FINAL INVESTIGATION REPORT

SERIOUS INCIDENT OF TCAS – RA REPORTED BY TURKISH AIRLINE FLIGHT THY714E, A333, REG NO TCLOE (ISTANBUL – LAHORE) & ROYAL BRUNEI FLIGHT RBA003, B788, REG NO V8DLB (BRUNEI – LONDON) ON 01-11-2018

SCOPE

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This report contains facts which have been determined up to the time of publication. This information is published to inform the aviation industry and the public of the general circumstances of civil aviation accidents and incidents.

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ABBREVIATIONS

1.	**ACC**	Area Control Center
2.	**ACAS**	Airborne Collision Avoidance System
3.	**AIRPROX**	Aircraft Proximity
4.	**AMSL**	above mean sea level
5.	**ANS**	Air Navigation Service
6.	**ANSP**	Air Navigation Service Provider
7.	**ATC**	Air Traffic Control
8.	**ATCO**	Air Traffic Controller
9.	**AVSA**	Adjust vertical speed adjust
10.	**COM**	Communication
11.	**CRM**	Crew Resource Management
12.	**EGLL**	London
13.	**FL**	Flight Level
14.	**hrs**	Hours
15.	**ICAO**	International Civil Aviation Organization
16.	**IIC**	Investigator In Charge
17.	**Km**	Kilometers
18.	**LT**	Local Time
19.	**LTBA**	Istanbul
20.	**m**	Metres
21.	**mb**	Millibars
22.	**No.**	Number
23.	**OK**	all correct
24.	**OPLA**	Lahore
25.	**QNH**	Barometric pressure adjusted to sea level
26.	**RH**	Right Hand
27.	**RoD**	Rate of Descent
28.	**SN**	Serial Number
29.	**SLOP**	Strategic Lateral Offset Procedure
30.	**SOP**	Standard Operating Procedures
31.	**STCA**	Short Term Conflict Alert
32.	**TCAS**	Traffic alert and Collision Avoidance System
33.	**TCAS RA**	Traffic alert Collision Avoidance System Resolution Advisory
34.	**TO**	Take Off
35.	**UTC**	Co-ordinated Universal Time
36.	**WBSB**	Brunei

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Synopsis

On 01st November 2018, Turkish Airlines Flight No THY714E, aircraft A333, Reg No TCLOE was maintaining FL390 & operating from Istanbul to Lahore (LTBA–OPLA) on route N644 / A466 (DOBAT–REGET–D I KHAN–JHANG). At position D I Khan (DI) aircraft requested descend clearance. THY714E was given descend by Area Radar Controller West to FL370 and traffic information was passed about Singapore Airline Flight No SIA346, aircraft A388,Reg No 9VSKU, operating from Singapore to Zurich (WSSS–LSZH) maintaining FL360. During the course, Area Radar Controller West realized the conflict of THY714E with another reciprocal traffic Royal Brunei Flight No RBA003, aircraft B788, Reg No V8DLB, operating from Brunei to London (WBSB–EGLL) which was maintaining FL380. Area Radar Controller West tried to take evasive action by assigning radar vectors / headings to both the flights, however both THY714E and RBA003 received Traffic Collision Avoidance System – Resolution Advisory (TCAS – RA) and initiated climb and descend respectively.

This incident of TCAS – RA was reported in the daily IOU report for the period 020500LT to 030500LT November 2018. AAIB was mandated to investigate the incident vide memorandum dated 14th November 2018 and corrigendum.

All available evidences have been analyzed by AAIB. No injuries were reported. At the time of minimum vertical separation of about 300 ft, both aircraft (THY714E & RBA003) were about 5 Nautical miles laterally separated. They crossed each other with a vertical separation of about 1500ft approximately, as both had initiated TCAS – RA climb and descend respectively. The incident occurred due to lack of situational awareness on the part of Lahore ATC (Area Radar Controller West and Area Procedure Controller West). Appropriate recommendations have been made for CAA Operations and CAA Regulatory Directorates.

1. FACTUAL INFORMATION

1.1 **History of Flights**.

1.1.1 On 01st November 2018 Turkish Airlines (State of Operator & Registry – Turkey) Flight No THY714E, aircraft A333, Reg No TCLOE was maintaining FL390 & operating from Istanbul to Lahore (LTBA–OPLA) on route N644 / A466.

1.1.2 At 23:34:12 UTC THY714E contacted Lahore ATC (Area Radar Controller West) at position "MESRA" maintaining FL390 and was instructed to report position "DOBAT", which was acknowledged by THY714E.

1.1.3 At 23:39:45 UTC THY714E reported position "DOBAT" and was asked to report D I Khan (DI). Pilot of THY714E acknowledged to report DI.

1.1.4 Royal Brunei (state of Operator & Registry – Brunei Darussalam) Flight No RBA003, aircraft B788, Reg No V8DLB was maintaining FL380 & was operating from Brunei to London (WBSB – EGLL).

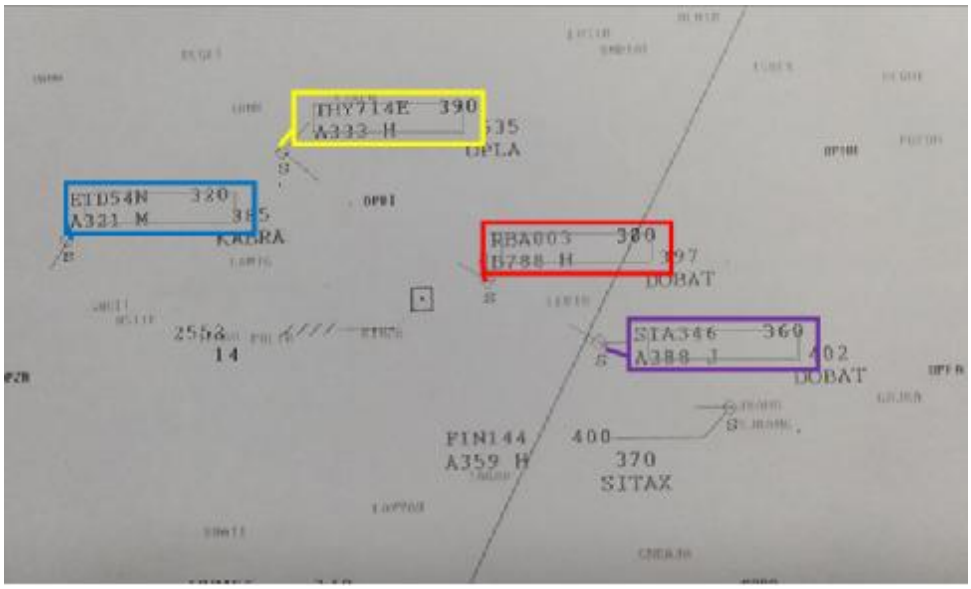
1.1.5 At 23:41:29 UTC RBA003 contacted Lahore ATC (Area Radar Controller West) and reported maintaining FL380 which was instructed to report position "REGET" and was acknowledged.

1.1.6 At 23:48:48 UTC Etihad Airline (state of Operator & Registry – United Arab Emirates) Flight no ETD54N, aircraft A321, Reg No A6AEJ operating from Islamabad to Abu Dhabi called Lahore ATC (Area Radar Controller West) and reported sick passenger on board and requested weather information of nearest airports (for possible diversion).

1.1.7 Lahore ATC (Area Radar Controller West) passed weather information about AIIAP Lahore and informed that they can divert to Islamabad or Lahore as both were at equidistant and pilot of ETD54N opted for a diversion to Lahore.

1.1.8 Singapore airline (state of Operator & Registry – Singapore) Flight No SIA346, aircraft A388, Reg No 9VSKU was maintaining FL360 operating from Singapore to Zurich (WSSS – LSZH) on route A466 to DI Khan.

1.1.9 At 23:49:16 UTC THY714E was between REGET and D I Khan (DI) maintaining FL390 and RBA003 was between Jhang and D I Khan maintaining FL380. Whereas SIA346 was maintaining FL360 between Jhang and D I Khan behind RBA003.

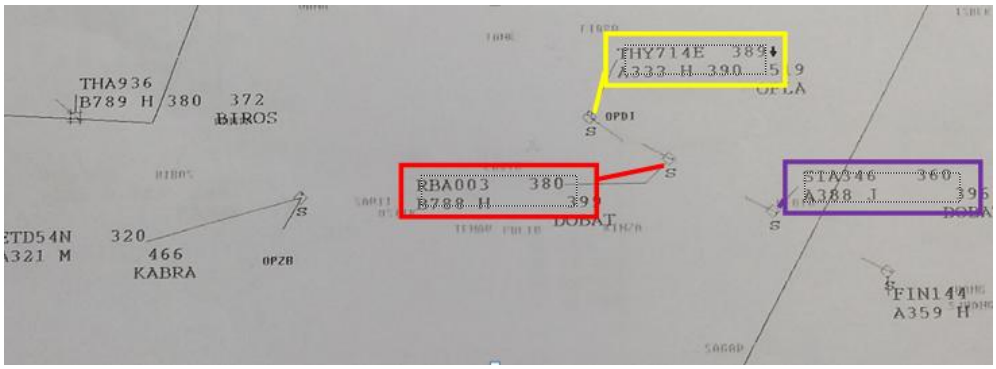


Screen Shot of Radar Display (UTC 23:49:16)

1.1.10 At 23:50:30 UTC THY714E (Lahore Arrival) reaching position D I Khan (DI), requested descend clearance which was cleared to descend to FL370 and acknowledged by pilot.

1.1.11 Lahore ATC provided THY714E traffic information about a reciprocal traffic maintaining FL360 and approximately 40 NM opposite (SIA346). THY714E acknowledged by saying that they have the traffic on TCAS. Lahore ATC missed out passing traffic info about RBA003 to THY714E.

1.1.12 At 23:51:03 UTC THY714E left FL390 for FL370.Radar display data was showing THY714E passing through FL389 **ê** for FL370 whereas RBA003 (reciprocal) maintaining FL380 and SIA346 was maintaining FL360.



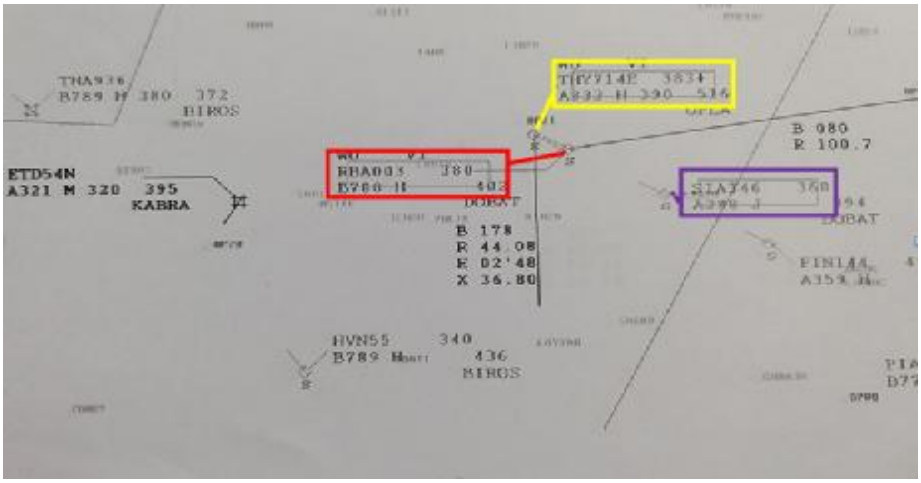
Screen Shot of Radar Display (UTC 23:51:03)

1.1.13 At the same time Lahore ATC passed traffic information to SIA346 about THY714E, and during the course also realized the conflict of THY714E with another traffic (RBA003 maintaining FL380).

1.1.14 At 23:51:36 UTC Lahore ATC (Area Radar Controller West) after noticing RBA003 at FL380 reciprocal to THY714E and getting close, tried to take evasive action.

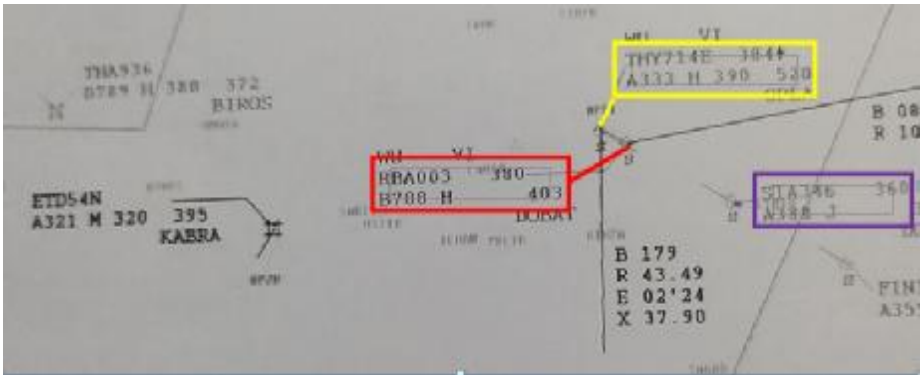
1.1.15 Lahore ATC instructed THY714E to turn left heading 180 degree and acknowledged by pilot. However, THY714E mean while also reported TCAS-RA, initiated climb, and did not initiate a turn.

1.1.16 At 23:51:45 UTC Radar display data was showing THY714E was passing through FL383 **ê** and RBA003 maintaining FL380.



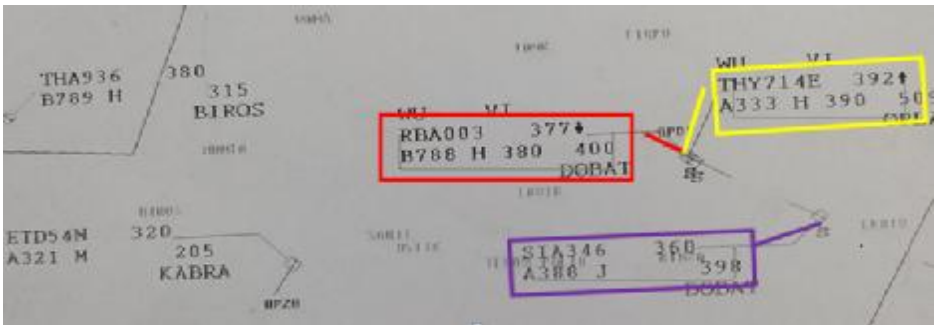
Screen Shot of Radar Display (UTC 23:51:45)

1.1.17 After few seconds Radar Display data at 23:51:53 UTC shows THY714E initiated climb and was passing FL384 **é**. RBA003 still maintaining FL380.



Screen Shot of Radar Display (UTC 23:51:53)

1.1.18 Lahore ATC instructed RBA003 to turn right heading 360 degree but RBA003 acknowledged as 030 degrees. Meanwhile RBA003 reported TCAS – RA and did not initiate any turn. Radar Display data at 23:52:14 showing RBA003 descended from FL380 and passing FL377 **ê**. At this moment THY714E was passing FL392 **é**.



Screen Shot of Radar Display (UTC 23:52:14)

1.1.19 At 23:52:15 UTC THY714E reported again that they had TCAS-RA and was acknowledged by Lahore ATC.

1.1.20 At 23:52:25 UTC RBA003 reported clear of conflicting traffic and returning to FL380 which was acknowledged by Lahore ATC.

1.1.21 At 23:52:35 UTC THY714E reported clear of conflict and descending FL370. Lahore ATC passed traffic information of Singapore airline maintaining FL360 and 16 NM reciprocal. THY714E acknowledged the call.

1.1.22 At 23:53:12 UTC Lahore ATC asked THY714E to stop descend FL380 and same acknowledged by the aircraft.

1.1.23 At 23:53:33 UTC RBA003 asked Lahore ATC about the traffic with which they had TCAS – RA. Lahore ATC passed the traffic info.

1.1.24 At 23:53:55 UTC THY714E also inquired about the traffic with which they had TCAS-RA, same info was passed by Lahore ATC.

1.1.25 At 23:54:57 UTC Lahore ATC cleared THY714E to descend to FL290 and was acknowledged by THY714E.

1.1.26 At 23:57:00 UTC Lahore ATC asked THY714E to contact Lahore Control East and same was acknowledged by aircraft.

1.2 **Injuries to person(s):** No injury was reported to any one on board in both the aircraft.

1.3 **Damage to Aircraft**: No damage occurred due to this incident to any of the aircraft.

1.4 **Personnel Information**: N/A

1.5 **Aircraft Information**.

1.5.1.	Turkish Airlines	:	**THY714E**
	Aircraft Make	:	Airbus
	Type of Aircraft	:	A-333
	Aircraft Registration	:	TC-LOE
	State of Operator / Registration	:	Turkey
	Sector	:	Istanbul to Lahore
	Flight conditions	:	IMC / Descending Phase
	Altitude	:	FL390 **ê** FL370
1.5.2	Royal Brunei	:	**RBA003**
	Aircraft Make	:	Boeing
	Type of Aircraft	:	B788
	Aircraft Registration	:	V8DLB
	State of Operator / Registration	:	Brunei Darussalam
	Sector	:	Brunei to London
	Flight conditions	:	IMC / Level Flight
	Altitude	:	FL380

1.5.3	Singapore Airline	:	**SIA346**
	Aircraft Make	:	Airbus
	Type of Aircraft	:	A388
	Aircraft Registration	:	9VSKU
	State of Operator / Registration	:	Singapore
	Sector	:	Singapore to Zurich
	Flight conditions	:	IMC / Level Flight
	Altitude	:	FL360

1.6 **Meteorological Information**: No significant weather was reported at operating altitude at the time of occurrence of this incident of TCAS-RA.

1.7 **ATC Records:** Audio Tape Extracts and Visual Record (Radar Tracings / SDD Screenshots) were obtained for detailed analysis. Statements of duty Air Traffic Controllers were obtained.

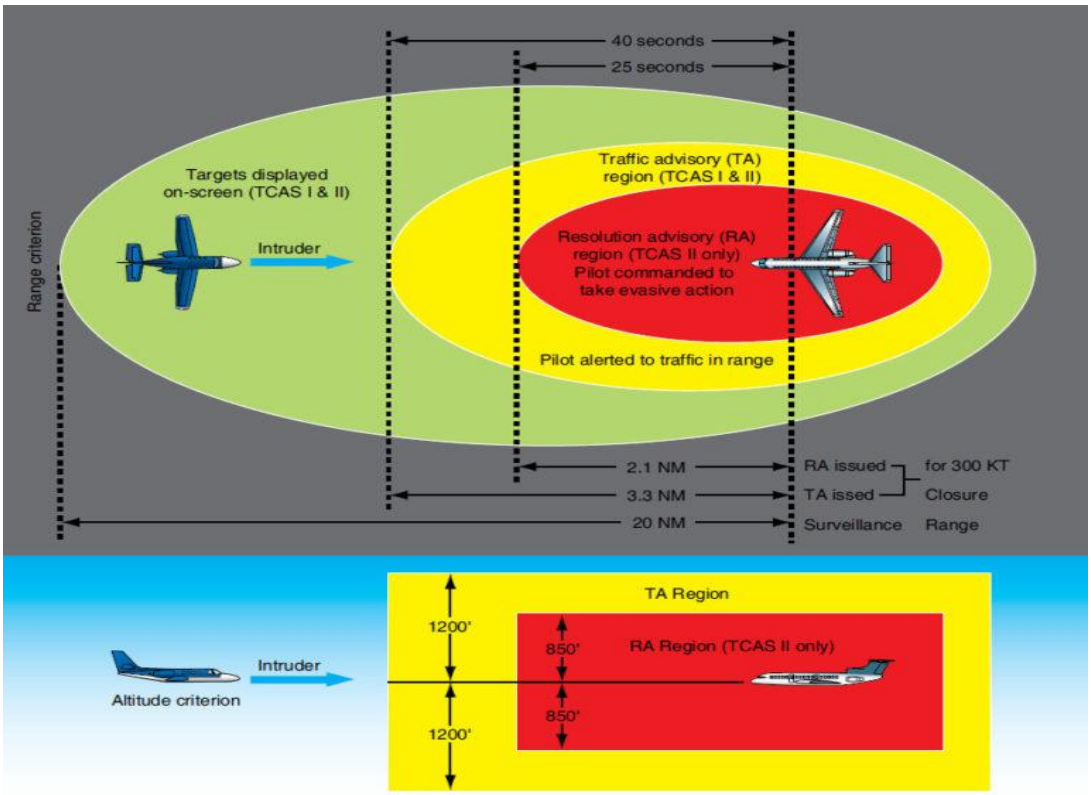
1.8 **Resumption of Navigation by Aircraft**: Post occurrence, both aircraft continued for their respective destinations.

1.9 **Additional Information**

1.9.1 **Traffic Alert and Collision Avoidance System (TCAS – RA)**.

1.9.1.1 A traffic collision avoidance system or traffic alert and collision avoidance system (both abbreviated as TCAS, and pronounced /tiːkæs/; TEE-kas) is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft.

1.9.1.2 ACAS / TCAS is based on secondary surveillance radar (SSR) transponder signals, but operates independently of ground-based equipment to provide advice to the pilot on potentially conflicting aircraft. Two types of alert can be issued by ACAS II - TA (Traffic Advisory) and RA (Resolution Advisory). The former is intended to assist the pilot in the visual acquisition of the conflicting aircraft and prepare the pilot for a potential RA. If a risk of collision is established by ACAS II, an RA will be generated. Broadly speaking, RAs tell the pilot the range of vertical speed at which the aircraft should be flown to avoid the threat aircraft. The visual indication of these rates is shown on the flight instruments. It is accompanied by an audible message indicating the intention of the RA. A "Clear of Conflict" message will be generated when the aircraft diverge horizontally. Once an RA has been issued, the vertical sense (direction) of the RA is coordinated with other ACAS II equipped aircraft via a mode S link, so that two aircraft choose complementary maneuvers. RAs aim for collision avoidance by establishing a safe vertical separation (300 - 700 feet), rather than restoring a prescribed ATC separation.



1.9.1.3 ACAS II operates on relatively short time scales. The maximum generation time for a TA is 48 seconds before the Closest Point of Approach (CPA). For an RA the time is 35 seconds. The time scales are shorter at lower altitudes (where aircraft typically fly slower). Unexpected or rapid aircraft maneuver may cause an RA to be generated with much less lead time. It is possible that an RA will not be preceded by a TA if a threat is imminent. The effectiveness of an RA is evaluated by the ACAS equipment every second and, if necessary, the RA may be strengthened, weakened, reversed, or terminated. A protected volume of airspace surrounds each ACAS II equipped aircraft. The size of the protected volume depends on the altitude, speed, and heading of the aircraft involved in the encounter.

TCAS Equipment Cockpit View

1.9.2 **Strategic Lateral Offset Procedure (SLOP)**: In order to reduce the probability of possible traffic conflict SLOP has been introduced worldwide and can be adopted by CAA Pakistan as well. Salient aspects are as follows:-

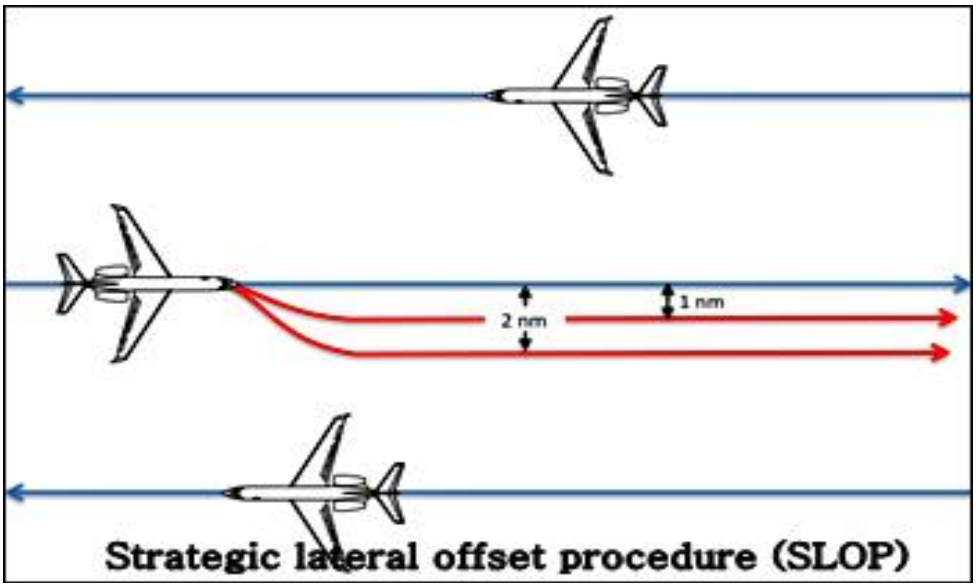
1.9.3 The increasing accuracy of en route navigation on designated ATS routes has had the effect of increasing the probability of loss of separation:

(a) Between traffic which is not operating in accordance with the correct air traffic control clearance, or

(b) Where an error has been made in the issue of an air traffic control clearance, or

(c) In case of loss of vertical separation between aircraft on the same route, in particular where movements take place outside areas covered by ATC surveillance service. Such areas may be encountered during transit over oceans or remote continental areas.

1.9.3.1 Route or track centre lines are now routinely flown over long distances to within a few tens of meters of lateral and vertical accuracy, and often much better than that, and therefore a clearance error from any source has a reduced margin for occurrence entirely attributable to that accuracy. This includes unplanned changes of level due to clear air turbulence and intentional variation in route to avoid the worst effects of wake vortex turbulence.



1.9.3.2 ICAO Document PANS-ATM (Doc4444) Chapter 16 Section 16.5 states that:

"16.5 STRATEGIC LATERAL OFFSET PROCEDURES (SLOP)

Note 1.– SLOP are approved procedures that allow aircraft to fly on a track parallel to the right of the centre line relative to the direction of flight to mitigate the lateral overlap probability due to increased navigation accuracy, and wake turbulence encounters. Unless specified in the separation standard, an aircraft's use of these procedures does not affect the application of prescribed separation standards.

Note 2. – Annex 2, 3.6.2.1.1, requires authorization for the application of strategic lateral offsets from the appropriate ATS authority responsible for the airspace concerned.

16.5.1 Implementation of strategic lateral offset procedures shall be coordinated among the States involved.

Note. — Information concerning the implementation of strategic lateral offset procedures is contained in the Implementation of Strategic Lateral Offset Procedures (Circ 331).”

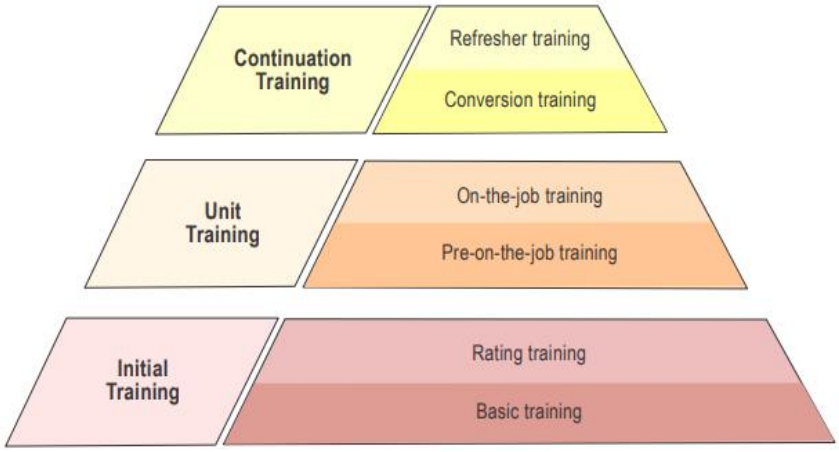
1.9.2.4 The description of the strategic lateral offset procedures are in ICAO Circular 331 (Cir 331, Implementation of Strategic Lateral Offset Procedures), chapter 2 attached as.

1.9.3 **ATC Refresher Training / Courses:**

1.9.3.1 PCAA Air Traffic Controllers Training Manual Chapter 4, Section 4.12 states that: -

“All Air Traffic Control Officers must undergo ATS Refresher Training at least once in ten years. Operations Directorate shall prepare schedule for refresher training in coordination with Principal CATI. ATS units shall ensure availability of concerned ATC Officers for refresher training. In case of any training limitation at CATI or sparability of Air Traffic Controllers, refresher courses may be conducted at ACC Simulators under the supervision / control of ATS/COM. OPS School CATI.”

1.9.3.2 ICAO Doc 10056 “Manual on Air Traffic Controller Competency-based Training and Assessment” Chapter 6 relates with “Refresher Training”. The training of an Air traffic Controller has been structured into three phases:



(a) The objective of initial training is to prepare a trainee for training at an ATC unit. It includes two stages, basic and rating training.

(b) The objective of Unit training is to prepare a trainee for the issue of an air traffic controller license and/or the appropriate rating(s) and at a specific unit. It includes Pre-OJT and OJT (On the Job Training).

(c) The objective of continuation training is to enable operational ATCOs to maintain the validity of their license and enhance their existing competencies. It consists of two possible phases, refresher training and conversion training, where conversion training occurs on an “as needed” basis only. These two can be explained as:

Refresher training:

Training designed to review, reinforce and/or enhance the existing competencies of ATCOs to provide a safe, orderly and expeditious flow of air traffic.

Conversion training:

Training designed to provide knowledge, skills and attitudes appropriate to a change in the operational environment. Conversion training may be provided for changes to operational procedures and/or systems.

1.9.3.3 Refresher training can be an opportunity to give air traffic controllers some exposure (usually through practical training, case studies or theory) to various situations that they are not likely to experience on a regular basis. Whilst exposure to these situations has some benefits, there can be significantly more benefit if the training is designed with the aim of analyzing and enhancing performance.

2. ANALYSIS

2.1 THY714E operating from West to East direction came in contact with ATC Lahore (Area Radar Controller West) at position “MESRA” and was asked to report position “DOBAT” and later on position “D I Khan” (DI). During all this while THY714E was maintaining FL390.

2.2 RBA003 operating from East to West direction, and came in contact with ATC Lahore (Area Radar Controller West) after position “JHANG”. It was maintaining FL380 and was instructed to maintain FL380 and to report “REGET”.

2.3 SIA346 another flight operating from East to West direction, maintaining FL360 was behind RBA003.

2.4 ETD54N (Islamabad to Abu Dhabi) was a transiting traffic for ATC Lahore. The aircraft requested weather information of nearby airfields due to sick passenger on board and a possible diversion.ATC Lahore passed the weather of Lahore and ETD54N decided to divert to Lahore.

2.5 THY714E requested descend while approaching D I Khan for Lahore as her final destination. ATC Lahore cleared THY714E to descend to FL370 considering only one reciprocal traffic SIA346 (Approximately 40NM away) maintaining FL360. Whereas another reciprocal traffic which was closer than SIA346 was RBA003, and was maintaining FL380. The traffic information passed to THY714E was that of SIA346, and missed out the presence of RBA003.

2.6 On realizing the mistake Area Radar Controller West tried to take evasive maneuver by instructing THY714E to turn left on a radar heading of 180 degrees and advising RBA003 to turn right on a radar heading of 360 degrees. Both the aircraft did not follow instructions of ATC Lahore as both had already received TCAS – RA (by this time) and initiated climb and descend respectively.

2.7 The evasive maneuver heading given to THY714E by the controller was “left 180” whereas it should have been “right 180”. As a left heading could have brought both the aircraft further closer to each other.

2.8 At the time of TCAS – RA both the flights initiated avoidance actions, ie THY714E while passing FL383 **ê** for FL370 climbed to FL 392, and RBA003 initiated descend from FL380 to FL377.

2.9 At the time of minimum vertical separation of about 300 ft, both aircraft (THY714E & RBA003) were about 5 Nautical miles laterally separated. They crossed each other with a vertical separation of about 1500ft approximately, as both had initiated TCAS – RA climb and descend respectively.

2.10 For such traffic, the Area Radar Controller West and the Area Procedure Controller West were required to coordinate first. This prior descend coordination was not done for THY714E by ATC Lahore.

2.11 Duty Radar Controller (Area Radar Controller West) overlooked / missed out RBA003 maintaining FL380.

2.12 Duty ATC Controller (Area Procedure Controller West) while doing coordination with other units for flight (ETD54N) requesting diversion due sick passenger on board, overlooked / missed out RBA003 maintaining FL380. He noticed STCA alarm and observed on his SDD (Situational Data Display) that while the Radar Controller was instructing both flights for an evasive maneuver, they had already initiated avoidance action under TCAS – RA.

3. CONCLUSION

3.1 Findings

3.1.1 All the three flights (ie Turkish Airlines Flight THY714E, Royal Brunei Airlines Flight RBA003 &Singapore International Airlines Flight SIA346) were in contact with ATC Lahore (Area Radar Controller West) on Radar display and R/T.

3.1.2 All three flights were on same route A466, but at different Flight Levels. THY714E was inbound (West to East) for Lahore, whereas the other two were flying in outbound (East to West) direction (in transit for respective destinations).

3.1.3 THY714E requested descend while approaching D I Khan, for Lahore as her final destination. ATC Lahore cleared THY714E to descend to FL370 considering only one reciprocal traffic SIA346 (Approximately 40NM away) maintaining FL360. Whereas another reciprocal traffic which was closer than SIA346 was RBA003, and was maintaining FL380. The traffic information passed to THY714E was that of SIA346, and missed out the presence of RBA003. This was contrary to the guiding principles / procedure provided in ICAO Doc 4444.

3.1.4 In the meanwhile Area Radar Controller West, while passing traffic information of THY714E to SIA346, realized the presence of RBA003 at FL380. Area Radar Controller West tried to take evasive measure and instructed THY714E to turn left heading 180 degree and RBA003 to turn right heading 360 degree. At the same time THY714E reported TCAS RA and both the aircraft initiated climb and descend due TCAS – RA.

3.1.5 Area Procedure Controller West was unable to provide necessary coordination / assistance to the Area Radar controller West about the overall situation, contrary to the instructions contained in AIIAP SATI (Station Air Traffic Instructions).

3.1.6 At the time of minimum vertical separation of about 300 ft, both aircraft (THY714E & RBA003) were about 5 Nautical miles laterally separated. They crossed each other with a vertical separation of about 1500ft approximately, as both had initiated TCAS – RA climb and descend respectively.

3.1.7 In order to optimize the airspace, and mitigate hazards related to traffic conflicts, a procedure of having lateral separation among the aircraft on same route ie Strategic Lateral Offset Procedure (SLOP) has been introduced and is implemented in various countries. It has been described at para 16.5 ICAO Doc4444 PANS-ATM. Detailed information has also been provided in ICAO Circular 331.

3.1.8 After the incident both flights continued to respective destinations.

3.2 Cause(s) of Occurrence

3.2.1 Lack of situational awareness on part of Duty Air Traffic Controller (Area Radar Controller West) who missed out the immediate reciprocal traffic RBA003 (maintaining FL380) while issuing descent clearance to THY714E and putting more emphasis on another reciprocal traffic (SIA346 maintaining FL360). Whereas this was comparatively at a larger distance than RBA003 and was not causing immediate concern.

3.2.2 Due to lack of situational awareness on part of Duty Air Traffic Controller (Area Radar Controller West) the recommended evasive maneuver was too late and incorrect.

3.2.3 Lack of coordination / assistance on the part of Duty Air Traffic Controller (Area Procedure Controller West) for not been able to anticipate the traffic conflict, contributed to the occurrence. This was because he was busy in coordination for another flight (ETD54N) diverting due to medical emergency.

4. SAFETY RECOMMENDATIONS

4.1 Pakistan CAA (Operations Directorate) is to issue necessary instructions to field ATS Units for adhering to the laid down procedures for the provisioning of Air Traffic Services (specifically vectoring / traffic information) in accordance with ICAO guidelines and best practices, with special emphasis on the aspects related to this serious incident.

4.2 Pakistan CAA (Operations Directorate) is to issue necessary instructions to field ATC Units for adhering to the laid down procedures related to coordination between Area Procedure Controller and Area Radar Controller with specific focus on the coordination lapse related to this serious incident.

4.3 Pakistan CAA (Operations Directorate) is to introduce simulator sessions (on ACC simulators) at field level (Karachi, Lahore, and Islamabad) at a specified periodicity, for all the Air Traffic Controllers. Outline may be orchestrated in consultation with Directorate of Aerodrome and Airspace Regulations (DAAR). This utilization of ACC simulators be aimed to enhance and refine the skills and identify areas of additional attention / training requirements etc. Required improvements may be undertaken in the training manual, and directions to field ATS Units may be issued to plan, execute and document such simulator sessions.

4.4 ATC Training Manual (Para 5.8) provides an overview of refresher training mechanism.CAA Pakistan (Operations Directorate) is to revisit the criteria, duration and define a periodicity of the said refresher training, and undertake necessary improvements in the scope of training. Administrative measures may be incorporated to ensure that this training is accorded due priority, its curriculum is reviewed from time to time, and all the air traffic controllers should undergo this training mandatorily at the specified intervals.

4.5 CAA Pakistan (Operations Directorate) may study and consider implementation of **“Strategic Lateral Offset Procedures (SLOP)”** on different ATS routes as described at para 16.5 ICAO Doc 4444. Detailed information has also been provided in ICAO Circular 331.