FINAL INVESTIGATION REPORT

SERIOUS INCIDENT (TCAS – RA) BETWEEN PIAC FLIGHT PIA303, A320-214 AIRCRAFT, REG. NO. AP-BOL (OPLA - OPKC) AND MILITARY AIRCRAFT ON 04-03-2022

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SCOPE

At Bureau of Aircraft Safety Investigation (BASI), Pakistan investigations are conducted in accordance with Annex-13 to the International Civil Aviation Organization (ICAO) Convention on International Civil Aviation and Civil Aviation Rules 1994 (CARs 94).

The sole objective of the investigation and the final report of an accident or serious incident under above stated regulations is the prevention of future accidents and incidents of similar nature. It is not the purpose of such an investigation to apportion blame or liability. Accordingly, it is inappropriate to use BASI Pakistan investigation reports to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

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

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ABBREVIATIONS

AAIB	Aircraft Accident Investigation Board
ACAS	Airborne Collision Avoidance System
ATC	Air Traffic Control
ATS	Air Traffic Services
BASI	Bureau of Aircraft Safety Investigation
BEA	Bureau of Enquiry and Analysis
CARs	Civil Aviation Rules
FL	Flight Level
ft	Feet
h	Hour(s)
HBC	Hawker Beechcraft Corporation
ICAO	International Civil Aviation Organization
IOU	Incident Occurrence and Unserviceability Report
MAC	Mid Air Collision
MET	Metrological
min	Minute(s)
MWO	Meteorological Watch Office
NM	Nautical Mile
OJT	On-the-Job Training
OJTI	On-the-Job Training Instructor
OPKC	Jinnah International Airport
OPLA	Lahore International Airport
OPRN	PAF Base Nur Khan
OPSF	PAF Base Sharea Faisal
PAF	Pakistan Air Force
PCAA	Pakistan Civil Aviation Authority
PIA	Pakistan International Airlines
RA	Resolution Advisory
STCA	Short Term Conflict Alert
TCAS	Traffic alert and Collision Avoidance System
UTC	Universal Time Coordinated

INTRODUCTION

The serious incident was reported to Bureau of Aircraft Safety Investigation (BASI), Pakistan previously known as Aircraft Accident Investigation Board (AAIB) by Pakistan Civil Aviation Authority (PCAA) vide Incident Occurrence and Unserviceability Report (IOU)[1]. Ministry of Aviation, Government of Pakistan issued Memorandum and Corrigendum[2] issued by BASI, Pakistan to investigate the serious incident. This serious incident was notified[3] to International Civil Aviation Organization (ICAO) and Bureau of Enquiry and Analysis (BEA), France in line with Annex-13. The investigation has been conducted by BASI, Pakistan. All corresponding timings are mentioned in Universal Time Coordinated (UTC).

[1] PCAA IOU Report dated 4th March, 2022

[2] Ministry of Aviation Memorandum No. HQCAA/1902/004/TCAS/Inv/153 dated 11th April, 2022 & BASI, Pakistan Corrigendum

[3] ICAO Initial Notification dated 9th March, 2022

SYNOPSIS

On 04th March 2022, Pakistan International Airlines (PIA) Flight PIA303, A320-214 aircraft Reg. No. AP-BOL, was a scheduled passenger flight from Alama Iqbal International Airport (OPLA), Lahore, Pakistan to Jinnah International Airport (OPKC), Karachi, Pakistan along Air Traffic Services (ATS) route MIMAL – J112 – NSH – KC at Flight Level (FL) 380. Concurrently, reciprocal traffic GHAURI-62, Hawker Beechcraft Corporation (HBC) aircraft was operating from Pakistan Air Force (PAF) Base Sharea Faisal (OPSF), Karachi, Pakistan to PAF Base Nur Khan (OPRN), Rawalpindi, Pakistan on ATS route OPSF – NSH – Z301 – OPRN climbing to FL390.

Both aircraft triggered a Traffic alert and Collision Avoidance System (TCAS) – Resolution Advisory (RA) approximately 30 Nautical Miles (NM) North-East of Nawabshah. As per the advisories, PIA303 initiated RA climb while GHAURI-62 began an RA descent. At the time of TCAS-RA event, there was a vertical separation of 200 feet (ft) and a lateral separation of 6.2 NM between both aircraft.

SECTION 1 - FACTUAL INFORMATION

1.1. **History of the Flight**

1.1.1. On 04th March, 2022, PIA Flight PIA303, A320 aircraft, Reg. No. AP-BOL was operating from OPLA, Lahore, Pakistan to OPKC, Karachi, Pakistan on ATS route J112 – NSH – KC maintaining FL380.

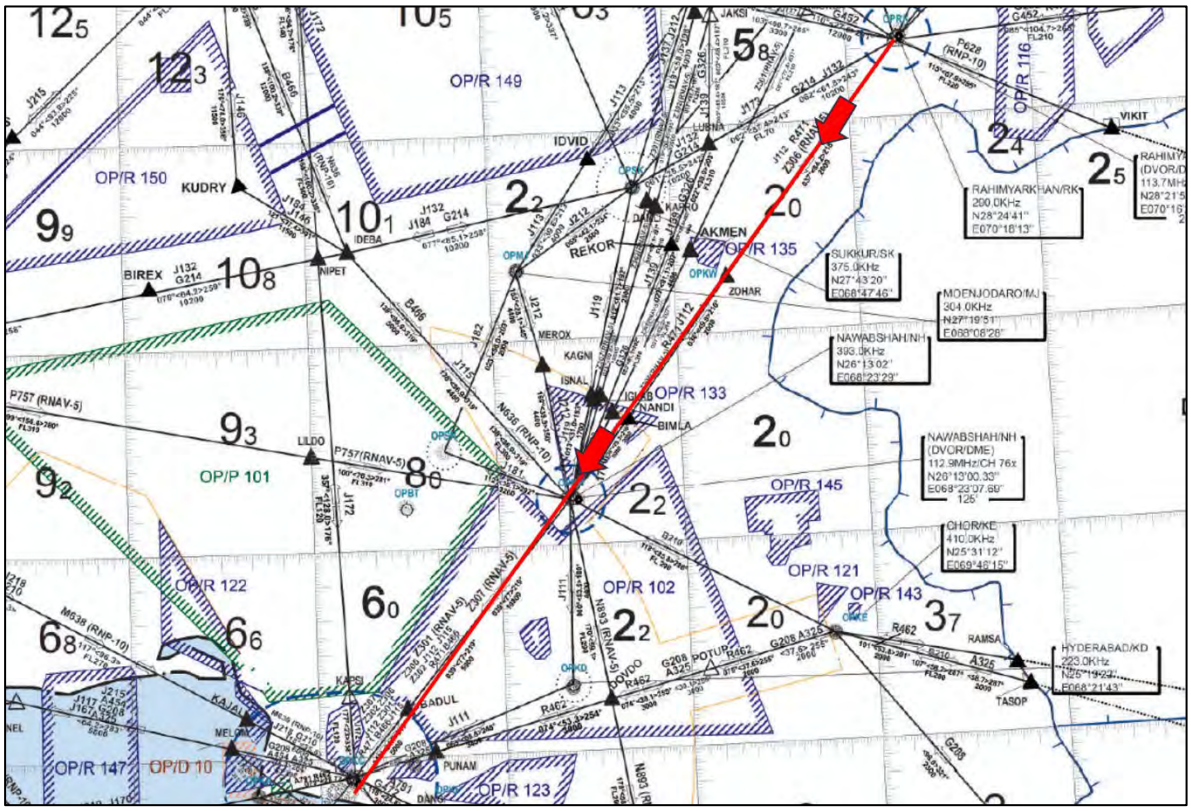

Figure 1 PIA303 Route

1.1.2. GHAURI-62, HBC aircraft was operating from OPSF, Karachi, Pakistan to OPRN, Rawalpindi, Pakistan on ATS route OPSF-NSH-Z301-OPRN climbing to FL390.

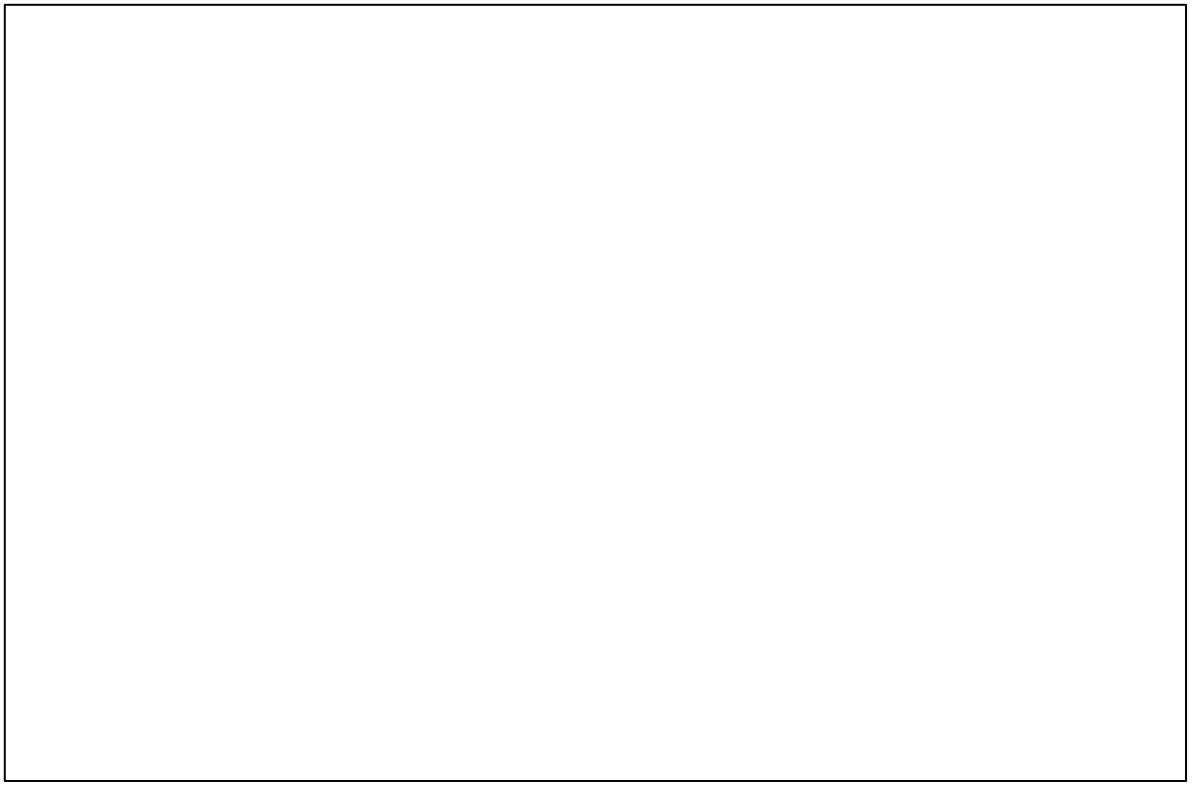

Figure 2 GHAURI-62 Route

1.1.3. At 06:51:00 h, GHAURI-62 came in contact with Karachi ACC East passing FL235 for FL310.

1.1.4. At 06:52:00 h, GHAURI-62 was re-cleared to FL390 [by trainee in coordination with his On-the-Job Training Instructor (OJTI)][4].

1.1.5. At 06:56:00 h, PIA303 checked position ZOHAR maintaining FL380 and was cleared direct to position MAKLI.

1.1.6. At 07:05:32 h, PIA303 informed Karachi ACC East that they are receiving reciprocal traffic climbing through its level. At that time reciprocal traffic GHAURI-62 was 20 NM from PIA303 climbing out of FL373 for FL390.

1.1.7. At 07:06:15 h, East Procedure Controller passed traffic information to GHAURI-62 regarding reciprocal traffic PIA303 at 9 NM maintaining FL380. At that time GHAURI-62 was passing FL376 for FL390. On response GHAURI-62 reported turning.

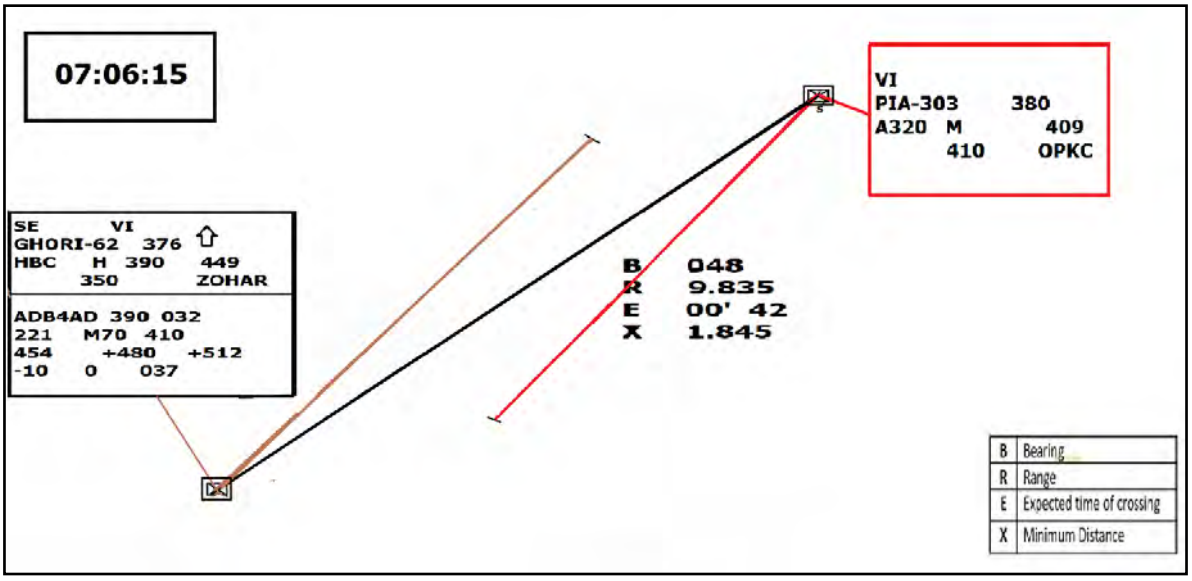

Figure 3 PIA303 Maintaining FL380

1.1.8. At 07:06:40 h, both aircraft reported TCAS-RA 30 NM North-East of Nawabshah. PIA303 initiated RA climb to FL385 whereas GHAURI-62 initiated RA descend to FL374 respectively.

[4] PCAA – Air Traffic Controller's statement

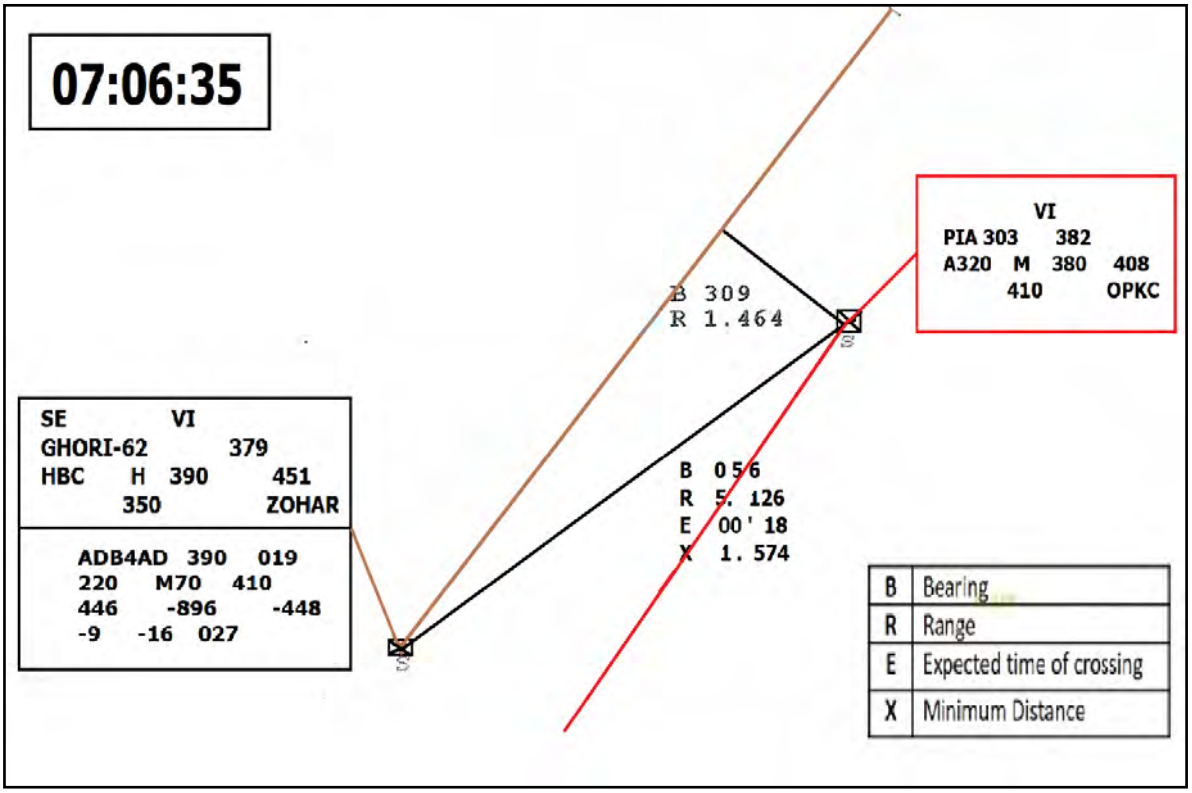

Figure 4 Aircraft initiated RA climb & descend

1.1.9. At the time of TCAS-RA, there was a vertical separation of 200 ft and a lateral separation of 6.2 nautical miles between both aircraft.

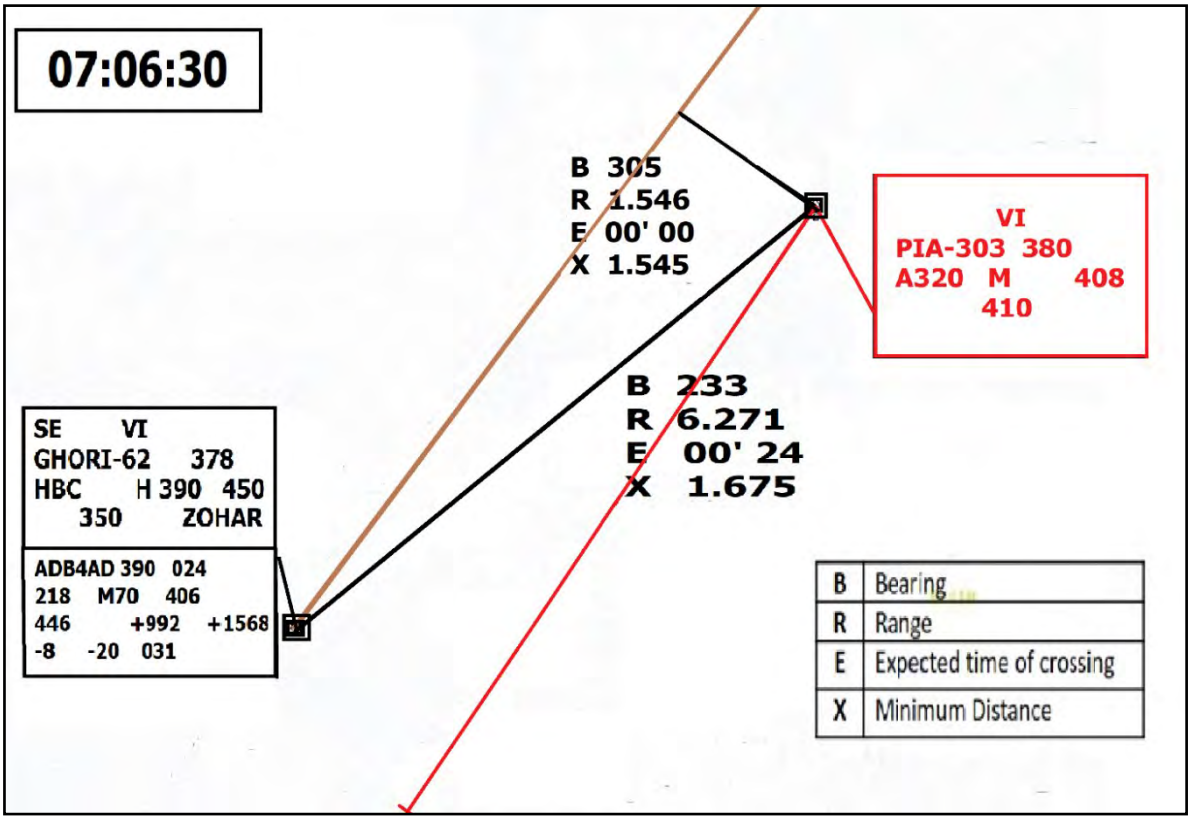

Figure 5 Vertical & Lateral separation

1.1.10. Once clear of conflict both aircraft proceeded to their destination without further incident.

1.2. Injuries to Person(s)

1.2.1. No injury was reported to any person on board any of the aircraft.

1.3. Damage to Aircraft

1.3.1. No damage was reported due to this incident to any of the aircraft.

1.4. Other Damage

1.4.1. Not Applicable.

1.5. Personnel Information

1.5.1. Not Applicable.

1.6. Aircraft Information

PIA303	
Aircraft Make & Model	Airbus 320-214
Registration Marking	AP-BOL
Manufacturer Serial No.	7792
Operator	Pakistan International Airlines
Sector	OPLA – OPKC

Table 1 PIA303 Aircraft details

GHAURI-62	
Aircraft Make & Model	Hawker Beechcraft Corporation
Registration Marking	0035
Manufacturer Serial No.	N/A
Operator	Pakistan Navy
Sector	OPSF – OPRN

Table 2 GHAURI-62 Aircraft details

1.7. Meteorological Information

1.7.1. No significant weather was reported by Meteorological Watch Office (MWO) at the time of the incident.

Terminal Aerodrome Forecast (TAF)
OPKC 0407 16006KT 6000 29/12 QNH019 NOSIG=

Table 3 TAF details for KC

1.8. Aids to Navigation

1.8.1. Not Applicable.

1.9. **Communications**

1.9.1. Navigational Aids for OPKC, Karachi are provided below: -

Table 4 Navigational Aids for OPKC, Karachi

1.10. **Aerodrome Information**

1.10.1. At the time of incident, no abnormality was reported. Aerodrome data of OPKC, Karachi is provided below: -

Designations RWY NR	*True bearing*	*Dimensions of RWY (M)*	*Strength (PCN) and surface of RWY and SWY*	*THR coordinates*	*THR elevation and highest elevation of TDZ of precision APP RWY*
1	2	3	4	5	6
07L	074.29	3200 x 46	54/R/C/X/U CONCRETE ACFT upto A310 are permitted	245416.90N 0670851.02E	THR23.50M/77FT
25R	254.29			245444.69N 0671040.84E	THR30.40M/100FT
07R	074.29	3400 x 45	87/R/B/W/T CONCRETE SWY bitumen	245402.15N 0670833.56E	THR21.62M / 71FT
25L	254.29			245431.79N 0671030.20E	THR27.25M / 89FT

Table 5 Aerodrome data of OPKC, Karachi

1.11. **Flight Recorders**

1.11.1. Not Applicable.

1.12. **Wreckage and Impact Information**

1.12.1. Not Applicable.

1.13. **Medical and Pathological Information**

1.13.1. Not Applicable.

1.14. **Fire**

1.14.1. Not Applicable.

1.15. **Survival Aspects**

1.15.1. Not Applicable.

1.16. **Test and Research**

1.16.1. Not Applicable.

1.17. **Organizational and Management Information**

1.17.1. Not Applicable.

1.18. **Additional Information**

1.18.1. **TCAS Working Principle –** TCAS stands for Traffic alert and Collision Avoidance System, and its purpose is to minimize the risk of mid-air collisions between aircraft. Working independently from Air Traffic Control, TCAS uses nearby aircraft's transponder signals to alert pilots to the danger of mid-air collisions. It does so by constructing a three-dimensional map of airspace through which the aircraft is travelling. In detecting the other aircraft's transponder signals, it can foresee the potential collisions based on speeds and altitude of planes passing through the airspace in question. If TCAS detects a potential collision, it will automatically notify each of the affected aircraft. In this instance, it will automatically initiate a mutual avoidance manoeuvre. This involves the system informing the crews of the aircraft in question both audibly and visibly to either climb or descend in a manner that ensures that, when their paths cross, they do not meet.

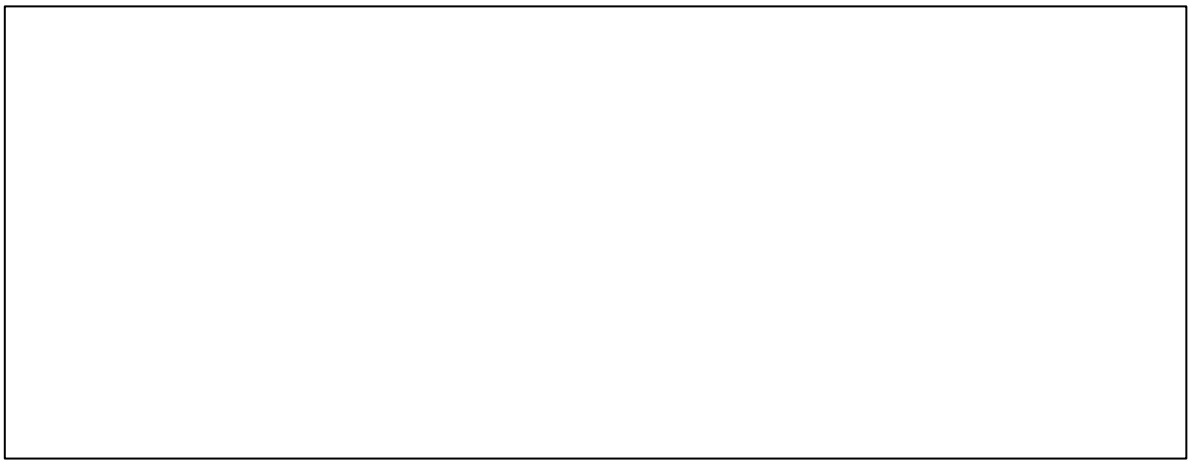

Figure 6 TCAS (TA) alert

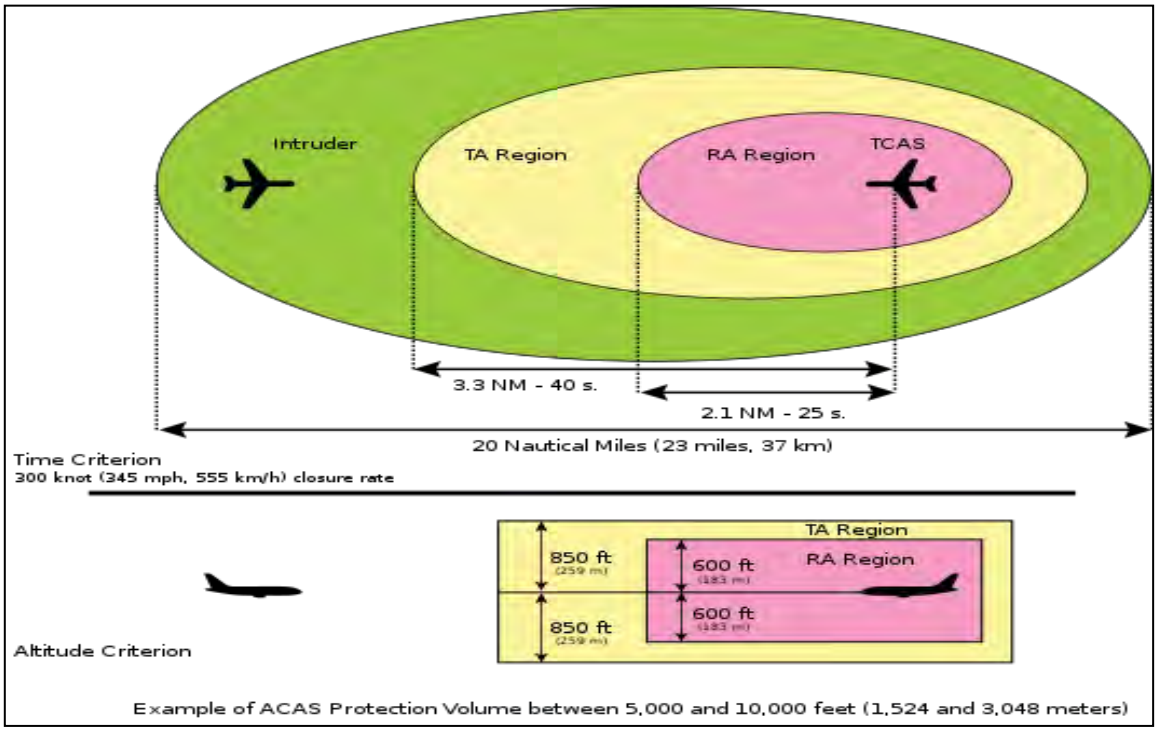

Figure 7 TCAS TA & RA ranges

1.18.2. **Airborne Collision Avoidance System (ACAS)**

1.18.2.1. The objective of ACAS is to provide advice to pilots for the purpose of avoiding potential collisions. This is achieved through Resolution Advisories (RAs), which recommend actions (including manoeuvres), and through Traffic Advisories (TAs), which are intended to prompt visual acquisition and to act as a precursor to RAs.

1.18.2.2. ACAS equipment in the aircraft interrogates Mode ‘A’ / ’C’ and Mode ‘S’ transponders on aircraft in its vicinity and listens for their replies. By processing these replies, ACAS determines which aircraft represent potential collision threats and provides appropriate display indications (or advisories) to the flight crew to avoid collisions.

1.18.2.3. **Traffic Advisories (TAs) -** TAs alert the flight crew to potential RAs and may indicate the range, range rate, altitude, altitude rate and bearing of the intruding aircraft relative to own aircraft. TAs without altitude information may also be provided on Mode ‘C’ or Mode ‘S’ equipped aircraft that have temporarily lost their automatic altitude-reporting capability. The information conveyed in TAs is intended to assist the flight crew in sighting nearby traffic.

1.18.2.4. **Resolution Advisories (RAs) -** If the threat detection logic in the ACAS computer determines that an encounter with a nearby aircraft could soon lead to a near-collision or collision, the computer threat resolution logic determines an appropriate vertical manoeuvre that will ensure the safe vertical separation of the two aircraft. The selected manoeuvres ensure adequate vertical separation within constraints imposed by the climb rate capability and proximity to the ground of the two aircraft.

1.18.2.5. The RAs provided to pilot can be divided into two categories: corrective advisories, which instruct pilot to deviate from the current flight path (“CLIMB” when aircraft is in level flight); and preventive advisories, which advise the pilot to maintain or avoid certain vertical speeds (“DON’T CLIMB” when aircraft is in level flight).

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SECTION 2 – ANALYSIS

2.1. **General**

2.1.1 On 04th March, 2022, PIA303, A320 aircraft, Reg. No. AP-BOL was operating from OPLA to OPKC on ATS route J112 – NSH – KC maintaining FL380.

2.1.2 Reciprocal traffic GHAURI-62, HBC aircraft, operating from OPSF to OPRN route OPSF – NSH – Z301 – OPRN established contact with Karachi ACC East at time 06:51 h, while passing FL235 for FL310.

2.1.3 Training was in progress at the ACC Procedure East position. The trainee controller had completed 250 hours of On-the-Job Training (OJT) and 45 watches.

2.1.4 The ACC Radar Controller (East) was not present at his duty position at the time of incident. According to his statement, he left the duty position at 06:50 h for a natural call, considering that the ACC Procedure Controller (East), who was also a rated radar controller will manage the position.

2.1.5 At 06:52 h, GHAURI-62 was re-cleared to FL390.

2.1.6 At 06:56 h, PIA303 checked position ZOHAR maintaining FL380 and was cleared direct to position MAKLI.

2.1.7 At 07:05:32-40 h, PIA303 informed Karachi ACC East about reciprocal traffic climbing through its level. At that time GHAURI-62 was 20 NM reciprocal to PIA303 climbing out of FL373 for FL390.

2.1.8 At 07:06:06 h, East Procedure Controller passed traffic information to GHAURI-62 regarding reciprocal traffic PIA303 at 9 NM maintaining FL380. At that time GHAURI-62 was passing FL376 for FL390 and on response it reported turning.

2.1.9 At 07:06:40 h, both aircraft received TCAS-RA 30 NM North-East of Nawabshah. PIA303 initiated RA climb to FL385 whereas Ghauri-62 initiated RA descent to FL374.

2.1.10 At the time of TCAS-RA, there was a vertical separation of 200 ft and a lateral separation of 6.2 NM between both aircraft.

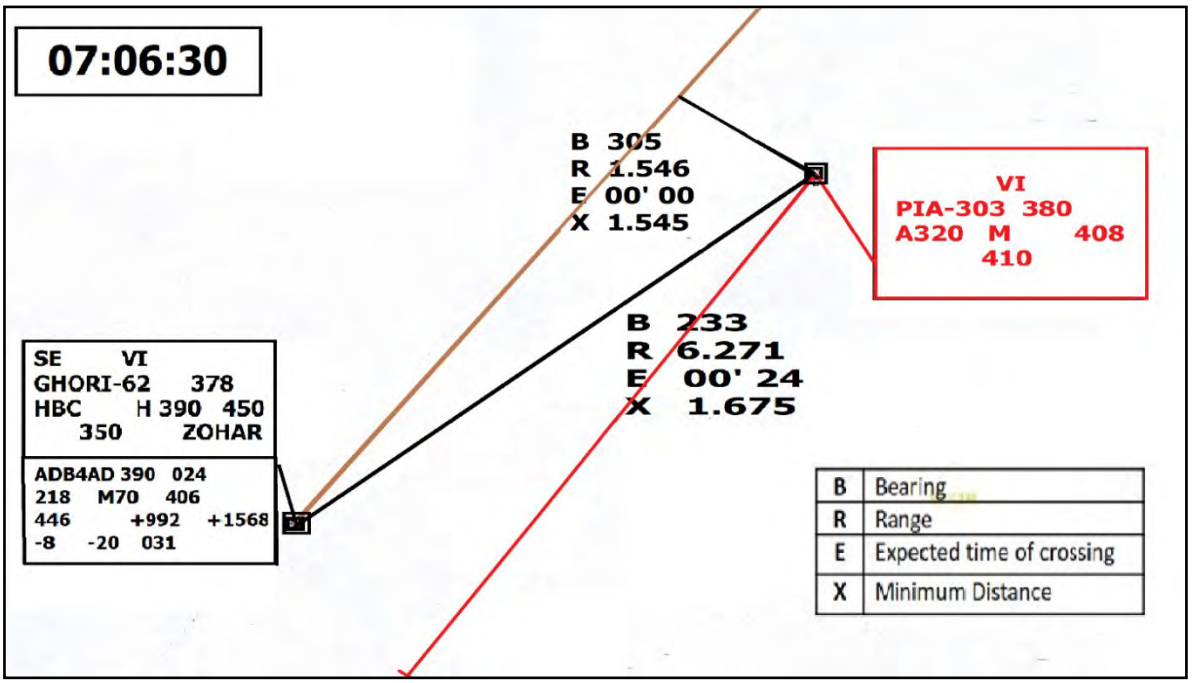

Figure 9 Vertical & Lateral Separation

2.1.11 Once clear of traffic, both aircraft proceeded to their destination without further incident.

2.1.12 The ACC Radar Controller (East) could have handed over the radar control position to the available team leader for better traffic management, instead of leaving the seat and assuming that the procedure controller, who was already pre-occupied with coordination with other units regarding military exercise, would manage the radar traffic in his absence.

3.2. Cause / Contributory Factors

3.2.1. Cause

3.2.1.1. Absence of ACC Radar Controller East from his radar executive position considering that ACC Procedure Controller (East), being radar rated would manage the position during his absence.

3.2.1.2. Activation of TCAS – RA **(MAC – Mid Air Collision)** due to lack of situational awareness by the ACC Procedure Controller.

3.2.2. Contributory Factors

3.2.2.1. Lack of supervision by ACC Procedure Controller East as OJTI due to engagement in training as well as coordination with other units.

3.2.2.2. Lack of involvement and supervision by Team Leader.

Note: Aviation Occurrence Category (ADREP Taxonomy)
*"**Mid-Air Collision (MAC):** Separation-related occurrences caused by either air traffic control or cockpit crew*

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SECTION 4 – SAFETY RECOMMENDATIONS

4.1. Safety Recommendations

4.1.1. PAA to implement rigorous training for Procedure Controllers and OJTIs to handle simultaneous tasks effectively, especially during critical situations like military exercises or high traffic scenarios.

4.1.2. Ensure that all Radar Controllers positions are manned positively to avoid attention diversion and pre-occupation of other controllers. A dedicated controller may be deployed for coordination among units during high density traffic / Military exercises.

4.1.3. Effective involvement and supervision by Team Leaders / Supervisors may avoid such recurrences in future.