



सत्यमेव जयते

**DRAFT FINAL REPORT ON SERIOUS  
INCIDENT (AIRPROX) BETWEEN  
BOEING 787-800 AIRCRAFT VT-AND &  
AIRCRAFT VT-ANI AT DELHI ON  
10.11.2016**

**AIRCRAFT ACCIDENT INVESTIGATION BUREAU**

## **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 2012, the sole objective of the investigation of a serious incident shall be the prevention of serious incidents and not apportion blame or liability.*

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

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**Final Report on Serious Incident (Airprox) between Boeing 787-800  
aircraft VT-AND & aircraft VT-ANI at Delhi on 10.11.2016.**

- 1. Aircraft**
  - Type** : Boeing 787-800 (Both)
  - Nationality** : Indian
  - Registration** : VT-ANI & VT-AND
- 2. Owner/ Operator** : Air India Ltd.
- 3. Pilot – in –Command** : ATPL Holders
  - Extent of injuries** : Nil
- 4. First Officer** : ATPL Holders
  - Extent of injuries** : Nil
- 5. Place of Incident** : Delhi ACC
- 6. Date & Time of Incident** : 10<sup>th</sup> November 2016, 0402UTC
- 7. Last point of Departure** : Vienna (VT-ANI) and Paris (VT-AND)
- 8. Point of intended landing** : Delhi for both VT-ANI & VT-AND
- 9. Type of operation** : Schedule Operation
- 10. Phase of operation** : During descent
- 11. Type of Occurrence** : Air Proximity

(ALL TIMINGS IN THE REPORT ARE IN UTC)

## **SYNOPSIS**

On 10.11.2016, Air India Ltd. Boeing 787-800 aircraft VT-ANI was operating flight AIC154 from Vienna to Delhi and another Boeing 787-800 aircraft VT-AND was operating flight AIC 142 from Paris to Delhi. Both these aircraft were between waypoint SAM and DP424 on arrival route SAM6F. The aircraft VT-AND (AIC142) was maintaining FL 250 (Flight Level) and was 2 NM ahead of the aircraft VT-ANI (AIC154) which was maintaining FL230. VT-AND was given descent to FL 210. Later VT-ANI was given descent from FL230 to FL210 and subsequently from FL210 to FL190. The last transmission of descent i.e. descent from FL 210 to FL 190 was not read back by the aircraft VT-ANI and it maintained FL210. The aircraft VT-AND continued its descent to FL210 and both the aircraft received Traffic Advisory (TA) which was immediately followed by Resolution Advisory (RA) from their respective Traffic Alert and Collision Avoidance Systems (TCAS). Both the flight crew took evasive actions as per TCAS advisory.

Investigation has revealed that the required standard vertical and lateral (radar) separation got reduced to 700 feet and 0 NM (Nautical Mile), respectively. At one point, momentarily AIC154 Mode C displayed FL217 while AIC142 Mode C also showed FL217. At that moment, the Radar Position Symbols (RPS) of both the flights were overlapping.

As per radar data, vertical separation was re-established when AIC154 was observed descending (passing FL183) and AIC142 was climbing (passing FL221).

Ministry of Civil Aviation appointed Committee of Inquiry vide order number AV-15013/12/2016-DG, to investigate the cause of the Serious Incident under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012. Corrigendum was issued vide Ministry of Civil Aviation order no AV-15013/12/2016-DG with changes in composition of Committee of Inquiry on 24.06.2019.

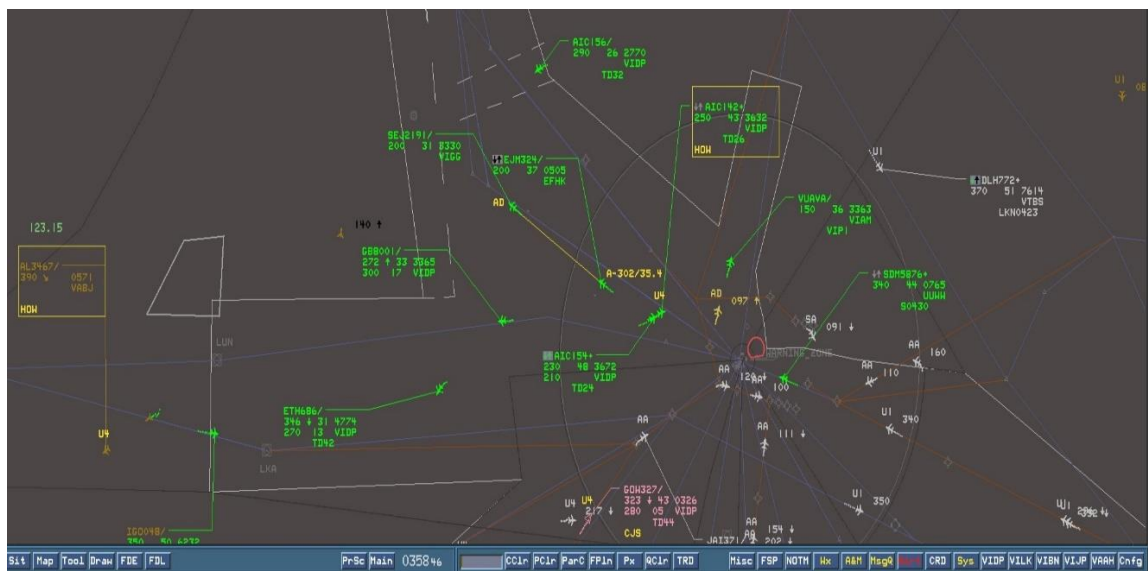
# 1. FACTUAL INFORMATION

## 1.1 History of the flight

On 10.11.2016, the aircraft VT-AND was scheduled to operate flight AIC142 from Paris to Delhi and the aircraft VT-ANI was operating flight AIC 154 from Vienna to Delhi. The aircraft VT-AND came in contact with ACC - West (Area Control Centre - West) on frequency 124.55 Hz at 035014 UTC and the aircraft VT-ANI came in contact at 035358 UTC. There was one more aircraft of the operator, operating flight AIC156 on the same route and was also in contact with ACC – West.

At that time four sectors were operational in Delhi ACC i.e. ACC-East, ACC-West, ACC-South and ACC-South East. During that time the traffic density was high and the ACC-West radar controller was handling 18 aircraft.

AIC154 (Vienna to Delhi) & AIC142 (Paris to Delhi) were initially spaced 9 minutes apart at the time of entering Delhi FIR (Flight Information Region). AIC154 (ahead) was asked by RSR (Route Surveillance Radar) West controller to make one orbit approximately 50 NM east of waypoint LKA altering the spacing between them to the extent that AIC142 became 2 NM ahead of AIC154. ACC (West) Radar controller initially cleared both the aircraft via arrival route AKBAN2A for runway 29 but due to traffic congestion in the adjacent ACC (South) both the aircraft were cleared direct to waypoint SAM VOR for SAM6F RNAV arrival.



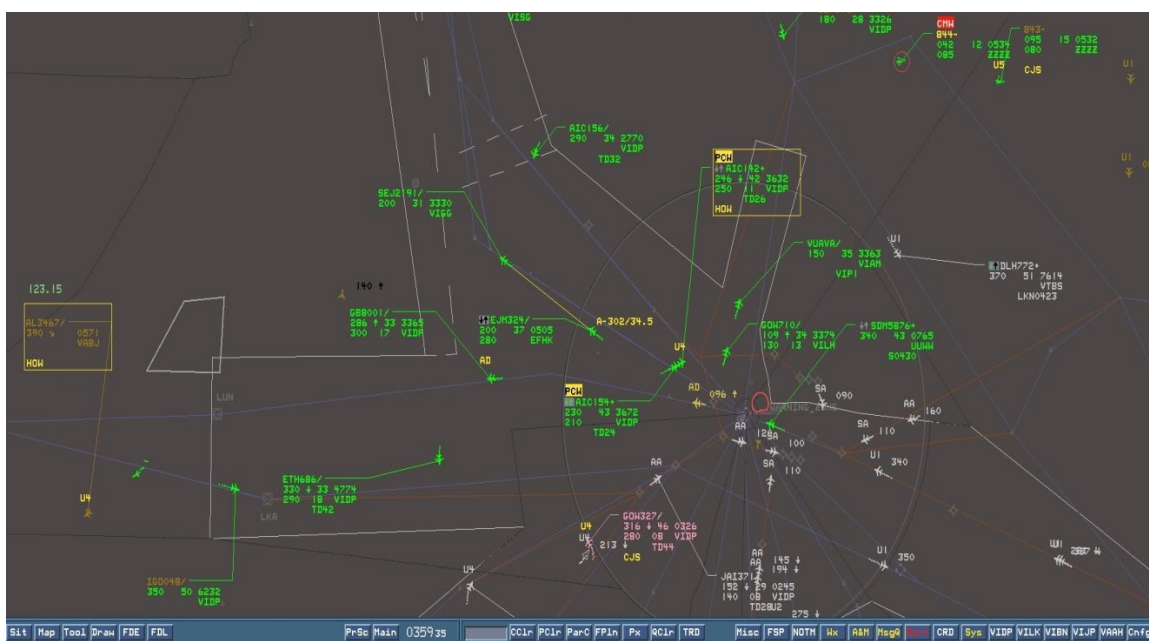
**Radar Snap Shot at 035846 UTC**

AIC154 and AIC142 were given descent to FL230 and FL250, respectively. At time 035835 UTC, AIC156 was given descend FL210. However, in the label the controller filled the cleared level for AIC154.

At time 035855 UTC, AIC142 was given descend to FL210. The CFL (Cleared Flight Level) was not filled (In the data block) for AIC142. The transmission was not acknowledged by AIC142. (However, there was a blocked transmission/ garbled noise). Between 035933 UTC and 040020 UTC, PCW (Predicted Conflict Warning) was generated between AIC154 and AIC142, which was probably not acknowledged by the RSR Controller. At that time,

- ✚ AIC142 was descending passing FL246 with a descend rate of 1100' / minute & ground speed of 420 knots.
- ✚ AIC154 was maintaining FL230 with a ground speed of 430 knots.

At time 035942 UTC, AIC154 was asked to descend to FL210 and the instruction was acknowledged by AIC154. At time 040035 UTC, AIC154 was further cleared to FL190 (CFL was entered in the data block) however, this transmission was not acknowledged by the aircraft and it descended to FL210 which it maintained. However, AIC142 which was given descend to FL210, continued its descent.



**Radar Snap Shot at 035935 UTC (Predicted Conflict Warning)**

At 040116 UTC, AIC154 was changed over to Approach Arrival (APAC). At 040138 UTC, APAC controller gave AIC154 to descent to FL110. At 040142 UTC, CCW (Current Conflict Warning) was generated in respect of AIC142 & AIC154, while AIC142 was descending passing FL220, the controller instructed it to maintain FL220. The CCW warning lasted till 040219 UTC. At 040230 UTC, AIC154 came in contact with ACC-West and informed that it is descending to FL110 and also informed that it received RA. Subsequently, AIC142 also informed that it has also received RA.



**Radar Snap Shot at 040209 UTC (Current Conflict Warning)**

At 040250 UTC, standard separation was established when AIC154 was descending (passing FL183) and AIC142 was climbing (passing FL221).

**1.2 Injuries to persons**

There was no injury to any of the occupant on board any of the aircraft.

**1.3 Damage to aircraft**

Nil

**1.4 Other damage**

Nil



### 1.5 Personnel information

Both the flights were operated by scheduled airlines and all the flight crew were appropriately qualified & licensed as per the existing regulations for operating the flight.

The Air Traffic Controller i.e. the ACC-West RSR controller was authorized to handle R/T (Radiotelephony) in the procedural and Radar environment respectively.

### 1.6 Aircraft information

Both the aircraft were wide body long range aircraft.

### 1.7 Meteorological information

The weather was fine and has got no bearing on the occurrence.

### 1.8 Aids to navigation

All aids to navigation on ground along with RSR South-West frequency 124.55 MHz, and Approach Arrival frequency 126.35 MHz were reported working normal. All the aircraft navigational systems were also working normal.

### 1.9 Communications

During the time of incident both the aircraft, VT-ANI & VT-AND were in contact with Delhi, ACC-West at 124.55 MHz. There was always two-way communications between concerned ATC unit and both the aircraft.

#### 1.9.1 ATC Tape Transcript

The ATC tape recording of frequency 124.55 MHz, ACC – West and frequency 126.35 MHz Approach Arrival were replayed and the relevant transcript is as follows:

**ACC-West, Frequency 124.55 MHz,**

**Transmission with AIC 142, AIC 154 & AIC 156**

TIME (UTC)	UNIT	TRANSCRIPT

<b>HHMMSS</b>		
035014 - 19	RADAR	AIC142, MAINTAIN LEVEL 270
	AIC 142	MAINTAIN 270, AIC142
035100- 07	RADAR	AIC156, DELHI RADAR, HOLD AT PRESENT POSITION, ALL TURNS TO LEFT.
	AIC156	HOLD AT PRESENT POSITION, LEFT, HOLD, AIC156
035241- 47	AIC142	DELHI, AIC142 IS MAINTAINING FL270
	RADAR	AIC142, ROGER MAINTAIN STANDBY DUE TRAFFIC
035358 - 035410	AIC154	AIC154, REQUEST FURTHER DESCENT
	RADAR	AIC154, DESCEND & MAINTAIN LEVEL 230
	AIC154	DESCEND & MAINTAIN LEVEL 230, AIC154
035429 - 34	RADAR	AIC154, DESCEND TO LEVEL 230
	AIC154	DESCEND.....WE ARE DESCENDING TO LEVEL 230, AIC154
035543- 49	RADAR	AIC142, DELHI RADAR, DESCENT TO FL250.
	AIC142	DESCEND FL250, AIC142
035656- 035704	RADAR	AIC156, DELHI RADAR, MAKE ONE MORE HOLD, EXPECTED TOUCH DOWN TIME 32.
	AIC156	ROGER, SIR
035744	RADAR	AIC142, MAINTAIN LEVEL 250 DUE TRAFFIC
	UNKNOWN	.....POSITION NAMASKAR
035753	AIC142	.....250 AIC142
035832- 37	RADAR	AIC156 DELHI RADAR, DESCEND TO FL210
	AIC156	DESCEND 210, AIC156
035852 - 035909	RADAR	AIC142, DESCEND TO LEVEL 210
	UNKNOWN	..... NOT READABLE
	RADAR	AIC156, DELHI RADAR, TURN LEFT, PROCEED TO SAM
	AIC156	TURN LEFT, DIRECT, PROCEED TO SAM, AIC156
035941 - 45	RADAR	DESCEND TO LEVEL 210
	AIC154	DESCEND LEVEL 210, AIC154
040033- 37	RADAR	AIC154 DELHI RADAR, DESCEND TO FL190
	UNKNOWN	...REQUESTING 350
040113 - 19	RADAR	AIC154 CONTACT DELHI APPROACH RADAR 126.35

	AIC154	126.35 AIC154 GOOD DAY
040150	RADAR	AIC142 DELHI RADAR, MAINTAIN LEVEL 220
	UNKNOWN	....126.35
040154	RADAR	AIC142, MAINTAIN LEVEL 220
	AIC142	CLIMBING BACK TO 220 AIC142 TRAFFIC
040202	RADAR	AIC154, DESCEND TO LEVEL 110
040209	RADAR	AIC142, MAINTAIN LEVEL 220
040212	Aic142	Climbing to 220 sir, reaching 220 now aic 142
040225 - 33	AIC154	DELHI AIC154
	RADAR	AIC154, GO AHEAD
	AIC154	WE HAVE BEEN CHANGED OVER TO YOU SIR DESCENDING TO LEVEL 110 AND WE HAVE A RA....
040233	RADAR	ROGER
040235- 40	AIC142	WE HAD AN RA AIC142
	RADAR	AIC142 ROGER

**Approach Radar, 126.35Mhz, Transmission with AIC154**

TIME (UTC) HHMMSS	UNIT	TRANSCRIPT
040120	AIC154	DELHI, NAMASKAR, AIC154 MAINTAINING LEVEL 210
040127	AIC154	DELHI, AIC154
	RADAR	AIC154, DELHI RADAR, TURN LEFT HEADING .... STANDBY
040138	RADAR	AIC154, RADAR, DESCEND TO FLIGHT LEVEL 110
040141	AIC154	DESCEND LEVEL 110, AIC154
040144	RADAR	AIC154, EXPEDITE DESCENT
040146	AIC154	EXPEDITING SIR, AIC154
040200	RADAR	AIC154, EXPEDITE DESCENT
	AIC154	EXPEDITING SIR, EXPEDITING AIC154
040207	RADAR	AIC154, CONTACT RADAR 124.55
	AIC154	12455, CONFIRM?
040212	RADAR	AFFIRM

### **1.10 Aerodrome information**

Indira Gandhi International Airport (IATA: DEL, ICAO: VIDP) is a Joint venture airport being managed by Delhi International Airport Limited (DIAL) and Airports Authority of India. The air traffic services at IGI airport are provided by AAI which includes Aerodrome Control service (ADC/SMC), Approach Control service (APP), Area Control Service (ACC), Terminal Approach Radar (TAR) and Route Surveillance Radar Service (RSR). IGI airport houses three near converging runways in the westerly direction namely Rwy 27, Rwy 28 and Rwy 29. ATS are provided by AAI.

### **1.11 Flight recorders**

Both the aircraft were installed with Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder.

### **1.12 Wreckage and impact information**

There was no damage to either of the aircraft.

### **1.13 Medical and pathological Information**

There was no reported adverse medical condition of the cockpit crew.

### **1.14 Fire**

There was no fire.

### **1.15 Survival aspects**

The incident was survivable.

### **1.16 Tests and research**

Nil

### **1.17 Organizational and management information**

Both the aircraft were operated by a Scheduled Airlines.

The Radar Controller, ACC – West was under the administrative control of Airports Authority of India which is responsible for Air Traffic Services at IGI airport, New Delhi including Route Radar Surveillance, Terminal Approach

Radar, Area Control Service, Approach Control Service and Aerodrome Control Service.

## **1.18 Additional information**

### **1.18.1 Traffic Alert and Collision Avoidance System (TCAS)**

Both aircraft were equipped with TCAS, which detects potentially conflicting aircraft using secondary surveillance radar transponder signals and provides advice to the flight crews of the aircraft involved. The system's advice is rendered on 2 levels: via Traffic Advisory (TA) and Resolution Advisory (RA). A TA advises a flight crew of potential traffic conflicts, whereas an RA alerts the crew to an actual conflict and provides advice on manoeuvres to avoid collision. Both TAs and RAs provide visual and verbal alerts as follows: -

- TA provide information on proximate traffic and indicate the relative positions of intruding aircraft. TA are intended to assist flight crew in visual acquisition of conflicting traffic and to prepare pilots for the possibility of an RA.
- RA are divided into two categories: preventative advisories, which instruct the pilot to maintain or avoid certain vertical speeds; and corrective advisories, which instruct the pilot to deviate from the current flight path (e.g. "CLIMB" when the aircraft is in level flight).

A TCAS RA is based on a 5-second crew reaction time, unless the advisory is a reversal or there is an increase in strength of the original, in which case it is based on a reaction time of 2.5 seconds. Generally, there are 12 different TCAS RA annunciations, which use both aural commands and visual cues. The most common aural commands are "climb, climb" and "descend, descend."

The RA "maintain vertical speed, crossing, maintain" is a preventive RA: it instructs a flight crew to maintain their current vertical speed and indicates that the aircraft's own flight path will cross that of the intruder.

On aircraft equipped with TCAS, the system will coordinate their resolution advisories. The coordination ensures that complementary advisories are issued to each aircraft. The crew should promptly but smoothly follow the advisory and never maneuver in the opposite direction.

## **Visual Display of Traffic and Resolution Advisories**

The navigation setting on the Multi-Function Display (MFD) can be configured to show traffic in automatic (pop-up) mode or continuous mode. The automatic mode shows only TA and RA indications, while the continuous mode shows all aircraft traffic, whether or not those aircraft constitute a threat.

During an RA, the primary flight display shows the required rates of climb or descent on the instantaneous vertical speed indicator.

After the transponder is initially selected ON, the TCAS display on the MFD defaults to the automatic mode. To view traffic in continuous mode, the flight crew must press the TCAS button, select the range to 40 NM or below on the electronic flight information system control panel, and ensure that the navigation page is selected to ARC or MAP mode.

### **1.19 Useful and Effective Techniques**

Nil

## **2 ANALYSIS**

Both the aircraft were initially spaced 9 minutes apart (AIC154 ahead of AIC142) at the time of entering Delhi FIR, but due to the orbit given to AIC154 (50NM East of LKA), spacing between the two aircraft altered and AIC142 became 2 NM ahead of AIC154. The technique adopted by the controller to delay the arrival was not appropriate.

The traffic, under the jurisdiction of RSR West controller, was heavy and complex. Descent to arriving aircraft on ATS route G452 was dependent on arrivals operating on ATS route Q1, under the jurisdiction on RSR South-West. In addition to arrivals, there were multiple departures from Delhi on ATS routes G333 and A589, which were conflicting with each other as well as with AIC154 and AIC142. The controller therefore had to frequently revisit the clearances issued to departures and arrivals resulting in frequency congestion.

During the period of the incident, following events took place:

- ✚ The instruction by controller meant for AIC154, to descend to FL210, was inadvertently given to AIC156. The actual intent of the controller is

corroborated by the fact that CFL (210) was filled in the radar data block of AIC154 and not AIC156.

✚ After a few seconds, the controller issued descent clearance to AIC142 to FL210, instead of AIC154. The actual intent is, again, corroborated by the fact that no change in the CFL of AIC142's radar data block was effected. (It appears the controller was under the assumption that despite having given descent clearance to AIC154 earlier, to descend to FL210, AIC154 had not left FL230.)

The RSR West controller did not take cognizance of the following events, which could have avoided the breach of separation between AIC154 and AIC142:

- ✚ Descent of AIC156 from FL290 to FL210.
- ✚ Descent of AIC142 from FL250 (the last intended cleared level) to FL210.
- ✚ PCW generated between AIC142 and AIC154, when the former was descending passing FL246 and the latter was maintaining FL230.

### 3 CONCLUSION

#### 3.1 Findings

- In order to have separation and absorb delay, AIC154 (which was ahead) was asked by RSR West controller to make one orbit approximately 50 NM east of waypoint LKA.
- At the time of entering Delhi FIR both the aircraft were initially spaced 9 minutes apart, but due to the orbit given to AIC154, spacing between the two aircraft altered and AIC142 became 2 NM ahead of AIC154.
- As per the sector plan, the aircraft were supposedly to be changed over to ACC (South), but due to **traffic congestion with ACC (South) and excessive holding over waypoint AKBAN**, the controller re-cleared both the aircraft to SAM VOR for SAM6F RNAV arrival.
- Subsequently, AIC154 and AIC142 were given descent to F230 and F250, respectively.
- From that point of time onwards, AIC142, AIC154 and AIC156, were operating with ACC (West).
- **At time 035835 UTC, AIC156 was given descend FL210. However, the controller filled the cleared level for AIC154.**

- At time 035855 UTC, AIC142 was given descend to FL210. **The CFL was not filled for AIC142.** The transmission was not acknowledged by AIC142. However, there was a blocked transmission/ garbled noise.
- Between 035933 UTC and 040020 UTC, **PCW was generated between AIC154 and AIC142, which was not acknowledged** by the RSR Controller.
- AIC142 was descending passing FL246 with a descend rate of 1100' / minute & ground speed of 420 knots.
- AIC154 was maintaining FL230 with a ground speed of 430 knots.
- At time 035942 UTC, AIC154 was asked to descend to FL210. The instruction was acknowledged by AIC154.
- At time 040035 UTC, **AIC154 was re-cleared to FL190 (CFL was entered in the data block). However, this transmission was not acknowledged by the aircraft.**
- The instruction by controller meant for AIC154, to descend to FL210, was inadvertently given to AIC156. The actual intent of the controller is corroborated by the fact that CFL (210) was filled in the radar data block of AIC154 and not AIC156.
- After a few seconds, the controller issued descent clearance to AIC142 to F210, instead of AIC154. The actual intent is, again, corroborated by the fact that no change in the CFL of AIC142's radar data block was effected.
- **CCW was generated by the ATM system, in respect of AIC154 and AIC142 at 040142 UTC**, the controller immediately instructed AIC142, which was descending passing FL220, to maintain FL220. The CCW lasted till 040219 UTC (37 seconds).
- The instruction for AIC142 to maintain FL220 was repeated at times 040154 UTC and 040208 UTC.
- At time 040200 UTC, AIC142 reported climbing back to FL220 and reported reaching FL220 at time 040214 UTC.
- At time 040250 UTC, standard separation was established when AIC154 was observed descending passing FL183 and AIC142 was climbing passing FL221.
- Both aircraft - AIC154 and AIC142, reported getting RA.



### 3.2 Probable Cause

The breach of separation between the two aircraft occurred due to incorrect label management, wrong separation technique for sequencing of arrival aircraft and inadequate surveillance.

### 3 SAFETY RECOMMENDATIONS

It is recommended that, necessary action be taken by AAI to ensure that ATCOs give due cognizance to the PCW and take corrective actions immediately.

*K. Ramachandran*

**(K. Ramachandran)**  
Member, Committee of Inquiry

*Mani*  
*1/3/2021*

**(R S Passi)**  
Chairman, Committee of Inquiry

Place: New Delhi

Date: *01.03.2021*