

FINAL INVESTIGATION REPORT

SERIOUS INCIDENT OF TCAS – RA

SCOPE

Aircraft Accident Investigation Board (AAIB), 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 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 AAIB 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.

Extracts may be published without specific permission provided that the source is duly acknowledged, and the material is reproduced accurately, and is not used in a derogatory manner or in a misleading context.

TABLE OF CONTENTS

SECTION 1 - FACTUAL INFORMATION	8
1.1. History of the Flight.....	9
1.2. Injuries to Persons	11
1.3. Damage to Aircraft.....	11
1.4. Other Damages	11
1.5. Personnel Information.....	11
1.6. Aircraft Information	11
1.7. Meteorological Information	11
1.8. Aids to Navigation.....	11
1.9. Communications.....	12
1.10. Aerodrome Information	12
1.11. Flight Recorders	12
1.12. Wreckage and Impact Information.....	12
1.13. Medical and Pathological Information	12
1.14. Fire	12
1.15. Survival Aspects	12
1.16. Test & Research	12
1.17. Organizational and Management Information.....	12
1.18. Additional Information	12
1.19. Useful & Effective Investigation Techniques.....	12
SECTION 2 – ANALYSIS	13
2.1. General.....	15
SECTION 3 – CONCLUSIONS	16
3.1. Findings	17
SECTION 4 – SAFETY RECOMMENDATIONS	18
4.1. Safety Recommendations.....	19

LIST OF FIGURES

S. No	Title	Page Number
1.	Figure 1 Radar Display Picture PIA 585 on FL100↓	9
2.	Figure 2 Radar Display Picture PIA 585 on FL101↑	10
3.	Figure 3 Radar Display Picture PIA 585 on FL102↑	10

ABBREVIATIONS

AAIB	Aircraft Accident Investigation Board
CARs	Civil Aviation Rules
CPA	Closest Point of Approach
JIAP	Jinnah International Airport, Karachi
FL	Flight Level
ft	Feet
IOU	Incident Occurrence and Unserviceability
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
kts	Knots
NM	Nautical Miles
PAF	Pakistan Air Force
PIA	Pakistan International Airlines
PCAA	Pakistan Civil Aviation Authority
R/W	Runway
TCAS-RA	Traffic Alert and Collision Avoidance System– Resolution Advisory
UTC	Universal Time Coordinated

INTRODUCTION

The incident was reported by PCAA Incident Occurrence and Unserviceability (IOU) Report for the period 150000 UTC to 160000 Universal Time Co-ordinated (UTC). Ministry of Aviation, Government of Pakistan issued Memorandum and Corrigendum for the investigation. The investigation has been conducted by Aircraft Accident Investigation Board (AAIB), Pakistan.

SYNOPSIS

On 15th February, 2018, Pakistan International Airline (PIA) flight PIA 585, ATR 42-500 aircraft, Reg. No. AP-BHP was a scheduled passenger flight from Dera Ghazi Khan Airport to Jinnah International Airport (JIAP), Karachi. PIA 585 reported Traffic Alert and Collision Avoidance System – Resolution Advisory (TCAS – RA) while maintaining Flight Level (FL) 100, Military Traffic, Pakistan Air Force (PAF) TIGER-1 03 x F16, operating from Bholari to Bholari and returning from Masroor Training Area via QILLA maintaining FL80, was the crossing traffic. At the time of TCAS – RA vertical separation of 2,000 feet (ft) existed. Traffic information was passed well before time by Approach. All available evidences were analyzed by AAIB Pakistan.

SECTION 1 - FACTUAL INFORMATION

1.1. History of the Flight

1.1.1. On 15th February, 2018, PIA 585 ATR 42-500 aircraft Reg. No. AP-BHP departed at 0410 UTC from Dera Ghazi Khan Airport to JIAP, Karachi to perform a regular commercial passenger flight. The enroute flight was uneventful. Meanwhile, a formation of PAF 03 x F16 aircraft having call sign TIGER-1 were operating from Bholari to Bholari and returning back from Masroor Training Area. Accordingly, all corresponding timings mentioned in UTC.

1.1.2. At 05:22:21, TIGER-1 tried to contact Karachi Approach but no response was received from Karachi Approach.

1.1.3. At 05:22:35, PIA 585 contacted Karachi Approach who identified the aircraft and advised to maintain FL100 due to military traffic moving from right to left and maintaining FL80. PIA 585 acknowledged to maintain FL100 and informed that they have copied traffic information, further they have the traffic on TCAS.

1.1.4. At 05:22:53, TIGER-1 again contacted Karachi Approach and informed that they are maintaining FL80. Karachi approach advised TIGER-1 to report ready for descend.

1.1.5. At 05:24:24, PIA 585 requested for descend. Karachi Approach informed PIA 585 about conflicting traffic approaching 2 o'clock and 13 NM, maintaining FL80. Karachi Approach advised PIA 585 to expect descend after approximately 02 minutes once clear of conflicting traffic. PIA 585 acknowledged that they have copied the conflicting traffic.

1.1.6. At 05:25:29, Karachi Approach Radar display showed PIA 585 on a bearing of 082° to TIGER-1 and range was 5.8 NM. PIA 585 was showing FL100↓ and two out of three military aircraft showing their transponder FL77 and FL79↑.

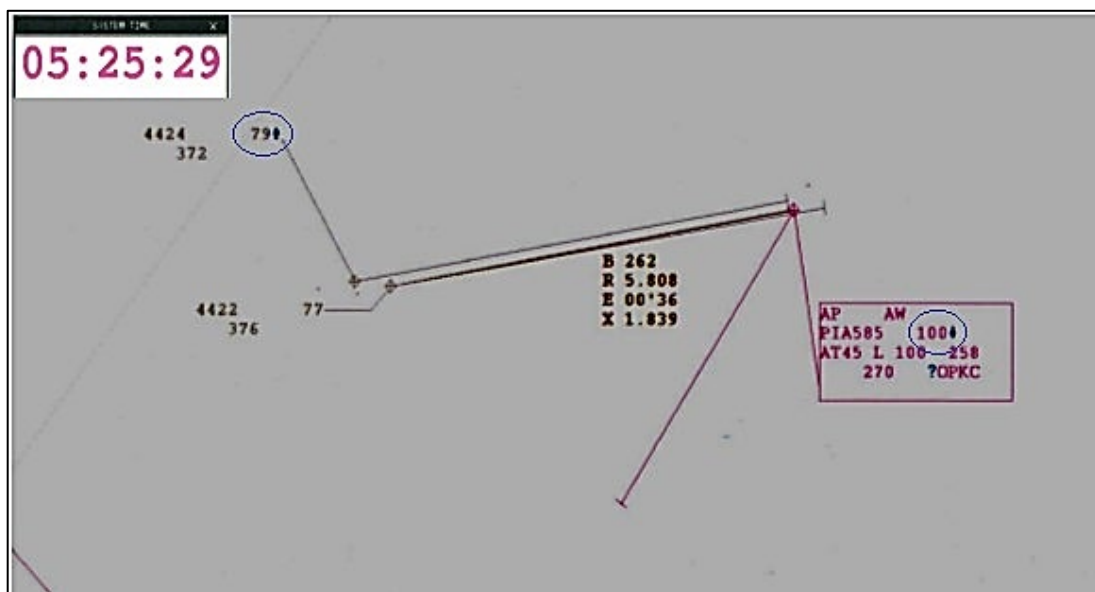


Figure 1 Radar Display Picture PIA 585 on FL100↓

1.1.7. At 05:25:45, Karachi Approach Radar display showed PIA 585 on a bearing of 095° to TIGER-1 and range was 3.6 NM. PIA 585 was showing climbed to FL101↑ and two out of three military aircraft showing their transponder FL77 and FL75↓.

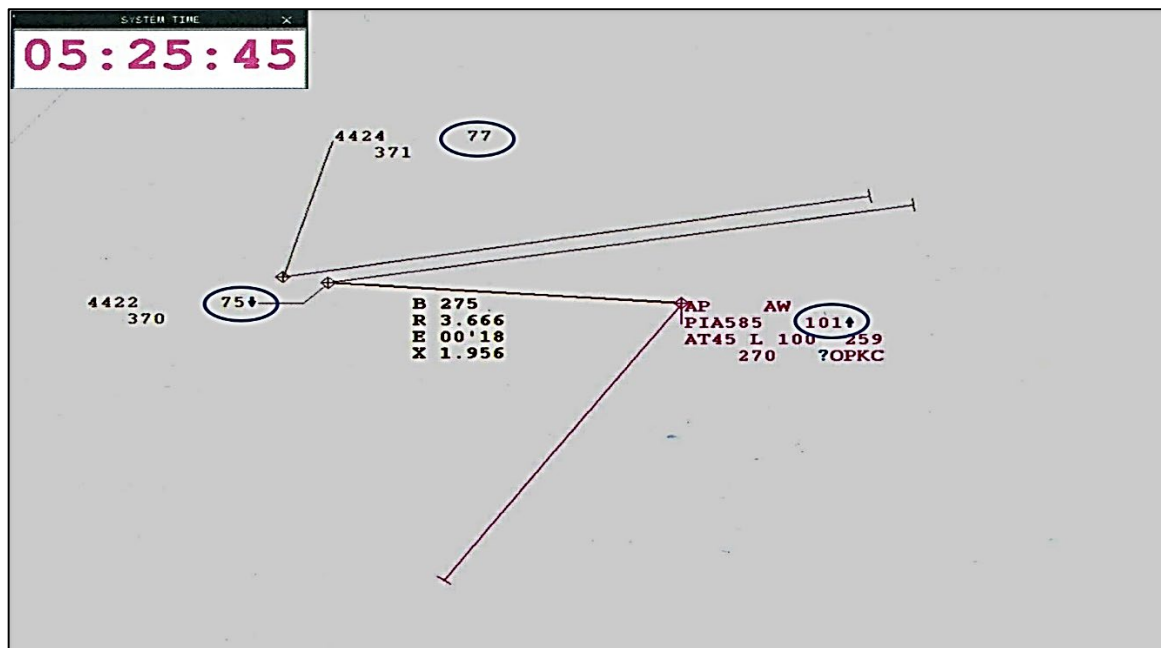


Figure 2 Radar Display Picture PIA 585 on FL101↑

1.1.8. At 05:25:49, Karachi Approach confirmed TIGER-1 distance from Karachi. TIGER-1 reported 23 NM from Karachi. Karachi Approach copied and gave descend to FL50.

1.1.9. At 05:25:53, Karachi Approach Radar display showed PIA 585 on a bearing of 116° to TIGER-1 and range was 2.45 NM. PIA 585 was showing climb to FL102↑ and two out of three military aircraft showing their transponder FL75 and FL76.

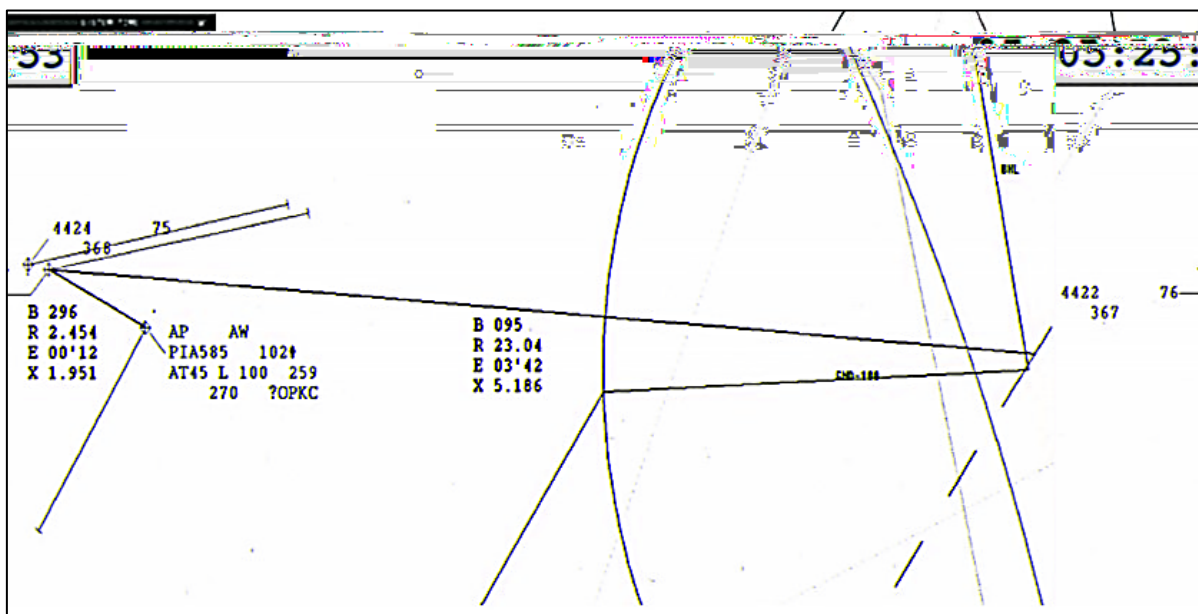


Figure 3 Radar Display Picture PIA 585 on FL102↑

1.1.10. At 05:26:17, PIA 585 reported TCAS – RA. Karachi Approach informed PIA 585 that traffic crossed behind your aircraft and later confirmed level of TIGER-1 which was FL50.

1.1.11. At 05:27:27, Karachi Approach cleared PIA 585 for ILS Approach runway (R/W) 25L and descend 3,000 ft on QNH.

1.1.12. Thereafter flight was uneventful. PIA 585 landed safely at Karachi at 05:38:00.

1.2. Injuries to Persons

1.2.1. During this occurrence there was no injuries to crew and passengers.

1.3. Damage to Aircraft

1.3.1. During this occurrence there was no damage to aircraft.

1.4. Other Damages

1.4.1. No other damages were reported.

1.5. Personnel Information

1.5.1. Not Applicable.

1.6. Aircraft Information

Aircraft	
Operator	Pakistan International Airlines
Call Sign	PIA 585
Aircraft Make & Model	ATR / 42-500
Registration Marking	AP-BHP
Sector	OPDG-OPKC
Level	FL100
Aircraft	
Operator	Pakistan Air Force
Call Sign	TIGER-1
Aircraft Make & Model	Military (Lockheed Martin F-16)
Registration Marking	-
Sector	Bholari – Bholari
Level	FL80

1.7. Meteorological Information

1.7.1. No significant weather was reported at the time of the incident which could have possibly contributed to the accident.

1.8. Aids to Navigation

1.8.1. Navigation facilities were fully functional during the event flight.

1.9. Communications

1.9.1. At the time of the incident no abnormality was reported.

1.10. Aerodrome Information

1.10.1. Not Applicable.

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 & Research

1.16.1. Not Applicable.

1.17. Organizational and Management Information

1.17.1. Not Applicable.

1.18. Additional Information

1.18.1. Not Applicable.

1.19. Useful & Effective Investigation Techniques

1.19.1. Not Applicable.

INTENTIONALLY LEFT BLANK

SECTION 2 – ANALYSIS

2.1. General

2.1.1. PIA 585 schedule arrival for JIAP, Karachi from DG Khan airport, contacted Karachi Approach while descending FL100.

2.1.2. TIGER-1 Military formation of PAF 03 x F16 returning from Masroor training area to Bholari contacted Karachi Approach maintaining FL80. Out of three two aircraft were Squawking 4422 and 4424 and level varying between FL77 and FL79.

2.1.3. On initial contact with PIA 585 Karachi approach advised to maintain FL100 due to military traffic moving from right to left maintain FL80. Same was acknowledged by PIA 585.

2.1.4. PIA 585 was provided traffic information second time when they requested for descend. At that time military aircraft were approaching 2 o' clock (13 NM) to PIA 585 and level of military aircraft varying between FL77 and FL79.

2.1.5. While descending FL100 PIA 585 reported TCAS – RA as military aircraft approached approximately 3 o'clock, about 5 NM.

2.1.6. Military aircraft remain all the time below FL80. PIA 585 never crossed below FL100, and initiated climb to FL102 on TCAS – RA.

2.1.7. The TCAS system on board the aircraft constantly monitors for the signals from the transponders of other nearby aircraft. It uses these signals to evaluate possible collision threats by determining: -

2.1.7.1. The bearing of an intruder aircraft.

2.1.7.2. The distance between the intruder and the aircraft, and the rate of closure / separation.

2.1.7.3. The relative altitude of intruders using Mode C or Mode S transponders.

2.1.8. The TCAS computer uses these inputs to build a model of the trajectory of the intruder, the resulting Closest Point of Approach (CPA) and the time until the CPA.

2.1.9. The radar picture showed that the bearing of military aircraft at time 05:25:29 was heading towards PIA 585 with FL79↑ having attitude of climb, however, the aircraft never initiated climb. At that moment speed was around 372 knots (kts). All these factors triggered TCAS – RA and PIA 585 climbed FL102.

SECTION 3 – CONCLUSIONS

3.1. Findings

- 3.1.1. PIA 585 was restricted to maintain FL100 by Approach Controller and the same was acknowledged and complied by the aircraft.
- 3.1.2. Traffic information about Military Traffic at FL80 was timely passed twice to PIA 585.
- 3.1.3. After setting course from QILLA to Bholari, only two aircraft of the formation (A4422 & A4424) remain displayed on radar.
- 3.1.4. Formation Leader reported maintaining FL80 on two-way contact with ATC. Later Formation given descend to FL50 to accommodate descend of PIA 585.
- 3.1.5. There remain 2,000 ft separation all the time.
- 3.1.6. The radar picture showed that the bearing of Military aircraft at the time 05:25:29 was heading towards PIA 585 with FL79↑ having altitude of climb, however, the aircraft never initiated climb. At that moment speed was around 372 kts. All these factors triggered TCAS – RA and PIA 585 climbed FL102.

3.2. Causes / Contributing Factors

- 3.2.1. Probably PIA 585 received TCAS – RA and climb FL102 due to abrupt attitude change of military aircraft for few seconds. As military aircraft were maintaining high speed and their heading showed towards PIA 585, PIA 585 might have received TCAS – RA, Mid Air Collision (MAC).

Note: Aviation Occurrence Category (ADREP Taxonomy)

“Mid-Air Collision (MAC): Traffic Collision Avoidance System (TCAS) / Airborne Collision Avoidance System (ACAS) alerts, loss of separation as well as near collisions or collisions between aircraft in flight”.

SECTION 4 – SAFETY RECOMMENDATIONS

4.1. Safety Recommendations

4.1.1. No Safety Recommendations issued by AAIB Pakistan.