
FAT	Final Approach Track
ATC	Air Traffic Controller
ATPL	Airline Transport Pilot License
CCW	Current Conflict Warning
CPL	Commercial Pilot License
DFDR	Digital Flight Data Recorder
ICAO	International Civil Aviation Organization
NM	Nautical Miles
STCA	Short Term Conflict Alert
TCAS RA	Traffic Collision Avoidance System- Resolution Advisories
TCAS TA	Traffic Collision Avoidance System- Traffic Advisories
UTC	Co-ordinated Universal Time
VHF	Very High Frequency

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FINAL REPORT ON AIRPROX BETWEEN M/s SPICEJET, DH8D (BOMBARDIER) AIRCRAFT, VT-SUL AND M/s QATAR AIRWAYS, A320 AIRCRAFT, A7AHA IN COCHIN AIRSPACE, ON 28/08/2020

1.	Aircraft Type	AIRBUS A320	DH8D
2.	Nationality	QATAR	INDIAN
3.	Registration and Call Sign	A7AHA & QTR7477	VT-SUL & SEH7077
4.	Owner	WILMINGTON TRUST SERVICES	MAPLE LEAF
5.	Operator	QATAR AIRWAYS	SPICEJET
6.	Pilot – in –Command	ATPL	ATPL
	Extent of Injuries	NONE	NONE
7.	Co-Pilot	ATPL	CPL
	Extent of Injuries	NONE	NONE
8.	Place of Serious Incident	COCHIN AIRSPACE	
9.	Co-ordinates of Serious Incident Site (Location)	6 DME ON RADIAL 101 FROM CIA VOR	
10.	Last point of Departure	DOHA	BANGALORE
11.	Intended place of Landing	COCHIN	COCHIN
12.	Date & Time of Serious Incident	28.08.2020 AT 1045 UTC	
13.	Extent of Injuries (Crew)	NONE	NONE
14.	Extent of Injuries (Passenger)	NONE	NONE
15.	Phase of Operation	DESCEND	DESCEND
16.	Type of Incident:	AIRPROX	

(ALL TIMINGS IN THIS REPORT ARE IN UTC)

SYNOPSIS

On 28/08/2020, QTR7477 (Type- A320, Registration- A7AHA) was scheduled from Doha to Cochin and SEJ7077 (Type- DH8D, Registration- VT-SUL) was scheduled from Bangalore to Cochin experienced TCAS RA while approaching Cochin.

QTR7477, while carrying out ILS 'Z' approach Runway 27 reported getting RA at time 1045 UTC. The conflicting traffic was SEJ7077 which was established on localizer Runway 27. The final approach altitude for glide path interception is 3000 ft. SEJ7077 was to be descending below the Final Approach Altitude before Glide Path interception. Thus, the controller alerted about the level. The flight crew of SEJ7077 replied as "coming back to 3000 ft". Instead of levelling at 3000 ft, SEJ7077 continued its climb upto 3624 ft and TCAS TA was triggered. It further climbed till 4000 ft due to which both involved aircraft came on reciprocal tracks and TCAS RA was triggered.

Controller discontinued the approach for both aircraft and recleared them again for ILS Approach for runway 27. SEJ7077 landed at 1108 UTC and QTR7477 landed at 1111 UTC.

The minimum separation was reduced to 2 NM laterally and 500 ft vertically.

The occurrence was classified as a "Serious Incident" in accordance with the Aircraft (Investigation of Accidents and Incidents) Rules, 2017. Vide Order INV/12011/10/2020-AAIB dated 04/09/2018, Director General, AAIB appointed Ms. Kunj Lata, Assistant Director, AAIB as Investigator – In – Charge & Sh. Amit Kumar, Safety Investigator Officer, AAIB as Investigator to investigate into the probable cause(s) of the serious incident,

1 FACTUAL INFORMATION.

1.1 History of the flight.

On 28.08.2020, a Serious Incident occurred between SEJ7077 (Type- DH8D, Registration- VT-SUL) and QTR7477 (Type- A320, Registration- A7AHA) in Cochin Airspace while both aircraft were approaching Cochin for landing.

SEJ7077 was scheduled to operate its flight from Bangalore to Cochin while QTR7477 was scheduled to operate its flight from Doha to Cochin. Both Aircraft were in the command of their respective ATPL holders.

QTR7477 was cleared for ILS Z Approach Runway 27 while SEJ7077 was cleared for ILS X Approach Runway 27.

For Runway 27 Approach at Cochin, Tactical Radar vectored approach is not permitted to intercept the localizer/Final approach track. Hence, a local procedure is followed where arriving aircraft are vectored for sequencing and then recleared to resume navigation to respective NAV Aids. After this, it completes IAL procedure.

SEJ7077 was given descent to 3000 ft and subsequently QTR7477 was given descent to 5000 ft. When SEJ7077 reached 3000 ft QTR7477 was given further descent of 4000 ft.

During descent, pilot flying of SEJ7077 missed to engage 'ALT SEL'. Thus, aircraft continued its descent. At 1045 UTC, Controller observed that SEJ7077 has descended below 3000 ft. Controller informed the aircraft and asked to maintain 3000 ft as the Final approach altitude for Runway 27 is 3000 ft. Cochin airport has high terrain in the east because of which descending below the Final approach altitude is extremely dangerous. Again it was observed by the controller that SEJ7077 has

climbed above 3000 ft. Controller promptly instructed SEJ7077 to stop climb at 3700 ft and QTR7477 to discontinue approach and climb to 6000ft. But, by this time TCAS RA had been triggered.

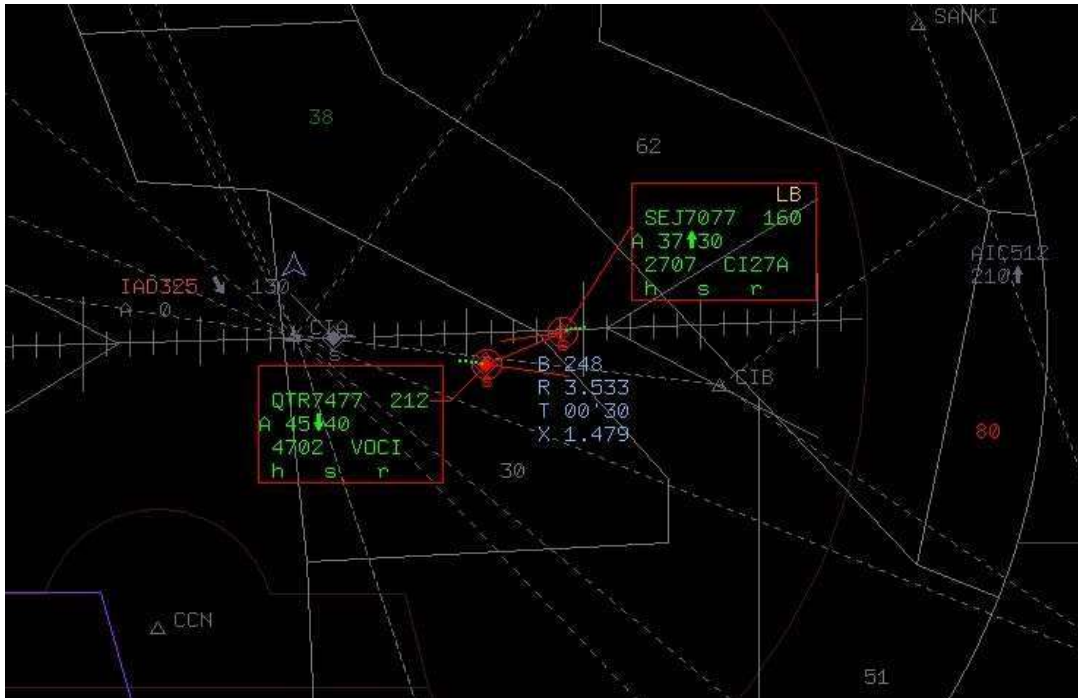


Figure: TCAS RA between OTR7477 and SEJ7077

The minimum separation was reduced to 2 NM laterally and 500 ft vertically. After TCAS RA, both aircraft were instructed to discontinue approach and were recleared again via ILS Z approach Runway 27. SEJ7077 landed at 1108 UTC and QTR7477 landed at 1111 UTC.

1.2 Injuries to Persons.

NIL

1.3 Damage to Aircraft.

NIL

1.4 Other Damage.

NIL

1.5 Personnel Information.

1.5.1 Air Traffic Controller.

Age	38
Licence Type	ATCOL
Date of Issue	15-11-2019
Validity	11-11-2041
Endorsements	AERODROME CONTROL APPROACH CONTROL PROCEDURAL APPROACH CONTROL SURVEILLANCE AREA CONTROL PROCEDURAL AREA CONTROL SURVEILLANCE
Medical done on	23-12-2017
Medical Validity	23-12-2021
Date of Last Proficiency Check	AERODROME CONTROL – 29/06/2020 AREA CONTROL PROCEDURAL – 29/06/2020 AREA CONTROL SURVEILLANCE – 29/06/2020 APPROACH CONTROL SURVEILLANCE (COMBINED WITH APPROACH CONTROL PROCEDURAL) – 04/07/2020
Fatigue factor	NIL

1.5.2 Flight Crew.

Flight crew of both aircraft held valid licenses and were qualified to operate their respective flights.

Details of Pilot-In Command of SEJ7077

Age	55 yrs
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License	ATPL
Date of Issue	05/05/2016
Valid up to	04/05/2021
Category	MULTI ENGINE
Date of Class I Med. Exam.	09/10/2019
Class I Medical Valid up to	14/10/2020
Date of issue FRTOL License	25/02/2016
FRTOL License Valid up to	24/02/2021
Endorsements as PIC	P-68 C , DHC 8 402
Total flying experience	6193.08 Hrs
Total flying experience on type	2116.23 Hrs
Last Flown on type	26/08/2020
Total flying experience during last 30 days	07.50 Hrs
Total flying experience during last 24 Hours	NIL
Rest period before flight	LAST FLOWN 26/08/2020
Whether involved in Accident/Incident earlier	NO
Date of latest Flight Checks and Ground Classes	31/07/2020

Details of Pilot-In Command of QTR7477

Date of Birth	35 yrs
License	ATPL
Date of Issue	07/03/2018
Validity	VALID
Category	ATPL (A)
Date of Class I Med. Exam.	12/01/2020

Class I Medical Valid up to	29/01/2021
Date of issue FRTOL License	07/03/2018
FRTOL License Validity	VALID
Endorsements as PIC	A320
Total flying experience	11938 Hrs
Total flying experience on type	6996:19 Hrs
Last Flown on type	LAST FLOWN ON 04/08/2020
Total flying experience during last 30 days	02:40 Hrs
Total flying experience during last 24 Hours	NIL
Rest period before flight	34:21 Hrs
Whether involved in Accident/Incident earlier	NO
Date of latest Flight Checks and Ground Classes	23/08/2020

Details of Co-Pilot of SEJ7077

Date of Birth	41 yrs
License	CPL
Date of Issue	23/02/2013
Valid up to	27/02/2023
Category	MULTI ENGINE
Date of Class I Med. Exam.	28/11/2019
Class I Medical Valid up to	08/12/2020
Date of issue FRTOL License	28/02/2013
FRTOL License Valid up to	27/02/2023
Endorsements as PIC	DA 40, DA 42, C172
Total flying experience	512.49 Hrs
Total flying experience on type	306.54 Hrs

Last Flown on type	08/08/2020
Total flying experience during last 30 days	08.30 Hrs
Total flying experience during last 24 Hours	NIL
Whether involved in Accident/Incident earlier	NO
Date of latest Flight Checks and Ground Classes	21/08/2020

Details of Co-Pilot of QTR7477

Date of Birth	24 yrs
License	ATPL
Date of Issue	29/03/2020
Validity	VALID
Category	MPL (A)
Date of Class I Med. Exam.	05/03/2020
Class I Medical Valid up to	19/03/2021
Date of issue FRTOL License	29/03/2020
FRTOL License Validity	VALID
Endorsements as PIC	NIL
Total flying experience	1124:57 Hrs
Total flying experience on type	1124:57 Hrs
Last Flown on type	27/08/2020
Total flying experience during last 30 days	13:10 Hrs
Total flying experience during last 24 Hours	09:04 Hrs
Rest period before flight	14:50 Hrs
Whether involved in Accident/Incident earlier	NO
Date of latest Flight Checks and Ground Classes	13/08/2020

1.6 Aircraft Information.

Aircraft Information of SEJ7077

Aircraft Model	DHC-8-402
Aircraft S.No.	4400
Year of Manufacturer	2012
Name of Owner	MAPLE LEAF FINANCING LIMITED
C of R	04.07.2012
C of A	30.06.2012
Category	PASSENGER
C of A Validity	UNLIMITED (INLINE WITH THE VALIDITY OF ARC)
A R C issued on	15.06.2020
ARC valid up to	17.06.2021
Maximum Takeoff weight	29257 KGS
Last major inspection	CHECK 1
List of Repairs carried out after last major inspection till date of incidence	NIL

Aircraft Details of QTR7477

Aircraft Model	AIRBUS A320
Aircraft S. No.	4110
Year of Manufacturer	11 Dec 2009
Name of Owner	WILMINGTON TRUST SERVICES
C of R	06/01/2019
C of A	01/12/2010

Category	TRANSPORT
C of A Validity	TILL REVOKED BY AUTHORITY
A R C issued on	19/11/2019
ARC valid up to	10/12/2020
Maximum Take-off weight	77000 Kg
Last major inspection	24/04/2019
List of Repairs carried out after last major inspection till date of incidence	Nil

1.7 Meteorological Information.

Meteorological information at time UTC recorded is as below:

TIME	1000	1030
Wind	280 Degree 12 kts	270 Degree 11 kts
Visibility	6000	6000
Temp	32	32
QNH	1006	1006
CLOUD	FEW020	FEW020
TREND	NO SIGNIFICANT CHANGE	NO SIGNIFICANT CHANGE

1.8 Aids to Navigation.

All Automation Systems, VHF channel and ATS surveillance system at Cochin Airport were reported to be working normal.

Frequencies of navigation aids are as below:-

Navigation Aid	Frequency
NDB (CA)	268 Khz

LLZ 27 (ICIL)	110.3 KHz
GP 27	335 MHz
DME (Co-Located with DVOR CIA)	1169/1106 MHz
DME (Co-Located with DVOR CIB)	1207/1144 MHz
DVOR (CIA)	113.5 MHz
DVOR (CIB)	117.3 Mhz

1.9 Communications.

The VHF channels were working normal. Following are the VHF channels working at Cochin Airport:-

ATC POSITIONS	FREQUENCY
ATIS	126.2 MHZ
Emergency	121.5 MHZ
Approach/ Radar	119.75 MHZ
Tower	118.8 MHZ
SMC (Ground)	121.75 MHZ

QTR7477 and SEJ7077 were in control of Cochin Approach on 119.75. Relevant portion of tape transcript is are given below:-

Tape Transcript of Cochin Approach , Frequency 119.75 MHz

TIME	TO	FROM	CONVERSATION
102933	APP	SEJ7077	COCHIN APPROACH, SEJ7077. NAMASKAR
	SEJ7077	APP	SEJ7077. RADAR. RADAR CONTACT. DESCENT TO FL140
103002	APP	SEJ7077	DESCENT TO F140. SEJ7077
103151	APP	QTR7477	COCHIN APPROACH, GOOD AFTERNOON, QTR7477. PASSING 200 DESCENDING 150. INFORMATION"E".
	QTR7477	APP	QTR7477, RADAR CONTACT. EXPECT ILS Z APPRAOCH RUNWAY 27

103211	APP	QTR7477	ILS Z APPROACH RUNWAY27, QTR7477. THANKYOU.
103225	SEJ7077	APP	SEJ7077, DESCENT TO 10,000 FT, TL FL125, QNH 1006.
	APP	SEJ7077	DESCENT TO 10,000 FT, TL FL 125, QNH 1006. SEJ7077
103252	SEJ7077	APP	SEJ7077, TRUN LEFT HEADING 195. VECTORING TO SOUTH OF CIB FOR ILS X APPRAOCH, RUNWAY27.
103310	APP	SEJ7077	LEFT HEADING 195. VECTORING FOR ILS APPROACH RUNWAY27. SEJ7077
103411	QTR7477	APP	AND COCHIN, QTR7477. ANY SPEED RESTRICTION FOR US?
	QTR7477	APP	QTR7477, NO ATC SPEED RESTRICTION. DESCENT TO 11,000FT, TL FL125, QNH 1006
103436	APP	QTR7477	SPEED.... QNH1006 DESCENT TO 11,000FT, QTR7477
103555	SEJ7077	APP	SEJ7077, DESCENT TO 9000FT.
103603	APP	SEJ7077	DESCENT9000FT. SEJ7077
103638	APP	QTR7477	QTR7477, REQUEST LOWER
	QTR7477	APP	QTR7477, DESCENT TO 7000FT
	APP	QTR7477	DESCENT 7000FT, .QTR7477
	SEJ7077	APP	SEJ7077, DESCENT TO 8000FT
103709	APP	SEJ7077	DESCENT TO 8000FT, SEJ7077
103734	SEJ7077	APP	SEJ7077, 38 MILES FROM TOUCH DOWN.
103743	APP	SEJ7077	MONITORED SEJ7077
103821	SEJ7077	APP	SEJ7077, DESCENT TO 7000,FT.
103829	APP	SEJ7077	DESCENT TO 7000FT, SEJ7077
103858	SEJ7077	QTR7477	QTR7477, APPROACHING 7000FT.
	APP	APP	QTR7477, DESCENT AND MAINTAIN 6000 FT.
103912	APP	QTR7477	DESCENT AND MAINTAIN 600OFT. QTR7477

103913	SEJ7077	APP	SPICE 7077, DESCENT TO 5100FT.
103920	APP	SEJ7077	DESCENT TO 5100FT, SEJ7077
103942	SEJ7077	APP	SEJ7077, TURN RIGHT HEADING 270.
103951	APP	SEJ7077	RIGHT HEADING 270, SEJ7077
104016	SEJ7077	APP	SEJ7077, TURN RIGHT PROCEED DIRECT CIB, RESUME OWN NAVIGATION. STANDBY FOR FURTHER DESCENT.
104026	APP	SEJ7077	TURN RIGHT, PROCEED DIRECT CIB, THEREAFTER..... SEJ7077.
104034	QTR7477	APP	QTR7477, REDUCE SPEED TO 210KTS
104038	APP	SEJ7077	REDUCE SPEED 210KTS, SEJ7077
104042	SEJ7077	APP	SEJ7077, CLEARED FOR ILS X APPROACH RUNWAY27 STA.. DESCENT AND MAINTAIN 5100FT, STANDBY FOR FURTHER DESCENT.
104054	APP	SEJ7077	CLEARED ILS X APPROACH RUNWAY27, DESCENT 5100FT, STANDBY FOR FURTHER DESCENT, SEJ7077
104101	QTR7477	APP	QTR7477, REDUCE SPEED TO 210KTS
104106	APP	QTR7477	REDUCING SPEED QTR7477 TO 185
104130	QTR7477	APP	QTR7477, SPEED 210 KTS
	APP	QTR7477	SPEED 210KTS. CAN WE REDUCE LOWER QTR7477
	SEJ7077	APP	STANDBY BREAK SEJ7077, DESCENT TO 4000FT
	APP	SEJ7077	DESCENT TO 4000FT
104158	QTR7477	APP	QTR7477, CLEARED FOR ILS Z APPROACH RUNWAY 27. STANDBY FOR FURTHER DESCENT.
	APP	QTR7477	CLEARED ILS Z RUNWAY27 AND STANDBY FOR FURTHER DESCENT. QTR7477
	QTR7477	APP	AFFIRM, EXPECT FURTHER AFTER PASSING CIA.

104217	APP	SEJ7077	SEJ7077, APPROACHING CIB. MAY WE CONTINUE FOR FINAL APPROACH FOR CONTINUE FOR LOCALISER INTERCEPT
	SEJ7077	APP	SEJ7077, CLEARED FOR ILS X APPROACH PASSING CIB CONTINUE ON TRACK 315 AND DESCENT TO 3000FT. REPORT ESTABLISHED ON LOCALIZER
SEJ7077 DID NOT ENGAGE 'ALT SEL'			
1042337	APP	SEJ7077	WILCO, SEJ7077
104325	SEJ3077	APP	SEJ7077, INCASE OF MISSED APPROACH CLIMB ON RUNWAY HEADING 2000FT
	APP	SEJ7077	INCASE OF MISSED APPROACH CLIMB ON RUNWAY HEADING TO 2000FT, SEJ7077
	QTR7477	APP	QTR7477, DESCENT TO 5000FT
	APP	QTR7477	DESCENT 5000FT, QTR7477
104506	QTR7477	APP	QTR7477, DESCENT TO 4000FT
104515	APP	QTR7477	DESCENT 4000FT QTR7477
SEJ7077 WAS OBSERVED TO HAVE DESCENDED BELOW 3000 FT			
101516	SEJ7077	APP	SEJ7077, RADAR
	APP	SEJ7077	SEJ7077. (ACKNOWLEDGE)
	SEJ7077	APP	YOU DESCENDED BELOW 3000FT, SIR, INTERCEPTION ALTITUDE IS 3000FT. YOU ARE MAINTAINING 2000FT
104530	APP	SEJ7077	APOLOGY. SIR, CLIMBING BACK TO 3000FT, SEJ7077
	SEJ7077	APP	ROGER
104558	SEJ7077	APP	DESCENT ON GLIDE
	APP	SEJ7077	AH. WILCO. SIR, SEJ7077,
	TCAS TA GOT TRIGGERED		
	QTR7477	APP	QTR7477, STOP DESCENT AT 4500FT
	QTR7477	APP	4500FT

	QTR7477	APP	AFFIRM. TRAFFIC 12 O'CLOCK ON LOCALISER 5 MILES MATINING 3000FT
	APP	QTR7477	COPIED TRAFFIC. WE HAD THEM ON TCAS AND HE IS CLIMBING.
	QTR7477	APP	ROGER
	SEJ7077	APP	SEJ7077 (CALLED)
	APP	SEJ7077	GOING AROUND SEJ7077
INSTEAD OF DISCOUNTINING APPROACH, SEJ7077 WENT AROUND			
	SEJ7077	APP	STOP CLIMB. STOP CLIMB 3700FT
	APP	SEJ7077	STOP CLIMB 3700FT, SEJ7077
	QTR7477	APP	QTR7477, CLIMB TO 6000FT
	APP	QTR7477	6000FT. QTR7477
	QTR7477	APP	QTR7477, DISCONTINUE APPROACH TURN RIGHT HEADING 180
TCAS RA GOT TRRIGERED			
	APP	QTR7477	CLIMB (RA SOUND) TCAS RA QTR7477
	QTR7477	APP	QTR7477, ROGER TURN RIGHT AH..
104628	SEJ7077	APP	SEJ7077, RADAR (CALLED)
104635	APP	SEJ7077	CLEAR OF CONFLICT NOW, SEJ7077
104643	APP	QTR7477	QTR7077, CLEAR OF CONFLICT CLIMBING TO 6000FT HEADING 100
	QTR7477	APP	SEJ. QTR7477 RADAR, ROGER
104807	SEJ7077	APP	SEJ7077, CONFIRM PROCEED TO CIA
	SEJ7077	APP	AFFIRM. ARE YOU READY FOR ILS Z APP RUNWAY 27
	APP	SEJ7077	AFFIRMATIVE

	SEJ7077	APP	SEJ7077, ROGER. CONTINUE PRESENT HEADING WILL BE VECTORED TO CIA FOR ILS Z APPROACH RUNWAY 27
	APP	SEJ7077	COPIED, SEJ7077
	SEJ7077	APP	SEJ7077, CLIMB TO 5000FT AND MAINTAIN
	APP	SEJ7077	CLIMB TO 5000FT AND MAINTAIN, SEJ7077
	QTR7477	APP	QTR7477, TURN RIGHT HEADING 270
	APP	QTR7477	RIGHT HEADING 270
	QTR7477	APP	QTR7477, WE ARE REPOSITIONING YOU FOR ILS Z APPROACH RUNWAY 27.

SEJ7077 LANDED AT 1108 UTC AND QTR7477 LANDED AT 1111 UTC

1.10 Aerodrome Information

Cochin International Airport (IATA: COK, ICAO: VOIC) is an international airport serving the city of Kochi, in the state of Kerala, India. Cochin International Airport is under a public-private partnership (PPP) model in India.

Runway orientation:

Runway 09/27 - 3400 X 45 meters

Mostly winds are as such in Cochin International Airport that Runway 27 is in use.

There are three ILS Approaches for Runway 27. They are as follows:

SL.No	Approaches	Minimum Sector Altitude
1	ILS (X) Runway 27	5900 ft less than 11 NM 10500 ft from 11 NM to 25 NM
2	ILS (Y) Runway 27	7700 up till 25 NM
3	ILS (Z) Runway 27	4100 ft less than 11 NM 6500 ft from 11 NM to 25 NM

At the time of incident, ILS (Z) Runway 27 was in use for SEJ7077.

1.11 Flight Recorders.

Flight recorder details of SEJ7077 are as follows:-

After incident, the flight crew did not reported about the RA incident (which is a reportable occurrence as per CAR Section 5 Series C Part I) to flight safety nor entered in the tech log book. Later crew operated flight SEJ7078, from Cochin to Bangalore. After landing at Bangalore, PIC reported the RA incident to Flight Safety. Therefore, relevant CVR portion of the incident flight could not be found.

Comparison of sequence of events by involved aircrafts and ATC:

The comparison is based on the data available on DFDR for both involved aircraft and ATC tape transcript.

Time (UTC)	Sequence of Events on SEJ7077	Sequence of Events on QTR7477	Actions by ATC
10:44:09	LOC active (V/S mode engaged) Alt: 2958 ft AMSL DME1: 13.38	Alt: 5750 ft	Descent instructions for QTR7477 to descent to 5000 ft and to SEJ7077 to descent to 2000 ft
10:44:53	V/S disengaged Alt: 2352 ft AMSL DME1: 11.88 Aircraft heading: H 272.5	Alt: 5022 ft Aircraft heading: H 98.4	
10:45:16	Aircraft carried out go-around Alt: 2281 ft AGL DME1: 11	Alt: 4966 ft Aircraft heading: H 98.8	Descent for QTE7477 to 4000 ft Informed SEJ7077 that they have descended below sector altitude ie. 3000 ft

10:45:20	V/S engaged Alt: 2394 ft AMSL DME1: 10.88	Alt: 4922 ft Aircraft heading: H 98.8	
10:45:27	Autopilot disconnected Alt: 2474 ft AMSL	Alt: 4806 ft Aircraft heading: H98.4	SEJ7077 made apology and informed about climbing back.
10:45:42	G/A active Alt: 2944 ft AMSL	Alt: 4662 ft Aircraft heading: 98.1	
10:45:57	TCAS TA got triggered Alt: 3624 ft AMSL Aircraft heading: H 260.8 ROC: 3390 fpm	TCAS TA got triggered Alt: 4522 ft Aircraft heading: H 98.4	Stop climb to 3700 ft instruction for SEJ7077 and Stop descent to 4500 ft instruction to QTR7477
10:46:15	TCAS RA Alt: 4000 ft AMSL Aircraft heading: 263.7 deg ROC: 2250 fpm	Alt: 4482 ft Aircraft heading: H 99.1	No instruction because of RA maneuvering
10:46:18	Aircraft starts descend after RA DESCENT Alert ROD: 210 fpm	TCAS RA got triggered Alt: 4498 ft with a CLIMB Alert	
10:46:23	TCAS TA Alt: 3958 ft AMSL ROD: 3420 fpm	Alt: 4518 Aircraft heading: H 99.5 At 10:46:26 aircraft was clear of conflict wen it was at altitude of 4714 ft on heading H 99.5	

10:46:34	No TA Alt: 3512 ft AMSL Aircraft was clear of conflict	Alt: 4890 ft Aircraft heading : H 99.1	After both aircraft were clear of conflict ATC recleared them for ILS Z approach Runway 27
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1.12 Wreckage and Impact Information.

NIL

1.13 Medical and Pathological Information.

Flight crew of both aircraft had undergone pre-flight medical (Breath Analyzer Test) before departure as per requirement of CAR Section 5, Series F, Part III. The test result was negative.

Air traffic controllers were having valid medical assessment report and were fit to perform their duties on their respected channels.

1.14 Fire.

NIL

1.15 Survival Aspects.

The serious incident was survivable.

1.16 Tests and Research.

NIL

1.17 Organizational and Management Information.

1.17.1 Airports Authority of India.

Airports Authority of India (AAI) is a PSU working under the Ministry of Civil Aviation, Government of India. It provides Communication Navigation Surveillance / Air Traffic Management (CNS/ATM) services over Indian airspace and adjoining oceanic areas.

Training of Air Traffic Controllers is done in Allahabad, Hyderabad and Gondia.

1.17.2 Qatar Airways.

Qatar Airways Company Q.C.S.C. operating as Qatar Airways, is the state-owned flag carrier of Qatar. Its headquarter is in Doha. It has a fleet of Airbus and Boeing flying domestic and internationally. It is also having executive fleet of Bombardier and Gulfstream. Its training centre is in Doha.

1.17.3 Spice Jet

M/s Spice jet Ltd. is a scheduled airline with a fleet of Boeing 737-700, Boeing 737-800, B737-900 aircraft and Bombardier Q-400 aircraft operating flights on domestic and international sectors. It's Head Quarter is located at New Delhi. The Air Operator Permit of the Airlines is valid till 16/05/2023. The Company is headed by Chief Executive Officer assisted by a team of professional of various departments. The Flight Safety Department is headed by Chief of Flight Safety approved by DGCA. The Chief of Safety is senior management official who reports directly to the CEO.

M/s Spice jet has a fully established operations training facility for the pilots. The training facility for both Boeing pilots and Bombardier Q-400 pilots is setup at Delhi. The training facilities are headed by the senior vice president operations who reports to Chairman directly. The training facility of Engineering is established at Delhi for B737 aircraft and at Hyderabad for Q-400 aircraft.

1.18 Additional Information.

1.18.1 Approach Procedure at Cochin:

Cochin Airport has Runway 09/27. Runway 27 is installed with an ILS. Runway 27 has three ILS approaches nomenclature as X, Y and Z. Due to runway and wind condition prevailing in Cochin most of the time runway 27 is in operation.

Due to Eastern hill terrain, Final approach altitude is high to intercept glide slope. Descending below final approach altitude is extremely dangerous.

At Cochin for runway 27, tactical radar vectors are not permitted, because published Radar Vector Altitude (RVA) do not allow the arriving aircraft to descent for final

approach fix or point. Thus, a local procedure is followed for arriving aircraft in which they are first vectored and then resumed to normal navigation for intercepting their respective NAV Aids.

A circular was issued in the year 2005 for aircraft approaching for ILS approach runway 27 for Cat C/D Aircraft at Cochin Airport by AAI, which states the following:-

When there is no departure between the successive arrivals:

- i. Clear the first aircraft for ILS approach descending to 3000 ft and advise the aircraft to report leaving the VOR. When aircraft reports leaving VOR calculate the estimated time of landing (approx. 10-11 min). Advise the aircraft to report when established on localizer (approx. 12 ILS DME).
- ii. Second aircraft to be held at 6000 ft over the VOR. Pass the EAT at an interval of 6 minutes from time first aircraft left the VOR.
- iii. When the first aircraft reports intercepting localizer clear the second aircraft for ILS with following restrictions.
 - a. Cross 6 DME (VOR) at 5000 ft or above.
 - b. Maintain 4000 ft until 12 DME (VOR).
- iv. In case of missed approach the aircraft shall follow the normal published procedure i.e. 2500 ft until on heading 285 degree after crossing the 2 ILS DME (west of aerodrome) and then turn right climbing 4000 ft or any other altitude as required by traffic situation.

1.18.2 Missed Approach Procedure for Runway 27:

As per published ILS X approach RUNWAY 27:

After Go-Around runway 27, climb straight ahead until 2D (ILS DME) past threshold then turn RIGHT heading 285 degree M climbing passing 2500 ft. then climbing turn RIGHT on track 117 degree M (R 297) to VOR (117.3 CIB) to join holding at 4500 ft or as instructed by ATC.

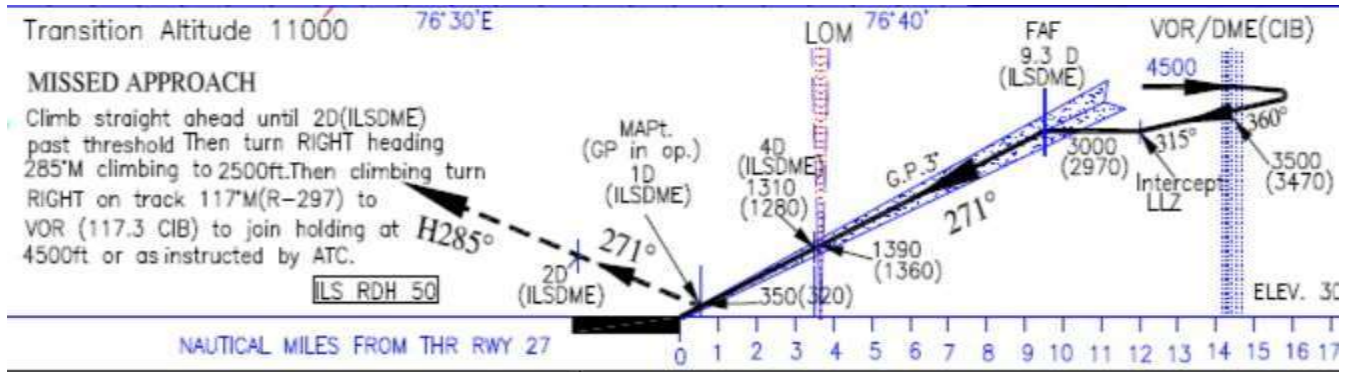


Figure: Showing missed approach path and descend gradient of ILS 'X' approach Runway 27

As per published ILS Z Approach RUNWAY 27:

After Go-Around runway 27, climb straight ahead until 2D (ILS DME) past threshold turn RIGHT heading 285 degree M climbing to 2500 ft. Then climbing turn RIGHT to join VOR holding at 4000 ft or as instructed by ATC.

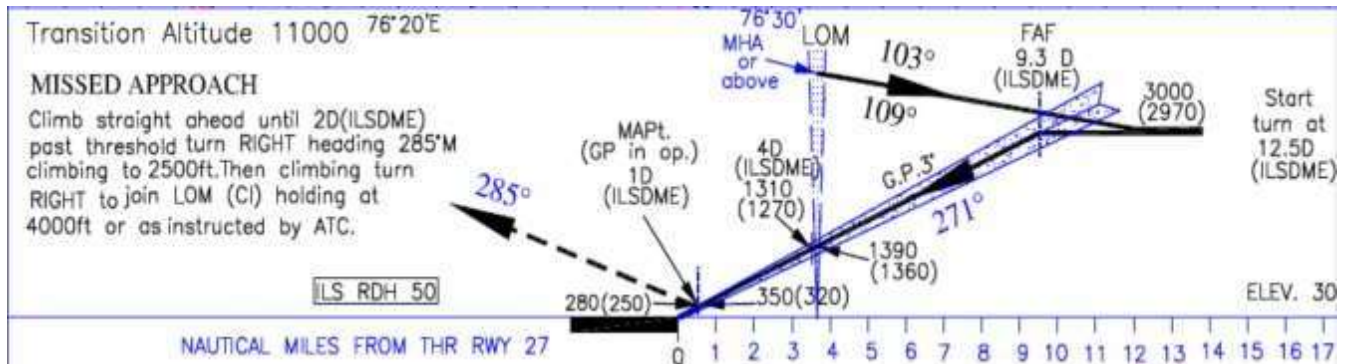


Figure: Showing missed approach path and descend gradient of ILS 'Z' approach Runway 27

An aircraft requires 11 min to make an approach for landing which is too high. As the traffic is increasing day by day.

NOTE: From 1.18.1 and 1.18.2, it is to be noted that the arriving Final approach track and missed approach paths crosses each other.

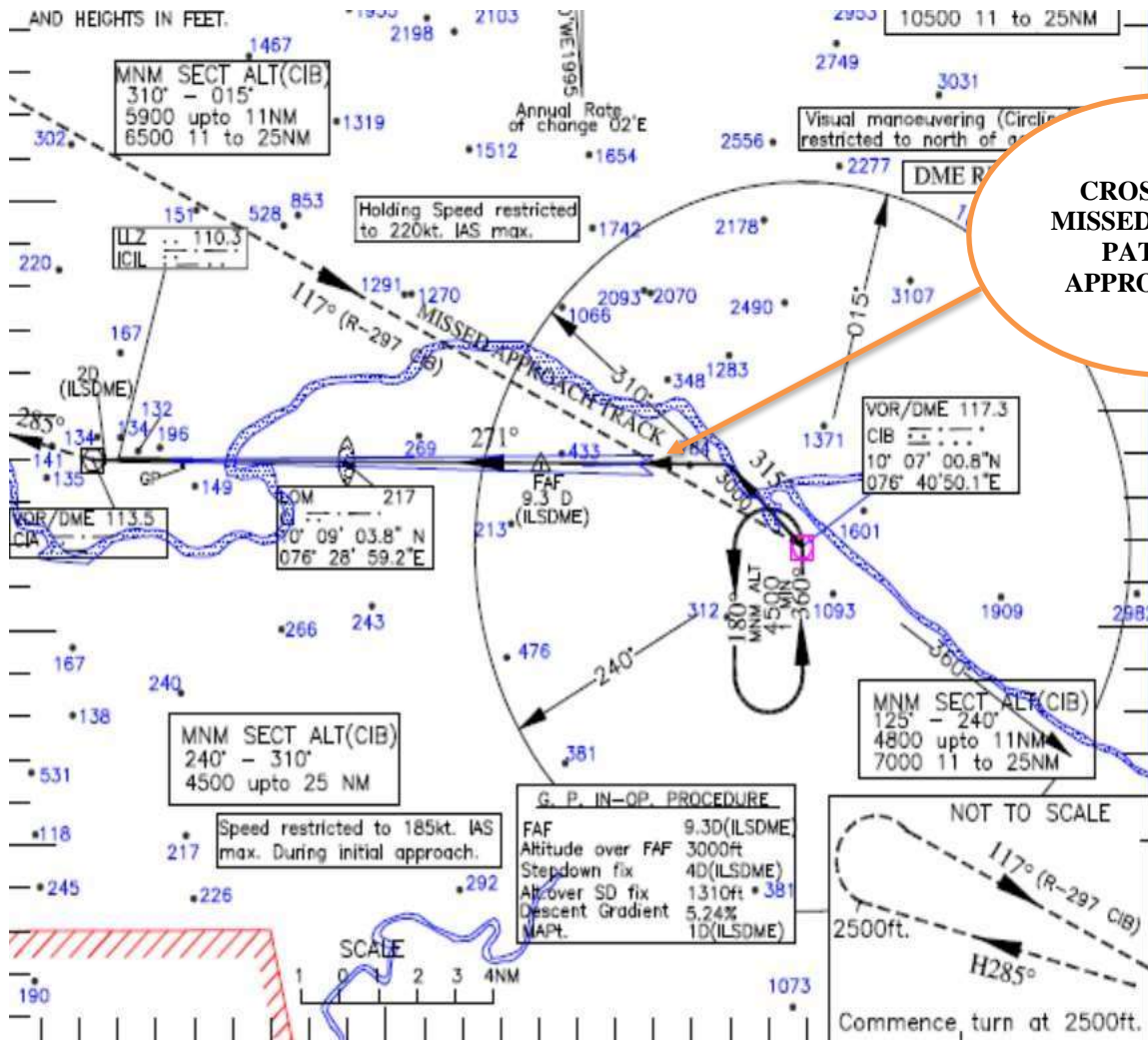


Figure : Showing crossing tracks

Runway 27 is the runway in use for most of the time due to wind pattern at Cochin. Due to high Radar vectoring altitude or descent profile, tactical vectoring is not approved. Max number of arrivals carryout ILS Z approach Runway 27 from CIA VOR and almost all of the departure takes right turn to join their respective routes. This forms a hotspot to the North West of CIA VOR within 15NM.

Due to crossing paths of arrival and departure to North West of CIA VOR, departures normally be given level of 4000 or 5000 feet and the arrivals are forced to leave VOR at or above 6000 feet. Because of this controllers have to be more cautious.

In this situation if the pilot is new they may get confused with the simultaneous clearances for the approach and instruction to maintain at higher level. Which is a not a standard practice.

The time taken for ILS Z approach Runway 27 from leaving VOR till touch down is 11 min. at Cochin successive approach are being practised so that 9 NM spacing is achieved. Due to crossing paths inter arrival spacing cannot be reduced even if there is no departure in between. Thus, utility of the runway is reduced. Also arrival and departures have to travel extra miles and on low level which leads to more fuel consumption.

Due to lower level clearances, crossing tracks and western ghat the situation becomes worse when there are deviation or go arounds.

1.18.3 Traffic Collision Avoidance System (TCAS)

Traffic Collision Avoidance System or Traffic Alert and Collision Avoidance System is abbreviated as TCAS. It is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder (Mode-S Transponder). This system is independent of the Aircraft Navigation, Flight Management Systems, and Air Traffic Control (ATC) ground system. It warns pilots of the presence of other transponder-equipped aircraft in its proximity, which may present a threat of mid-air collision.

Generally TCAS system issues the following types of aural warning/advisory:-

- Traffic advisory (TA)
- Resolution advisory (RA)

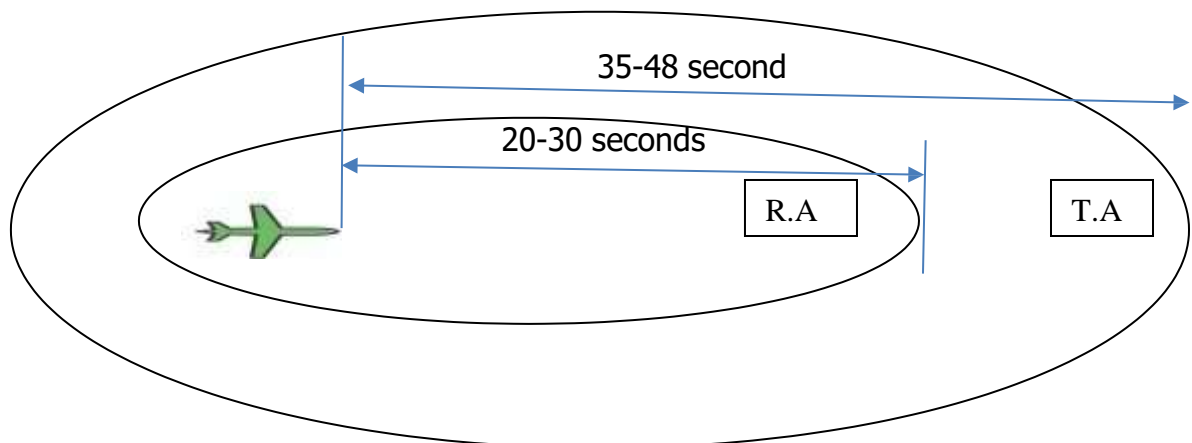


Figure: Symbolic representation of TCAS system

Traffic Advisory (TA): When any aircraft equipped with TCAS or Mode-S transponder comes in aircraft's pre-defined range, then the system simultaneously generates an aural alert and a visual alert on its display unit called Traffic Advisory. It alerts the pilot and keeps him informed of the present traffic situation.

Resolution Advisory (RA): When another aircraft equipped with TCAS or Mode-S transponder in aircraft close proximity, which is going to present a mid-air collision threat then the system simultaneously generates a visual alert on its display unit and an aural vertical manoeuvring command, till the aircraft comes out of the conflict. When an RA is issued, pilots are expected to respond immediately to the RA unless doing so would jeopardize the safe operation of the flight. R.A manoeuvres have priority over ATC instruction. This means that aircraft will at times have to manoeuvre contrary to ATC instructions or disregard ATC instructions.

1.18.4 Radar Vectored Approach

Vectoring is used to separate aircrafts by a specified distance, to aid the navigation of flights and to guide arriving aircraft to a position from which they can continue their final approach to land under the guidance of an approach procedure as published by the states.

It is useful technique for both pilot and ATC as the paths of arrivals, departures and missed approach paths are separated so that no path is crossing or hampering the operations of other. A vector given contains magnitude and direction in order to achieve desired path.

1.18.5 Altitude Selection Mode

In an Altitude Selection Mode, aircraft captures the level selected by flight crew and adjust its rate of climb or descent to level the assigned level.

As per Reference Airplane Operating Manual, Chapter 6 Airplane System-Altitude selection Mode of M/s SpiceJet:

In the Altitude Select Mode, the FD commands to acquire and hold a Selected Altitude target. The Altitude Select mode consists of the following sub modes:-

- Altitude Select Arm
- Altitude Capture

The flight crew uses the Altitude Select mode operationally as follows:-

- Preselect an altitude target using the FGCP ALT knob.
- Press the ALT SEL pushbutton on the FGCP to arm the mode
- Manoeuvre the aircraft towards the preselected altitude target. This may be performed using a different FD vertical mode.

This automatically arms the Altitude Select mode. When the aircraft baro corrected altitude approaches the Selected Altitude target, the FD automatically transitions to the Altitude Capture mode and begins to return the aircraft to level flight. When the Selected Altitude target has been captured, the FD automatically transitions to the Altitude Hold mode and maintains the Selected Altitude.

The Flight Data Processing System (FDPS) activates a visual and aural altitude alert whenever the aircraft closes to within ± 1000 ft of the selected altitude. When the aircraft is at “1000’ to go” to the selected altitude, the altitude analog bug changes colour from normal cyan to yellow. The aural alert sounds for one second while the visual alert remains present until the aircraft is within ± 230 ft of the selected altitude whereupon it will go out.

1.19 Useful or Effective Investigation Techniques.

NIL

2. ANALYSIS.

On 28/08/2020 at 1045 UTC, serious incident of TCAS RA occurred in Cochin Airspace between M/s Qatar Airways, QTR7477 and M/s Spicejet, SEJ7077 while both were approaching Cochin for landing.

On the day of incident QTR7477 (Type- A320 , Registration- A&AHA) was scheduled to operate its flight from Doha to Cochin and SEJ7077 (Type- DH8D, Registration- VT-SUL) was scheduled to operate its flight from Bangalore to Cochin.

Cochin has a runway orientation of 09/27. Due to wind condition at Cochin, mostly Runway 27 is in use. Runway 27 has three published approaches X, Y and Z. ILS 'Z' approach is the lengthiest approach, it take 11 min to complete the approach. Due to high terrain in East, the final approach altitude is 3000 ft and descending below this level is dangerous. For Runway 27 tactical vectoring is not approved due to high radar vector altitudes which further increases the delay as spacing between the successive arrivals, arrival departure and departures can't be reduced.

Due to Runway orientation and tracks of Arrivals and Departures, traffic is formed in North West of CIA VOR within 15 NM. Also, due to crossing tracks of arrivals and departures to north West of CIA VOR, departures have to maintain lower level for longer duration before enough separation is achieved. At this point, controller has to be extra cautious and in peak hours it is more difficult.

At 1029 UTC, SEJ7077 came in contact with Cochin Approach. Controller identified the aircraft and gave a descent to FL140. QTR7477 came in contact with Approach Controller at 1032 UTC, after identification controller informed that QTR7477 expects ILS 'Z' approach Runway 27. At this time, QTR7477 was descending for FL150. At 1033 UTC ,SEJ7077 was also informed that they expect ILS 'X' approach Runway 27.

At 1037 UTC, SEJ7077 was 38 miles to touchdown. At 1039 UTC, QTR7477 was given descent to 6000 ft and SEJ7077 to 5100 ft. At 1040 UTC, SEJ7077 was cleared for ILS X approach Runway 27 with an instruction to maintain 5100 ft and further descent to 4000 ft at 1041 UTC, This instruction was readback correctly by crew. At 1041 UTC, QTR7477 was also cleared for ILS Z approach Runway 27 with an instruction to stand by for further descent. This instruction was readback correctly by QTR7477.

At 1042 UTC, SEJ7077 was given descent to 3000 ft and asked to report when established on localizer. As per the local procedure, SEJ7077 was also given instruction

if go-around is initiated as “*SEJ7077, in case of missed approach climb on runway heading 2000 ft*”. All these instructions were readback correctly. Simultaneously, QTR7477 was asked to descent to 5000 ft. and further descent of 4000 ft was given to QTR7477 at 10:45:06 UTC.

During descent to 3000 ft, pilot flying of SEJ7077 missed to engage ‘ALT SEL’ and the same was not corrected by pilot monitoring also which resulted in continued descent of SEJ7077 below 3000 ft. SEJ7077 was not on glide and the minimum altitude to intercept localizer is 3000 ft. Radar Controller monitored it and informed SEJ7077 that they have descended below 3000 ft (SEJ7077 continued it’s descent to 2400 ft at that time it was 12 NM to touchdown) to which SEJ7077 make an apology and reported climbing back to 3000 ft.

Since, it was immediate traffic to QTR7477 which was descending to 4000 ft, controller asked QTR7477 to stop descent at 4500 ft. Instead of discontinuing approach, SEJ7077 initiated a go-around at 2281 ft. The power was increased and the aircraft started climbing. Due to the crossing tracks of arrivals on Runway 27 and missed approach path, the aircraft came reciprocal to each other and separation got breached. As per the instructions, SEJ7077 in case of go-around should have climbed to 2000 ft on runway heading but instead of levelling at 2000 ft, SEJ7077 continued climb to 3624 ft when TCAS TA got triggered. The traffic information of SEJ7077 was passed to QTR7477.

At 10:45:38 UTC, controller observed that SEJ7077 is climbing above 3000 ft and passing 3500 ft, controller immediately instructed SEJ7077 to stop climb 3700 ft and instructed QTR7477 to climb to 6000 ft on heading H180.

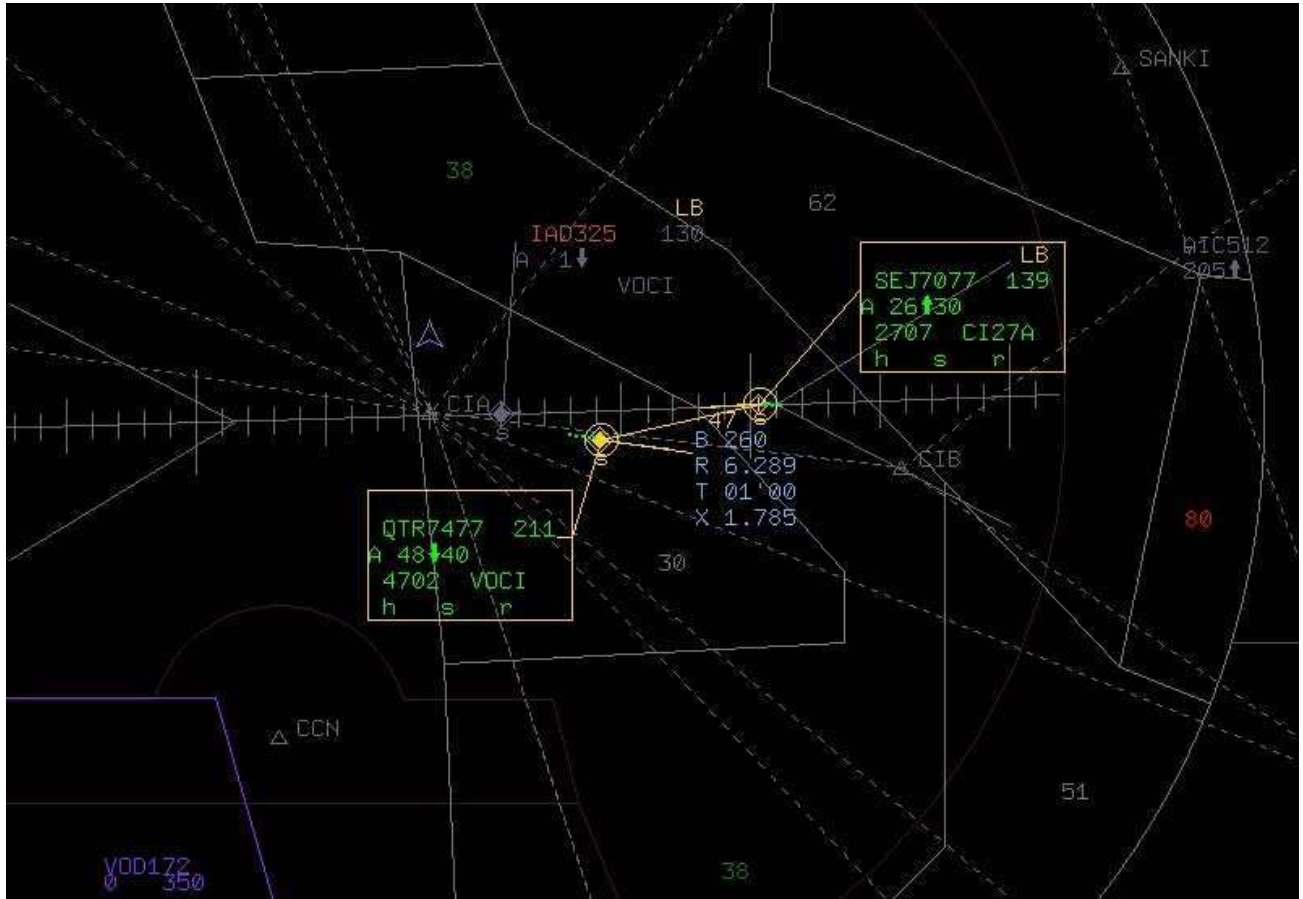


Figure: Showing Breach of Separation (TCAS TA)

TCAS RA got activated at 10:45:45 UTC, when SEJ7077 was at 4000 ft and QTR7477 was at 4498 ft. SEJ7077 followed RA instruction and descended. At 3512 ft, TCAS TA and RA got deactivated and the aircraft reported clear of conflict at 10:46:35 UTC. QTR7477 reported clear of conflict at 10:46:43 UTC.

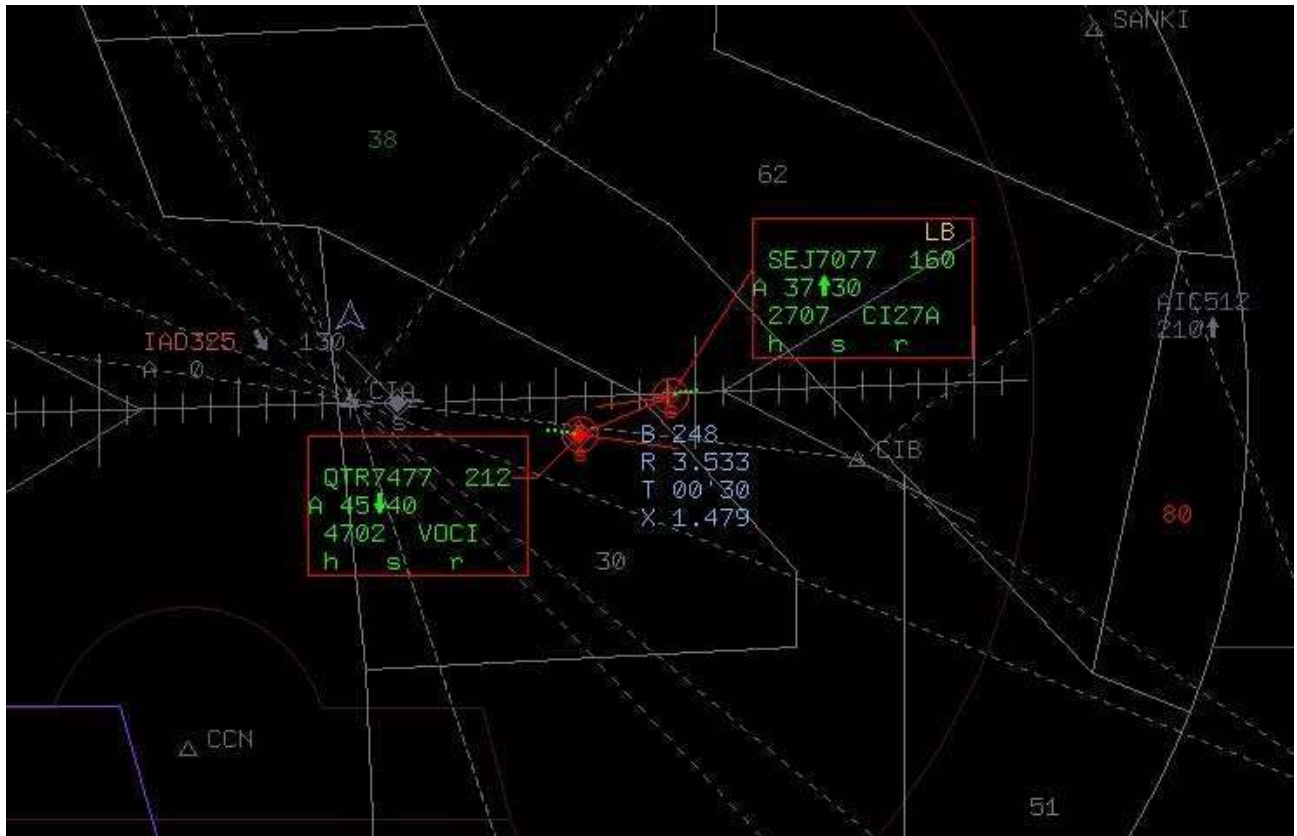


Figure: Showing Breach of Separation (TCAS RA)

The minimum separation was reduced to 2.39 NM laterally and 500 ft vertically. After both aircraft were clear of conflict, controller recleared both aircraft to ILS Z approach Runway 27. SEJ7077 landed at 1108 UTC and QTR7477 landed at 1111 UTC.

After landing, Flight crew of SEJ7077 did not report RA incident nor made a log entry of this incident which is a reportable incident as per DGCA CAR Section 5 Series C Part I.

Spicejet crew operated return flight to Bangalore and informed Flight safety. By that time, relevant CVR data got erased.

3. CONCLUSIONS.

3.1 Findings.

- i. Flight crews of both aircraft were having a valid license to operate their respective flights.
- ii. Air Traffic Controller was rated to perform his duty on Radar.

- iii. No abnormality was reported on both involved aircraft.
- iv. ILS is installed on Runway 27. X, Y and Z type of approaches are published by AAI for Runway 27.
 - v. Due to wind condition, Runway 27 is normally 'Runway In Use'.
- vi. Both flights were approaching to Cochin Airport for landing. QTR7477 was cleared for ILS 'Z' Approach Runway 27 and SEJ7077 was cleared for ILS 'X' Approach Runway 27.
- vii. Cochin Airport has high terrain in it's East, because of which the Vectoring Altitude is high (3000 ft).
- viii. For Runway 27, Tactical Radar Vectors to intercept the Localizer/Final Approach Track is not permitted. Since, the published Radar Vector Altitude does not allow the aircraft to descent to reach the Final Approach Fix at the Final Approach Altitude, hence, a local practice is being used in which the arrivals are vectored for sequencing and are cleared to resume it navigation to their Nav Aids.
- ix. In between all the published approaches, ILS'Z' approach takes maximum time of 11 minutes.
 - x. Due to Runway orientation and tracks of Arrivals and Departures, traffic is formed in North West of CIA VOR within 15 NM.
 - xi. Due to crossing tracks of arrivals and departures to north West of CIA VOR, departures have to maintain lower level for longer duration before enough separation is achieved.
- xii. A local procedure is made at Cochin to streamline the flow of arrivals and departures.
- xiii. When the first aircraft which is approaching for ILS approach Runway 27 is descending to 3000 ft reports leaving VOR at Cochin then, it is cleared for establishing for Localizer.
- xiv. When first aircraft reports leaving VOR then, the second aircraft is aligned after 6 minutes. It has to maintain 4000 ft until 12 DME (VOR).

- xv. In case of missed approach,, the aircraft shall follow the normal published procedure i.e. 2500 ft until on heading 285 degree after crossing the 2 ILS DME (west of aerodrome) and then turn right climbing 4000 ft or any other altitude as required by traffic situation. In this case the cleared level was 2000 ft instead of 2500 ft.
- xvi. When SEJ7077 was cleared for ILS 'X' Approach , missed approach procedure was passed. SEJ7077 readback the instruction correctly.
- xvii. When SEJ7077 was at localizer and descending to 3000 ft (Final approach Altitude), QTR7477 was given a descent of 4000 ft.
- xviii. Controller observed SEJ7077 descending below 3000 ft and informed the flight crew to which crew reported climbing back.
- xix. Flight did not engage 'ALT SEL' due to which aircraft continued to descend below 3000 ft.
- xx. Instead of discontinuing approach, a Go-Around was initiated at 2281 ft.
- xxi. Due to increase in power, aircraft climbed above the desired level.
- xxii. On SEJ7077, TCAS TA got activated at 3624 ft.
- xxiii. Controller asked QTR7477 to stop descent at 4500 ft to avoid the conflict.
- xxiv. Controller asked SEJ7077 to stop climb at 3700 ft but it continued to climb and TCAS RA got triggered at 4000 ft and instructed QTR7477 to climb to 6000 ft.
- xxv. Due to crossing track of approach path and missed approach path, aircraft came opposite to each other.
- xxvi. On Radar display violation was observed at 10:45:45 UTC.
- xxvii. Minimum lateral separation was 2.39 NM and vertical separation was 500 ft between SEJ7077 and QTR7477.
- xxviii. At 10:46:35 UTC, SEJ7077 reported clear of conflict and at 10:46:43 UTC, QTR7477 reported clear of conflict.
- xxix. 'Climb Climb' command was generated on QTR7477 and 'Descent Descent' was generated on SEJ7077.
- xxx. Both Aircraft followed RA manoeuvring.

- xxxi. After clear of conflict, SEJ7077 was recleared for ILS 'Z' approach Runway 27.
- xxxii. SEJ7077 landed at 1108 UTC and QTR7477 AT 1111 UTC.
- xxxiii. Flight crew of SEJ7077 did not follow DGCA CAR Section 5 Series C Part I. Loss of standard separation is a reportable occurrence but crew did not report the incident and even did not enter in the tech log. Thus, crew violated the regulation.
- xxxiv. As no information of incident was passed by the crew, next flight was also performed which resulted in non-availability of CVR data.

3.2 Probable Cause of the Incident.

Non adherence to ATC instructions by the crew of SEJ7077.

Contributory factor.

During descent to 3000 ft , pilot flying did not engage 'ALT SEL' and the same was not monitored by Pilot monitoring also.

4.0 Safety Recommendations.

- i. M/s SpiceJet may impart suitable training to flight crew of SEJ7077.
- ii. M/s SpiceJet may brief its Crew about actions to be taken on reportable occurrences as per DGCA CAR Section 5 Series C Part I.
- iii. AAI may reassess the traffic emerging at Cochin and formulate suitable Radar Vectors for approaches and departures at Cochin to avoid further such incidents.



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