

## FINAL INVESTIGATION REPORT



**SERIOUS INCIDENT OF TCAS – RA REPORTED BY  
AIRBLUE FLIGHT ABQ 211 AIRBUS 320 AIRCRAFT  
REG. NO. VN-A650 (ON WET LEASE) AT  
ISLAMABAD ON 03-04-2018**

## SECTION 1 - FACTUAL INFORMATION

## 1.1. History of the Flight

1.1.1. On 3<sup>rd</sup> April 2018, Airblue flight ABQ 211, Airbus 320 aircraft, Reg. No. VN-A650 was operating from Dubai International Airport, Dubai to BBIAP, Islamabad on route PG – G325 – HANGU – J139 – FATEH – OPRN.



Figure 1 ABQ 211 Route plan

1.1.2. While approaching position HANGU, ABQ 211 came in contact with Cherat Approach and was given descent to FL150.

1.1.3. Military traffic, a formation of 02 x Fighters from PAF Base Minhas to Pindi Gheb was crossing ATS route J139 from North to South at FL140.

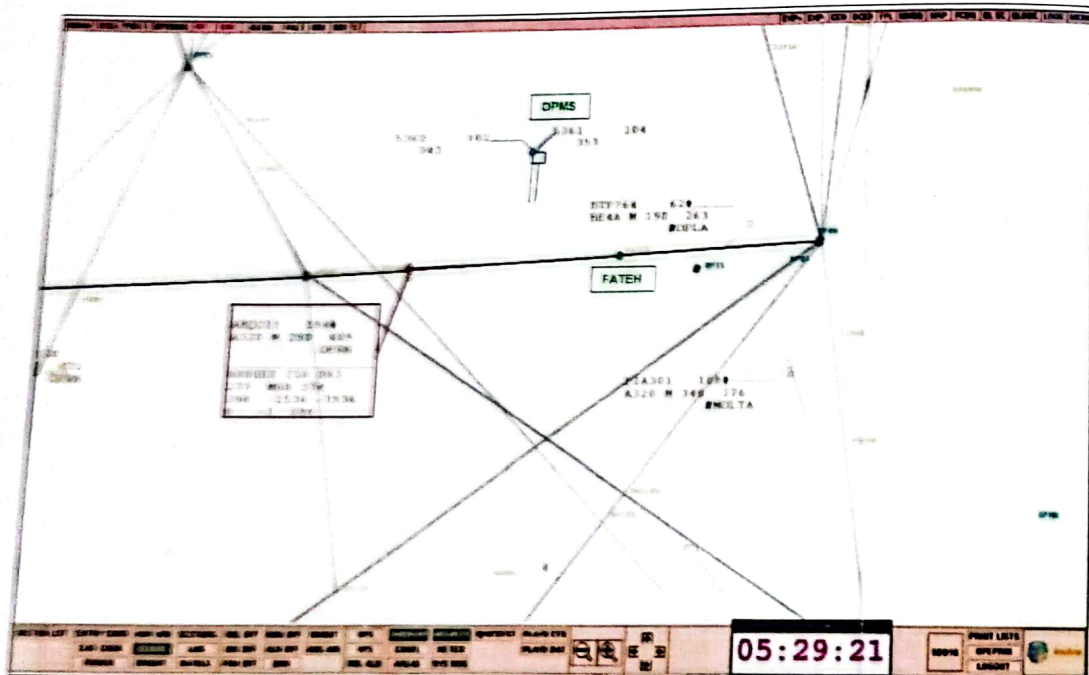


Figure 2 Military Traffic crossing Route J139 from North to South

1.1.4. At 05:29:00 hours (h) when ABQ 211 was 40 NM west of position FATEH, while passing FL180, it was re-cleared FL160 by Cherat Approach.



1.1.5. At 05:31:02 h, while ABQ 211 was 30 NM West of position FATEH descending through FL166, it reported TCAS – RA due traffic.

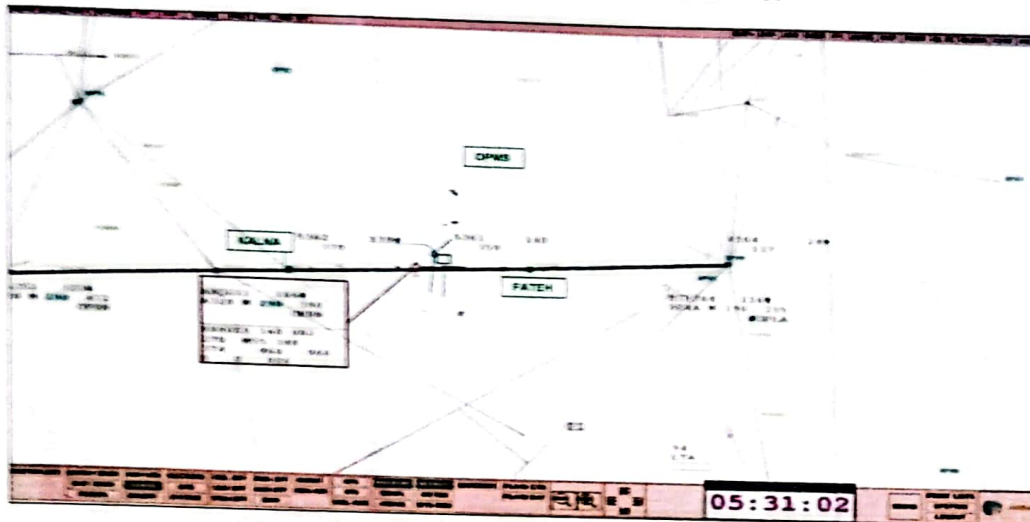


Figure 3 Activation of TCAS – RA of ABQ 211

1.1.6. At 05:31:22 h, Mode C of Fighter aircraft No 2 showed a climb up to FL148. At this time, ABQ 211 also initiated climb as a result of RA activation.

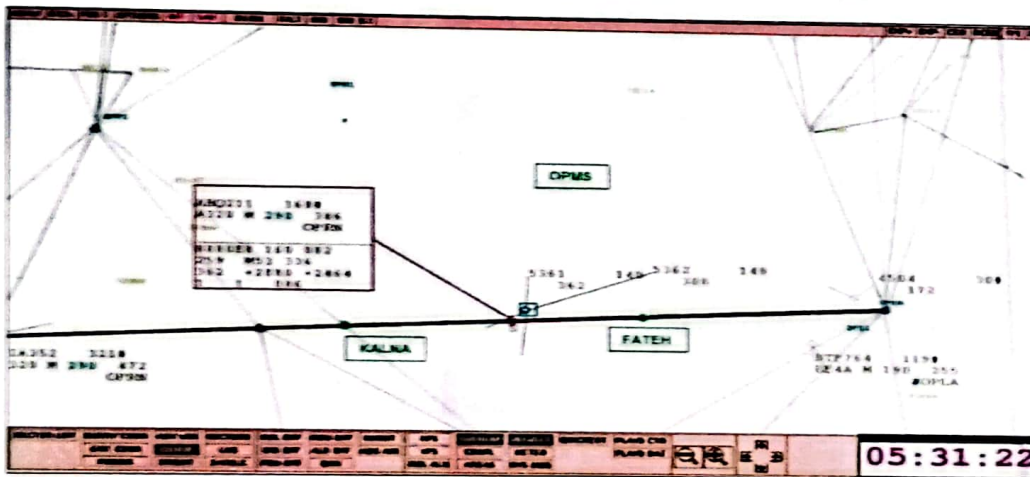


Figure 4 ABQ 211 initiated climb

1.1.7. Vertical Separation of approximately 1,800 ft existed between both the aircraft at the time of RA.

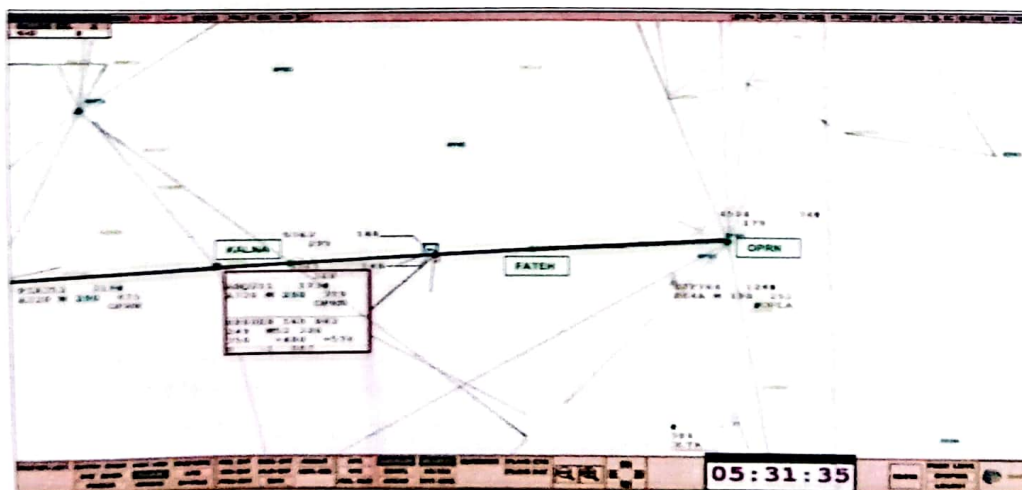


Figure 5 Vertical Separation of 1,800 ft between ABQ 211 & Military Traffic

1.1.8. At 05:31:35 h, while both the fighters were crossing the path of ABQ 211, ABQ 211 was at FL173 and Military aircraft (No. 2 of the formation) was maintaining FL148.

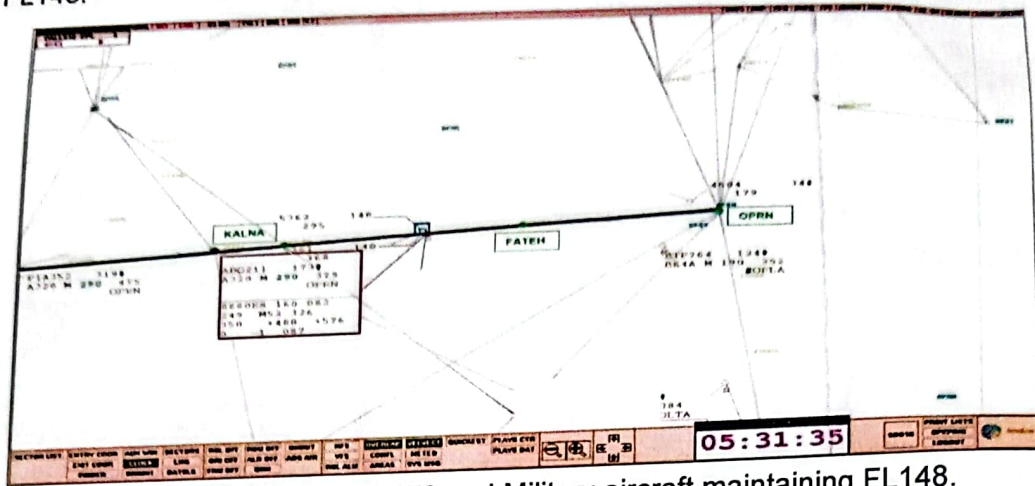


Figure 6 ABQ 211 at FL173 and Military aircraft maintaining FL148.

1.1.9. Thereafter, PAF Formation proceeded for their mission profile and ABQ 211 continued its flight to its destination and landed safely without any further incident.

## 1.2. Injuries to Person(s).

1.2.1. No injury was reported to any person on board 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

| ABQ 211                 |                        |
|-------------------------|------------------------|
| Aircraft Make & Model   | Airbus A320            |
| Registration Marking    | VN-A650                |
| Manufacturer Serial No. | 6457                   |
| Operator                | Airblue                |
| Sector                  | Dubai to Islamabad     |
| Maximum Take-off Weight | 77,000 kilograms (kgs) |
| Maximum Landing Weight  | 64,500 kgs             |
| Maximum Fuel Capacity   | 27,200 Liters (L)      |
| Altitude                | FL160                  |

Table 1 Aircraft Information

## 1.7. Meteorological Information

1.7.1. No significant weather was reported at BBIAP, Islamabad at the time of the incident.

| Meteorological Aerodrome Report (METAR) BBIAP, Islamabad   |
|------------------------------------------------------------|
| OPRN 030500Z 27004KT 7000 NSC 24/14 Q1015 NOSIG RMK A2998= |

Table 2 METAR details BBIAP, Islamabad

| METAR BBIAP, Islamabad |                                                                                      |
|------------------------|--------------------------------------------------------------------------------------|
| OPRN                   | (Station ID) BBIAP, Islamabad                                                        |
| 030500Z                | (Date and Time) Day 03, Time 05:00 UTC                                               |
| 27004KT                | Wind Direction & Speed- Wind Direction: 270°, Speed: 04 knots (kts)                  |
| 7000                   | Visibility- 7,000 meters (m).                                                        |
| NSC                    | No significant cloud (NSC)                                                           |
| 24/14                  | Temperature: 24°C, Dewpoint: 14°C                                                    |
| Q1015                  | Altimeter setting- Air pressure 1015 hpa                                             |
| NOSIG                  | No significant change is expected to the reported conditions within the next 2 hours |
| RMK                    | Remarks                                                                              |
| A2998                  | Altimeter setting- Air pressure is 29.98 inches of mercury                           |

Table 3 METAR description at time 030500Z



## 1.8. Aids to Navigation

1.8.1. Navigational aids for BBIAP, Islamabad are provided below.

| TYPE OF AID<br>(CAT of ILS<br>VAR VOR/ILS) | ID          | Frequency          | Hours of<br>operation | Site of<br>transmitting<br>antenna<br>coordinates | Elevation of DME<br>transmitting<br>antenna | Remarks |
|--------------------------------------------|-------------|--------------------|-----------------------|---------------------------------------------------|---------------------------------------------|---------|
| 1                                          | 2           | 3                  | 4                     | 5                                                 | 6                                           | 7       |
| ILS/LOC CAT I<br>30                        | IRN         | 110.3 MHz          | H24                   | 333728.90N<br>0730451.72E                         | 522.000000 M                                | -       |
| DVOR/DME<br>(2/2015)                       | RN          | 112.1 MHz<br>CH58X | H24                   | 333621.39N<br>0730733.37E                         | 504.47M                                     | -       |
| GP/DME 30                                  | DOTS/DASHES | 335.0 MHz<br>CH40X | H24                   | 333639.92N<br>0730629.53E                         | -                                           | -       |

Table 4 Radio Navigation & Landing Aids BBIAP, Islamabad

1.8.2. There was no abnormality reported regarding Navigational Aids at BBIAP, Islamabad during the time of incident.

## 1.9. Communications

1.9.1. Communication frequencies for BBIAP, Islamabad are provided below.

| Service designation | Call sign       | Frequency   | Hours of operation | Remarks             |
|---------------------|-----------------|-------------|--------------------|---------------------|
| 1                   | 2               | 3           | 4                  | 5                   |
| APP                 | Cherat Approach | 125.60 MHZ  | H24                | Primary Frequency.  |
| APP                 | Islamabad APP   | 124.90 MHZ  | H24                | Primary frequency   |
| ATIS                | ATIS            | 129.60 MHZ  | H24                | -                   |
|                     | Radio           | 2923.00 KHZ | H24                | -                   |
|                     | Radio           | 5601.00 KHZ | H24                | -                   |
| BS                  | Radio Pakistan  | 1150.00 KHZ | HX                 | -                   |
| TWRChaklala Tower   | Chaklala Tower  | 119.70 MHZ  | H24                | Secondary Frequency |
| TWRChaklala Tower   | Chaklala Tower  | 121.50 MHZ  | H24                | Emergency Frequency |
| TWRChaklala Tower   | Chaklala Tower  | 123.70 MHZ  | H24                | Primary Frequency   |
| APP                 | Islamabad APP   | 125.50 MHZ  | H24                | Secondary Frequency |

Table 5 Communication & Radio Navigational Aids, BBIAP, Islamabad

1.9.2. There was no abnormality reported regarding Communication facilities at BBIAP, Islamabad during the time of incident.

## 1.10. Aerodrome Information

1.10.1. Aerodrome data of BBIAP, Islamabad is provided below. At the time of incident, no abnormality was reported.

| Designations<br>RWY NR  | True bearing            | Dimensions of<br>RWY (M)  | Strength<br>(PCN)<br>and surface of<br>RWY and SWY | THR coordinates           | THR elevation<br>and highest<br>elevation of<br>TDZ of<br>precision APP<br>RWY | Slope of<br>RWY/SWY                                                                                                                                                                                 |
|-------------------------|-------------------------|---------------------------|----------------------------------------------------|---------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                       | 2                       | 3                         | 4                                                  | 5                         | 6                                                                              | 7                                                                                                                                                                                                   |
| 12                      | 118.00°                 | 3291 x 46                 | 111/F/C/W/T<br>Bitumen                             | 333721.41N<br>0730508.49E | THR 506.00 M /<br>1660.10 FT                                                   | 0.150% up till<br>1881 M from<br>displaced THR                                                                                                                                                      |
| 30                      | 298.00°                 | 3291 x 46                 | 111/F/C/W/T<br>Bitumen                             | 333639.32N<br>0730642.38E | THR 505.00 M /<br>1658.62 FT                                                   | 0.500% up till<br>762 M from<br>displaced THR<br>then .15%                                                                                                                                          |
| SWY<br>dimension<br>(M) | CWY<br>dimension<br>(M) | Strip<br>dimension<br>(M) | RESA<br>dimension<br>(M)                           | Arresting<br>system       | Obstacle<br>Free Zone                                                          | Remarks                                                                                                                                                                                             |
| 8                       | 9                       | 10                        | 11                                                 | 12                        | 13                                                                             | 14                                                                                                                                                                                                  |
| 229                     | -                       | -                         | -                                                  | -                         | -                                                                              | THR RWY 12 displaced 274 m.<br>LCN 68 for 274 m (900') in the<br>portion of runway before displaced<br>THR RWY 12. Fair weather strip<br>on both sides of RWY 12 not<br>available due uneven level. |
| 213                     | -                       | -                         | -                                                  | -                         | -                                                                              | THR RWY 30 displaced 274 m.<br>Fair weather strip on<br>both sides of RWY 30 not<br>available due uneven level.                                                                                     |

Table 6 Aerodrome Information BBIAP, Islamabad

**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 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.

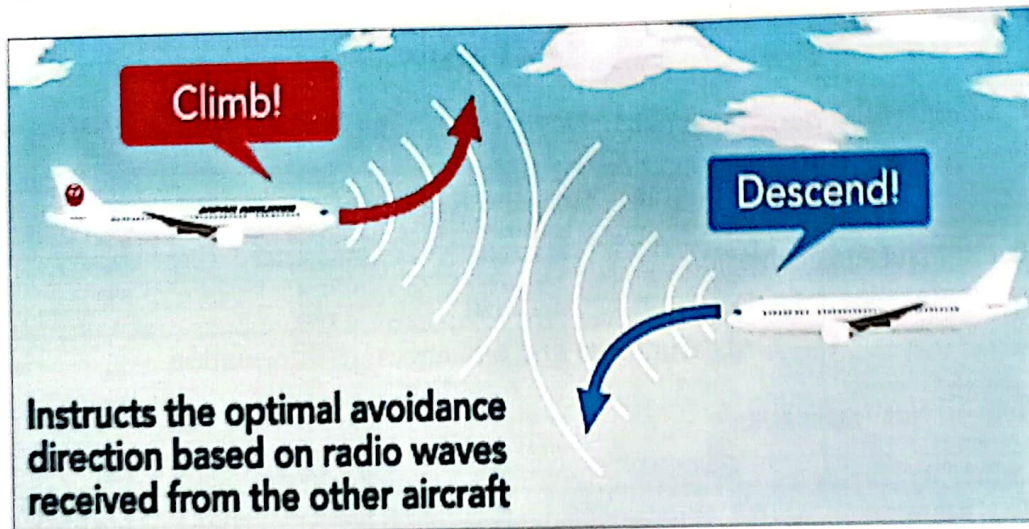


Figure 7 TCAS (TA) alert

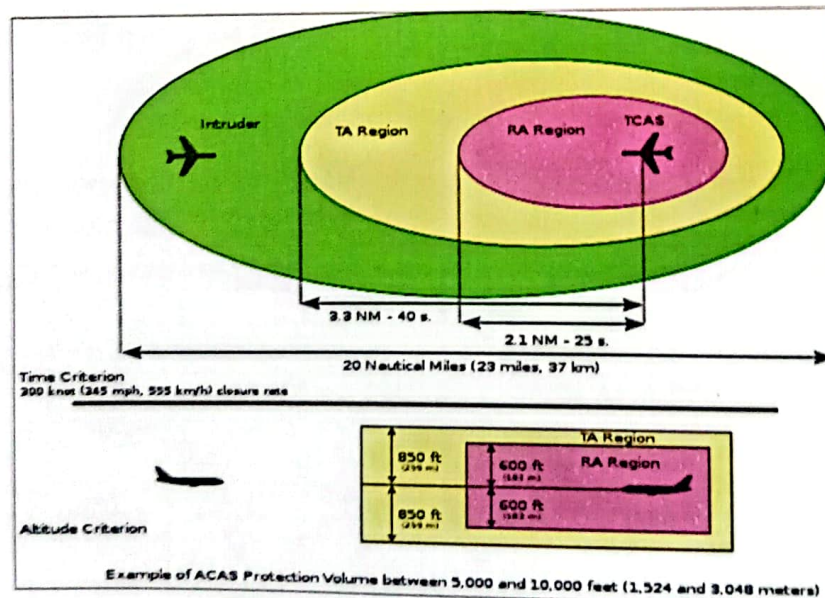


Figure 8 TCAS TA &amp; RA ranges

**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).

1.18.2.6. **Warning Times** - In any potential collision, ACAS generates an RA nominally 15 to 35 seconds (s) before the Closest Point of Approach (CPA) of the aircraft. The ACAS equipment may generate a TA up to 20 s in advance of an RA. Warning times depend on Sensitivity Levels (SLs) of RAs.



1.18.3. **Traffic Display Symbology** – On the TCAS traffic display both colour and shape are used to assist the pilot in interpreting the displayed information.

1.18.3.1. Own-aircraft is depicted as a white or yellow aircraft-like symbol. Targets are displayed by different symbols, according to their threat status

1.18.3.2. Hollow white diamond – for other traffic. (No threat).

1.18.3.3. Solid white diamond – for proximate traffic.

1.18.3.4. Solid yellow or amber circle – for intruders (i.e. aircraft which trigger a TA).

1.18.3.5. Solid red square – for threats (i.e. aircraft which trigger an RA).



Figure 9 Traffic Display

### 1.19. Useful & Effective Investigation Techniques

1.19.1. Standard investigation procedures and techniques were used during the course of investigation.



## **SECTION 2 – ANALYSIS**

## 2.1. General

- 2.1.1. On 3<sup>rd</sup> April 2018, Airblue Flight No. ABQ 211 was a scheduled passenger flight operating from Dubai International Airport, Dubai to BBIAP, Islamabad on route PG – G325 – HANGU – J139 – FATEH – OPRN.
- 2.1.2. No significant weather was reported at BBIAP, Islamabad as well as surrounding areas at the time of the incident.
- 2.1.3. While approaching position HANGU, ABQ 211 came in contact with Cherat Approach and was given descend to FL150 in the Area of Responsibility (AOR) of Cherat Approach.
- 2.1.4. Military traffic, a formation of 02 x Fighter aircraft from PAF Base Minhas to Pindi Gheb was crossing ATS route J139 from North to South at FL140 for their routine mission.
- 2.1.5. At 05:29:00 h, when ABQ 211 was 40 NM west of position FATEH, while passing FL180, it was re-cleared FL160 by Cherat Approach to ensure separation of 2,000 ft between ABQ 211 and Military formation due to performance differences between civil and military aircraft.
- 2.1.6. At 05:31:02 h, while ABQ 211 was 30 NM West of position FATEH descending out of FL166, it reported TCAS – RA due Military traffic, crossing ATS route J139 from North to South.
- 2.1.7. However, at 05:31:22 h, Mode C of Fighter aircraft No 2 showed a climb up to FL148, which was 800 ft above the cleared level. At this time, ABQ 211 initiated climb as a result of RA activation.
- 2.1.8. Vertical Separation of approximately 1,800 ft existed between both the aircraft at the time of RA.
- 2.1.9. Standard separation as mentioned in ICAO Doc 4444 (PANS – ATM) is to be implemented between civil aircraft. However, due to significant performance difference between civil and fighter aircraft, vertical separation of 2,000 ft or more is ensured between civil and military traffic.
- 2.1.10. Abrupt climb of Military aircraft may have triggered the TCAS – RA of ABQ 211.
- 2.1.11. At 05:31:35 h, while fighter aircraft were crossing the path of ABQ 211, ABQ 211 was at FL173 while No. 2 aircraft of the PAF formation was maintaining FL148.
- 2.1.12. Thereafter, PAF Formation proceeded for their mission profile while ABQ 211 continued its flight to its destination and landed without any further incident.

## SECTION 3 – CONCLUSIONS



### 3.1. Findings

- 3.1.1. Airblue flight ABQ 211 was a scheduled passenger flight operating from Dubai International Airport, Dubai to BBIAP, Islamabad on route PG – G325 – Hangu – J139 – FATEH – OPRN.
- 3.1.2. No significant weather was reported at BBIAP, Islamabad as well as surrounding areas at the time of the incident.
- 3.1.3. While approaching position HANGU, ABQ 211 was given descend to FL150 within the AOR of Cherat Approach.
- 3.1.4. A formation of 02 x Fighters from PAF Base Minhas to Pindi Gheb was on a routine mission when they crossed ATS route J139 from North to South at FL140.
- 3.1.5. ABQ 211 was initially cleared to FL150, thereafter it was re-cleared FL160 by Cherat Approach to ensure separation of 2,000 ft between ABQ 211 and Military formation due to performance differences between civil and military aircraft.
- 3.1.6. ABQ 211 was 30 NM West of position FATEH descending out of FL166 when it reported TCAS – RA due Military traffic crossing North to South.
- 3.1.7. No 2 of the PAF formation climbed to FL148, which was 800 ft above the cleared level. At the same time, ABQ 211 initiated climb as a result of RA activation.
- 3.1.8. Vertical Separation of approximately 1,800 ft existed between both the aircraft at the time of RA.
- 3.1.9. As per procedure in vogue, separation of 2,000 ft is to be maintained between civil and Military fighter traffic due performance difference between Civil and Military fighter aircraft.
- 3.1.10. Abrupt climb of Military aircraft may have triggered the TCAS – RA of ABQ 211.
- 3.1.11. ABQ 211 was maintaining FL173 and Military aircraft was maintaining FL148 when the path of both the aircraft crossed each other.
- 3.1.12. No Radiotelephony (RTF) contents were provided by Air Headquarters (AHQ) to ascertain the reason of climb of the fighter aircraft in the formation but AHQ has described its climb as 'Unintentional'.
- 3.1.13. In the absence of tape extracts and Cherat Approach Controller statement, it cannot be ascertained if traffic information regarding Civil traffic had been passed to the Military aircraft by Cherat Approach.
- 3.1.14. Thereafter, PAF Formation proceeded for their mission profile while ABQ 211 continued its flight to its destination and landed without any further incident.

3.2. Cause / Contributory Factors

3.2.1. Cause

3.2.1.1. Activation of TCAS – RA (MAC – Mid Air Collision) due to non-adherence of flight level restrictions by Military aircraft.

3.2.2. Contributory Factors

3.2.2.1. Violation of ATC Clearance by Military Traffic.

3.2.2.2. Unintentional climb of No 2 Fighter in Formation

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

## **SECTION 4 – SAFETY RECOMMENDATIONS**



#### 4.1. Safety Recommendations

- 4.1.1. AHQ may educate and enhance the knowledge on the working of TCAS – RA to Military Controllers and fighter pilots and limitations of civil aircraft (especially speed variations / rate of climb and descent) to ensure standard separation / spacing between the traffic at regular intervals.
- 4.1.2. Periodic sessions may be conducted by PAF for Fighter Pilots to strictly adhere to the ATC Clearance in order to maintain standard separation.
- 4.1.3. PCAA / AHQ may ensure that proper communication and traffic Information is passed to concerned aircraft on conflicting path especially during climb and descend phase.



(UMME HABIBA AHSAN)  
Senior Additional Director  
ATS Investigator

Dated: 29<sup>th</sup> Nov, 2023



(MIRZA AAMIR WALAYAT)  
Air Commodore  
President AAIB  
Investigator In-charge  
Dated: 30 Nov, 2023