

FINAL INVESTIGATION REPORT



SERIOUS INCIDENT TCAS-RA

**SAUDIA AIRLINE FLIGHT SVA722 BOEING 777-300ER
AIRCRAFT REG. NO. HZ-AK32 (OEJN TO OPIS) AND
MILITARY AIRCRAFT ON 14-03-2022**

SCOPE

At Bureau of Aircraft Safety Investigation Pakistan (BASIP) investigations are conducted in accordance with Pakistan Aircraft Safety Investigation (PASI) Act, 2023, Air Safety Rules (ASR), 2025 and International Civil Aviation Organization (ICAO) Annex-13.

The sole objective of the investigation and its final report as per above stated regulations is to prevent future accidents / serious incidents / incidents of similar nature without apportion blame or liability. Accordingly, it is inappropriate to use BASIP investigation reports to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for Judiciary and administrative purpose.

This report contains facts, which are based on information which came to the knowledge of BASIP during the investigation 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 serious incidents.

Extracts may be published with specific permission from BASIP provided that the source is duly acknowledged, and the same material is reproduced accurately, and is not used in a derogatory manner or in a misleading context.

TABLE OF CONTENTS

SECTION 1 - FACTUAL INFORMATION	10
1.1. History of the Flight	11
1.2. Injuries to Person(s)	20
1.3. Damage to Aircraft	20
1.4. Other Damage	20
1.5. Personnel Information	20
1.6. Aircraft Information	21
1.7. Meteorological Information	21
1.8. Aids to Navigation	21
1.9. Communications	22
1.10. Aerodrome Information	23
1.11. Flight Recorders	23
1.12. Wreckage and Impact Information	23
1.13. Medical and Pathological Information	23
1.14. Fire	23
1.15. Survival Aspects	23
1.16. Test and Research	23
1.17. Organizational and Management Information	23
1.19. Useful or Effective Investigation Techniques	25
SECTION 2 – ANALYSIS	26
2.1. General	27
SECTION 3 – FINDINGS	29
3.1. Findings	30
3.2. Cause / Contributory Factors	32
SECTION 4 – SAFETY RECOMMENDATIONS	33
4.1. Safety Recommendations	34

LIST OF FIGURES

Figure #	Title	Page
Figure 1	Route Map SVA722.....	11
Figure 2	Map of Airspace around OPIS, Islamabad	13
Figure 3	NOTAM issued regarding Airspace closure.....	14
Figure 4	SVA722 approaching position HANGU	15
Figure 5	SVA722 instructed to turn right heading 110°	15
Figure 6	SVA722 descending to 11,000 ft.....	16
Figure 7	SVA722 deviated 10NM right of intended route.....	16
Figure 8	SVA722 turning right direct to SUMEB	17
Figure 9	SVA722 proceeding direct to ISBAX	17
Figure 10	TCAS-RA SVA722.....	18
Figure 11	SVA722 climbing out of FL085	19
Figure 12	SVA722 clear of conflicting military aircraft.....	19
Figure 13	SVA722 changed over to Islamabad Approach.....	20
Figure 14	Navigational Aids for OPIS	22
Figure 15	Communication Facilities for OPIS	22
Figure 16	TCAS (RA) alert.....	24
Figure 17	TCAS TA & RA ranges	24
Figure 18	Traffic Display.....	25

LIST OF TABLES

Table No.	Title	Page
Table 1	Airspace around OPIS, Islamabad.....	12
Table 2	SVA722 Aircraft details.....	21
Table 3	METAR details for OPIS	21
Table 4	METAR description.....	21

ABBREVIATIONS

ACAS	Airborne Collision Avoidance System
AHQ	Air Headquarters
AIB	Aviation Investigation Bureau
BASIP	Bureau of Aircraft Safety Investigation Pakistan
EAT	Expected Approach Time
FL	Flight Level
ft	Feet
h	Hour
hPa	Hectopascal
ICAO	International Civil Aviation Organization
IOU	Incident Occurrence and Unserviceability Report
KSA	Kingdom of Saudia Arabia
Kts	Knots
m	Meter(s)
MAC	Mid Air Collision
METAR	Meteorological Aerodrome Report
MWO	Meteorological Watch Office
NM	Nautical Mile
OEJN	King Abdulaziz International Airport, Jeddah, Saudia Arabia
OPIS	Islamabad International Airport, Islamabad, Pakistan
PAA	Pakistan Airports Authority
PAF	Pakistan Air Force
PASI	Pakistan Air Safety Investigation
PCAA	Pakistan Civil Aviation Authority
RA	Resolution Advisory
SVA	Saudia Airlines
TA	Traffic Advisory
TCAS	Traffic alert and Collision Avoidance System
UTC	Universal Time Coordinated

INTRODUCTION

This serious incident was reported to BASIP by then Pakistan Civil Aviation Authority (PCAA) vide Incident Occurrence and Unserviceability Report (IOU)¹. This serious incident was notified ² to International Civil Aviation Organization (ICAO), Aviation Investigation Bureau (AIB), Kingdom of Saudia Arabia (KSA) and National Transportation Safety Board (NTSB), USA (United States of America) in line with ICAO Annex-13. The investigation has been conducted by BASIP. All corresponding timings are mentioned in Universal Time Coordinated (UTC).

¹ PCAA IOU Report dated 15 March, 2022

² ICAO Initial Notification

SYNOPSIS

On 14 March 2022, Saudia Arabian Airlines flight SVA722, Boeing 777-368(ER), was operating from Jeddah to Islamabad when it experienced a TCAS-RA south-west of Islamabad, while descending under the control of Cherat Approach South. The occurrence took place during a period of scheduled military fly-past activity, with multiple military aircraft recovering in formation through the same airspace.

During the descent, SVA722 was cleared to descend through altitudes used by the recovering military formation. A reduction in both lateral and vertical separation occurred when a formation of four military aircraft crossed ahead of SVA722 while climbing, resulting in the activation of a Short-Term Conflict Alert (STCA) and a subsequent TCAS-RA (Traffic Collision Avoidance System – Resolution Advisory) onboard the civil aircraft. The flight crew responded correctly to the RA by discontinuing the descent and initiating a climb, which restored separation.

The occurrence highlights challenges associated with civil–military air traffic service under interim arrangements during high-demand operations. TCAS functioned as the final safety barrier, preventing further loss of separation.

SECTION 1 - FACTUAL INFORMATION

1.1. History of the Flight

1.1.1. On 14 March, 2022, Saudia Airline flight SVA722, a Boeing 777-368(ER), Registration no. HZAK32, departed from King Abdul Aziz International Airport, Jeddah, Saudia Arabia (OEJN) for Islamabad International Airport, Islamabad, Pakistan (OPIS). The aircraft entered Pakistan airspace via ATS Route ALPOR G216 KC R471 NH G326 ZB G325 HANGU J139 to KALMI and landed at OPIS.

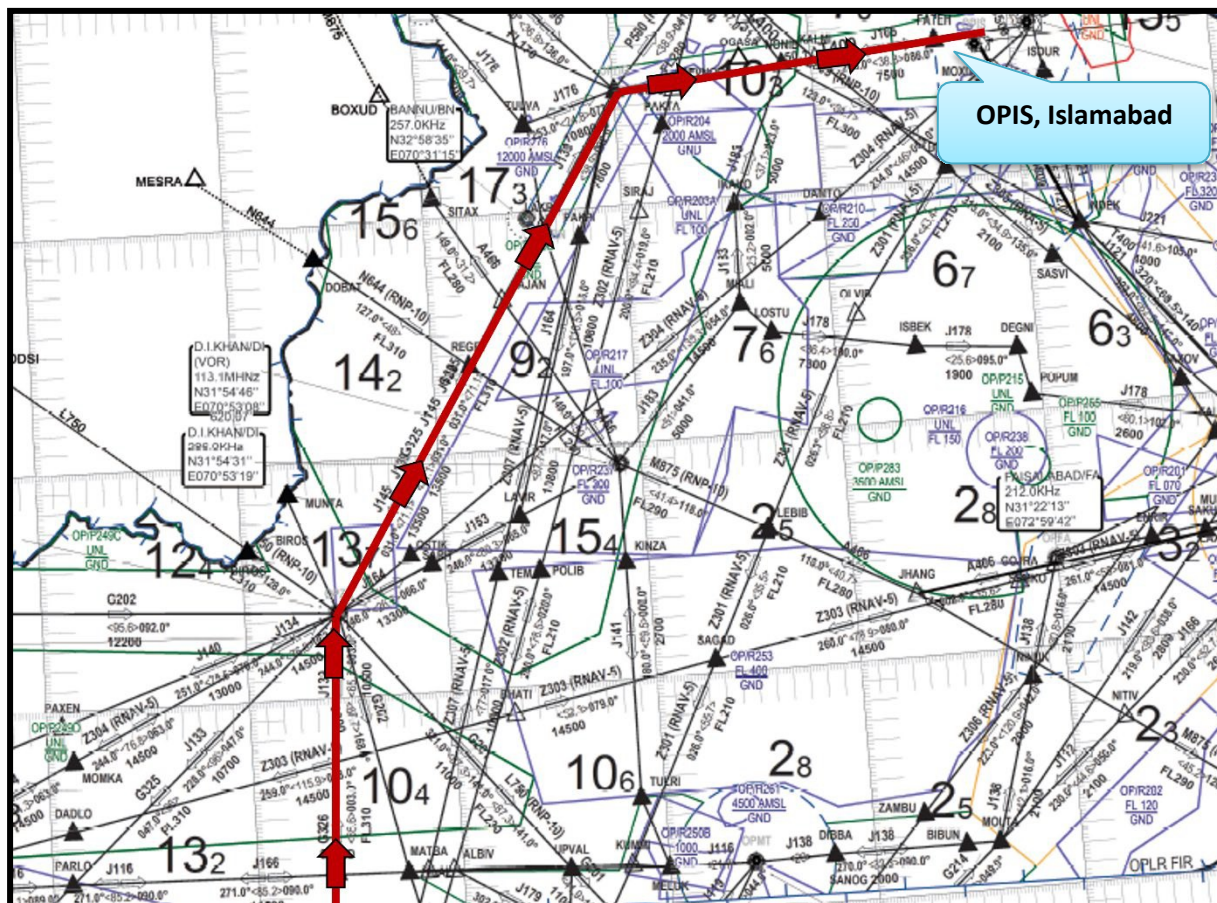


Figure 1 Route Map SVA722

Name Lateral limits Vertical limits Class of airspace	Unit providing service	Callsign/ Language Area and conditions of use Hours of service	Frequency/ purpose	Remarks
1	2	3	4	5
<p>CHERAT NORTH APPROACH</p> <p>Area bounded by lines joining points 334300N/0710259E then along the clockwise arc of a circle of 59.99NM radius centred on 335300N/ 0721358E to 340259N/0732506E; 340303N/ 0731013E; 335816N/0725200E; 334500N/0725100E; 334500N/0723609E; 334017N/0723613E; 333858N/ 0722459E; 333752N/0720130E; 333427N/0705640E to point of origin.</p> <p><u>UNL</u> GND</p> <p>Class of Airspace:C Except on ATS Routes</p>	Cherat North Approach	Cherat North (English) H24	121.2 MHZ Secondary FREQ. 125.6 MHZ Primary FREQ.	
<p>CHERAT SOUTH APPROACH</p> <p>Area bounded by lines joining points 333427N/0705640E; 325800N/0702959E; 325300N/ 0703959E; 333000N/0710659E then along the counter clockwise arc of a circle of 60.21NM radius centred on 335300N/0721358E to 325741N/ 0714555E; 323814N/0714513E; 323731N/0722314E; 325328N/0722350E; 325529N/0723447E; 325510N/ 0725151E; 324259N/0731101E; 330416N/0730026E; 330840N/0725044E; 330842N/0724743E; 331816N/ 0724727E; 332030N/0723756E; 332049N/0722459E; 333858N/0722459E; 333752N/0720130E to point of origin.</p> <p><u>UNL</u> GND</p> <p>Class of Airspace:C Except on ATS Routes</p>	Cherat South Approach	Cherat South (English) H24	126.25 MHZ Secondary FREQ. 127.35 MHZ Primary FREQ	Excluding Islamabad TMA West.
<p>ISLAMABAD TMA South</p> <p>Area bounded by lines joining points 331034N/0725040E; 330840N/0725044E; 330416N/ 0730026E; 324259N/0731101E; 324642N/0732151E; 331143N/0731742E to point of origin.</p> <p><u>FL205</u> 6500FT AMSL</p> <p>Class A above FL 150 Class C at or below FL 150</p>	Islamabad APP	Islamabad APP (English) H24	121.5 MHZ Emergency FREQ 121.65 MHZ Primary FREQ 124.65 MHZ Secondary FREQ.	
<p>ISLAMABAD TMA West</p> <p>Area bounded by lines joining points 333556N/0720130E; 332120N/0720128E; 332049N/ 0722459E; 333858N/0722459E to point of origin.</p> <p><u>FL175</u> 9500FT AMSL</p> <p>Class A at or above FL 150 Class C at or below FL 150</p>	Islamabad APP	Islamabad APP (English) H24	121.5 MHZ Emergency FREQ 121.65 MHZ Primary FREQ 124.65 MHZ Secondary FREQ.	

Table 1 Airspace around OPIS, Islamabad

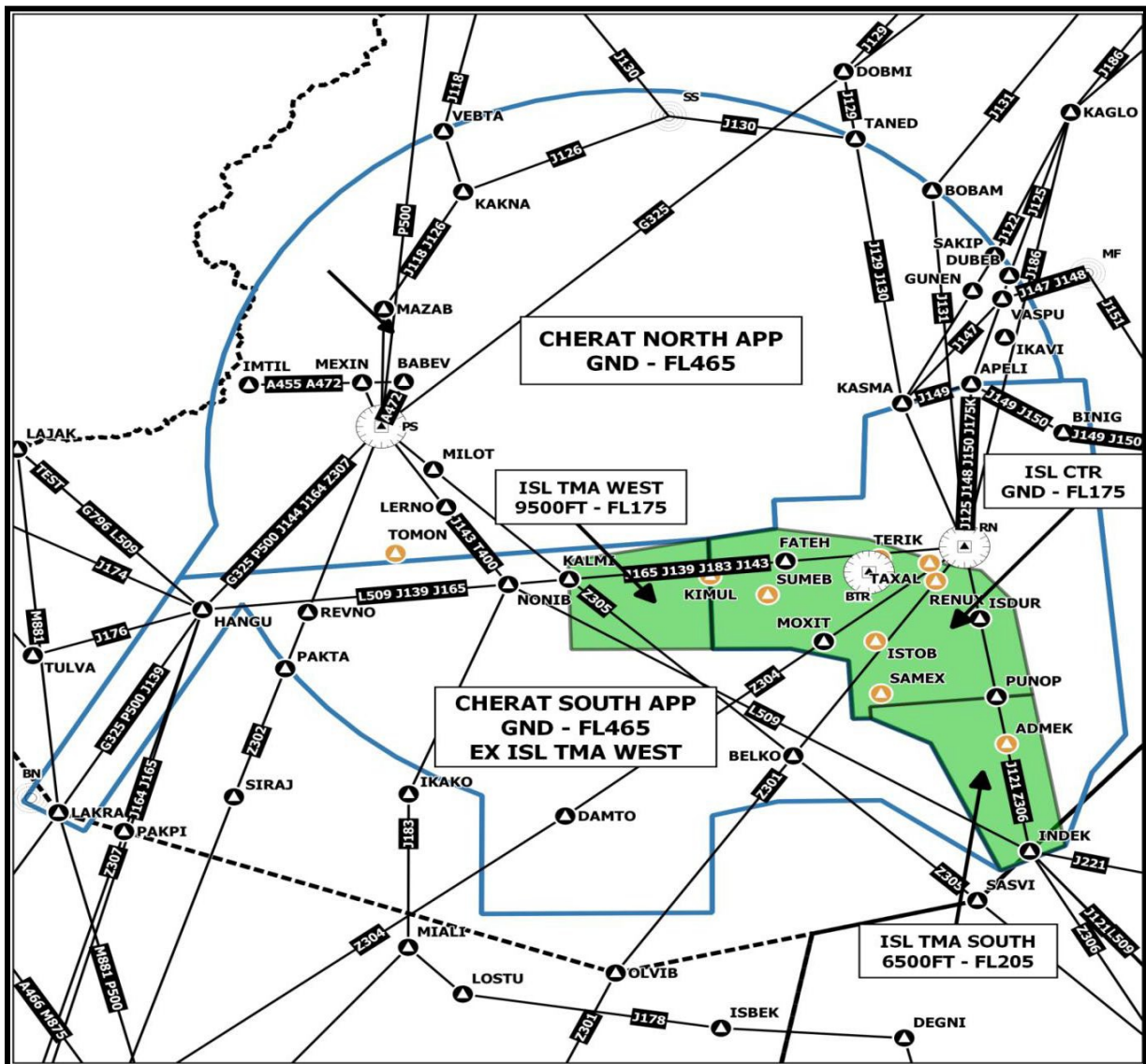


Figure 2 Map of Airspace around OPIS, Islamabad

1.1.2. A scheduled military fly-past activity was being conducted on that day. Fly-past operations of this nature are conducted annually in connection with the Pakistan day on 23 March, and typically involve multiple aircraft operating in formation, at varying altitudes during both the display and recovery phases.

1.1.3. NOTAM A0203/22 promulgated airspace restrictions associated with the fly-past activity and advised operators to expect delays and tactical vectoring. NOTAM action was taken due to Airspace limitation and restrictions. There was no requirement for issuance of NOTAM for closure of airspace, the coordination between ATS units was affected before such activity where departures from and arrivals at OPIS, Islamabad were restricted through a corridor at FL070 and below (Figure 3).

NOTAMS FOR FLYPAST

(A0203/22 NOTAMR A0201/22
 Q) OPLR/QARLC/IV/NBO/E/000/210/3321N07315E120
 A) OPLR
 B) 2203080330 C) 2203220700
 D) FM 08TH TO 22ND MAR 2022
 BTN 0330-0700
 E) FLW RTE SEGMENTS OF INTL ATS RTE WI LAHORE FIR
 WILL NOT BE AVBL FM GND TO FL210 DUE OPR REASONS.
 ATS ROUTE ROUTE SEGMENT
 =====
 J139/143/J165/J183 KALMI - RN
 J121 INDEK - RN
 J131 RN - BOBAM
 ALTERNATE ATS ROUTE FL200 AND BELOW:
 =====
 1) INDEK DCT 3250N07313E DCT 3245N07251E DCT 3245N07233E
 DCT 3330N07230E DCT KALMI AND VICE VERSA.
 2) ARRIVALS / DEPARTURES TO / FROM OPIS TO EXPECT DELAY.
 FLIGHT OPERATION WILL BE ACCOMMODATED THROUGH
 RADAR VECTORS / ATC INSTRUCTIONS.
 F) GND G) FL210)

Figure 3 NOTAM issued regarding Airspace closure

1.1.4. The military aircraft formations involved in the fly past activity had planned their recovery from the fly-past area at FL080 and above.

1.1.5. **04:10:40** SVA722 contacted Cherat Approach South approximately 24 NM short of HANGU, passing FL335 and descending to FL270. The aircraft was re-cleared to descend to FL250.

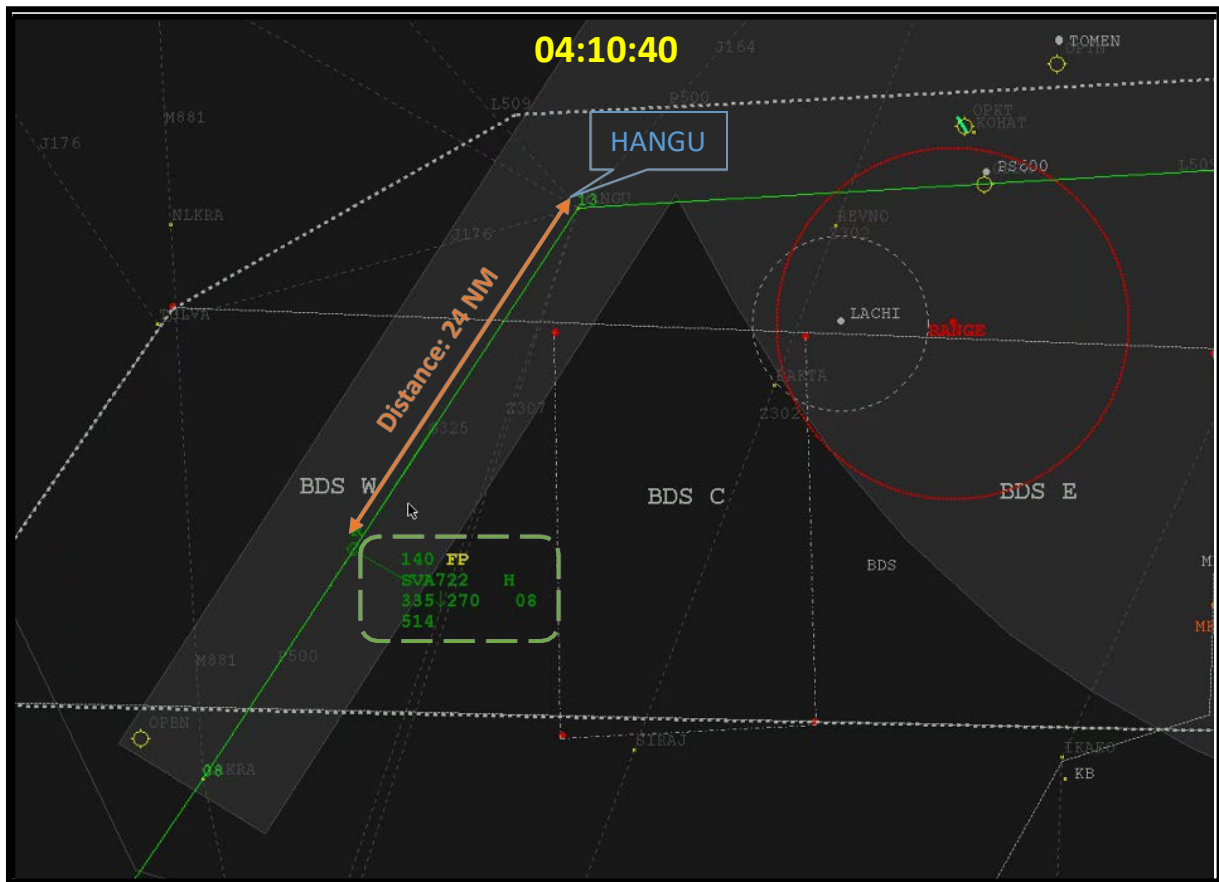


Figure 4 SVA722 approaching position HANGU

1.1.6. **04:14:12** To facilitate an unrestricted descent due departing traffic from OPIS, Islamabad, SVA722 was instructed to turn right onto heading 110°, approximately 9 NM East of HANGU on route J139, and was re-cleared to descend to FL210.

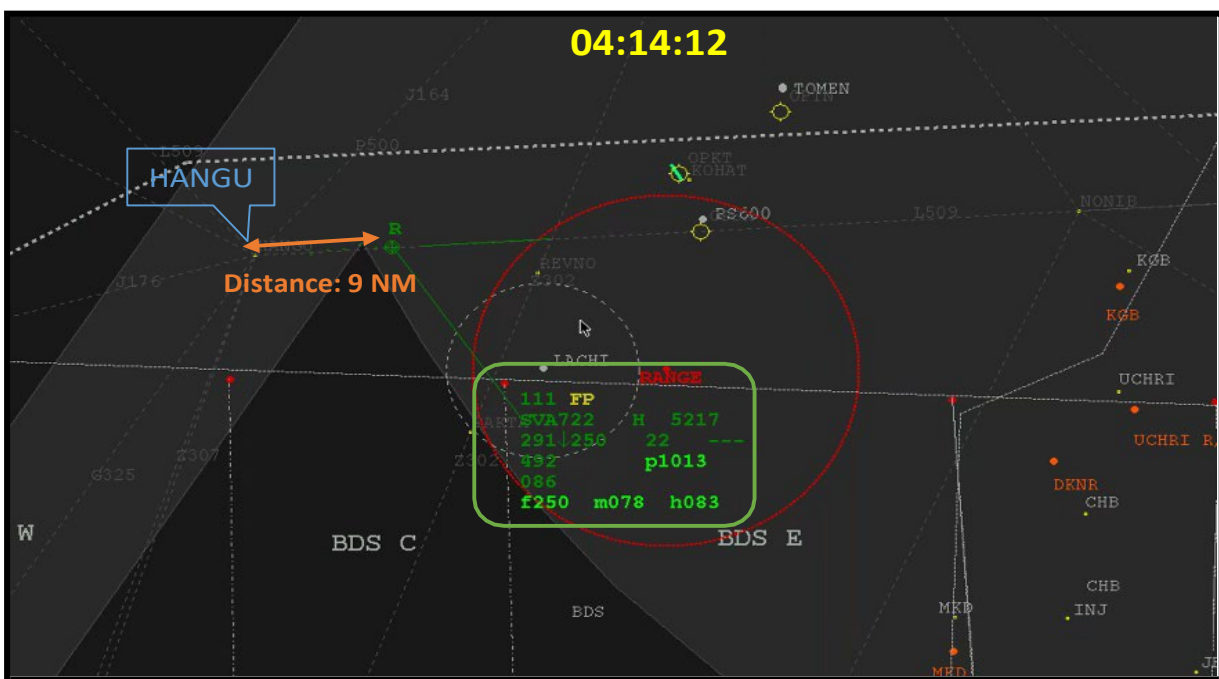


Figure 5 SVA722 instructed to turn right heading 110°

1.1.7. **04:14:52** SVA722 was re-cleared to 11,000 ft on QNH 1013. Military ATCO provided Traffic information regarding reciprocal inbound traffic (climbing and proceeding toward HANGU). Cherat controller instructed SVA722 to cross KIMUL at 9,000 ft or below, in accordance with published procedure.

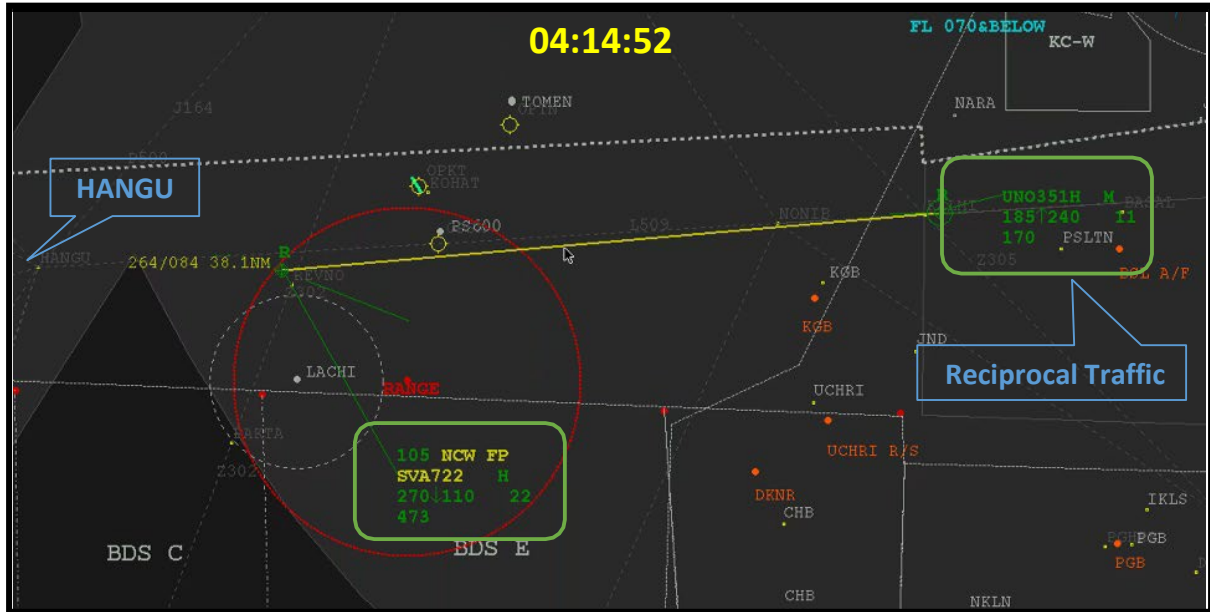


Figure 6 SVA722 descending to 11,000 ft

1.1.8. **04:17:58** Due to the earlier right turn, SVA722 had deviated approximately 10 NM to the right of the intended route. The aircraft was instructed to proceed direct to KIMUL and re-cleared to descend to 9,000 ft.

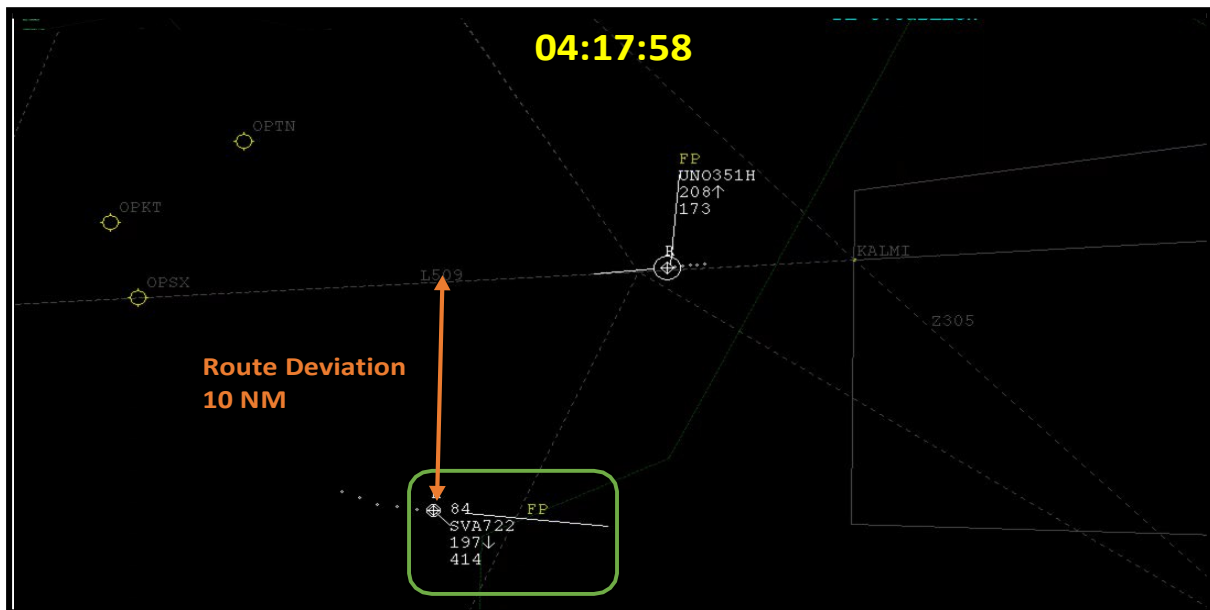


Figure 7 SVA722 deviated 10NM right of intended route

1.1.9. **04:18:28** Approximately 35 NM short of KIMUL while passing FL180, SVA722 was re-cleared to descend to 7,000 ft. The controller again sought confirmation if the flight crew was comfortable crossing KIMUL at 9,000 ft or below to which the crew responded in affirmative.

1.1.10. **04:20:05** SVA722 was instructed to turn right and proceed direct to SUMEB.

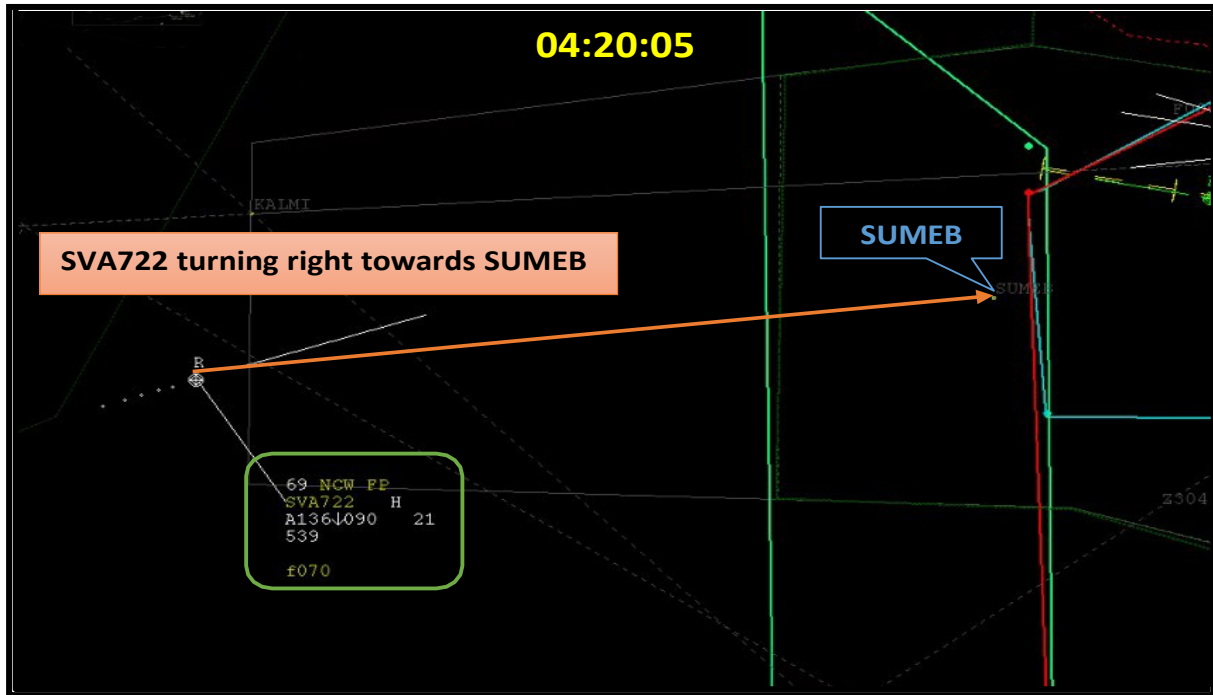


Figure 8 SVA722 turning right direct to SUMEB

1.1.11. **04:20:38** Cherat Approach contacted Islamabad Approach and advised that the military aircraft were recovering from fly-past training area. Islamabad Approach was further requested to initially restrict the climb of UAE613 (Emirates Airline), departing from OPIS, to 6,000 ft.

1.1.12. **04:20:54** SVA722 was instructed to turn right and proceed direct to position ISBAX.

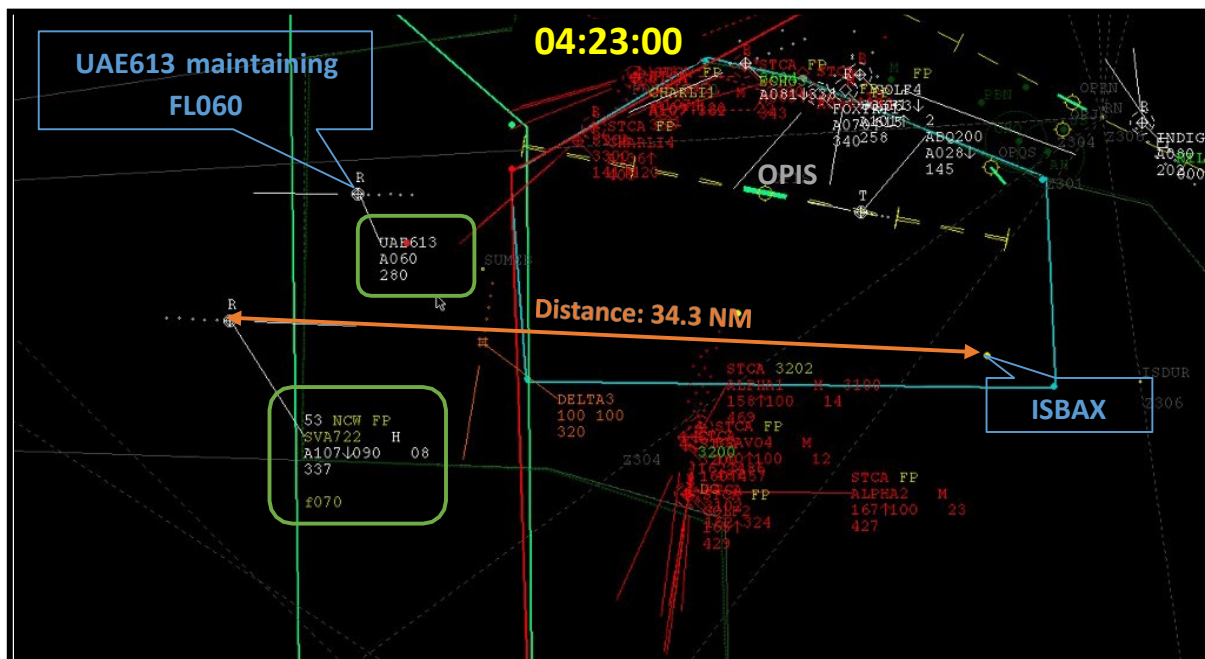


Figure 9 SVA722 proceeding direct to ISBAX

1.1.13. **04:25:27** At 12 NM South-West of OPIS, abeam position SUMEB, radar display indicated SVA722 encountering an STCA followed by TCAS-RA. At this time, SVA722 was passing 8,200 ft for 7,000 ft with a descent rate of approximately 500 ft/min. The conflicting military formation crossing ahead of SVA722, at a distance of approximately 3.5 NM, consisted of four military aircraft, two of which were observed climbing and passing 7,800 ft and 7,700 ft, thereby reducing the vertical separation. The military aircraft were climbing to 10,000 ft on recovery from fly past area to Mianwali, OPMI.

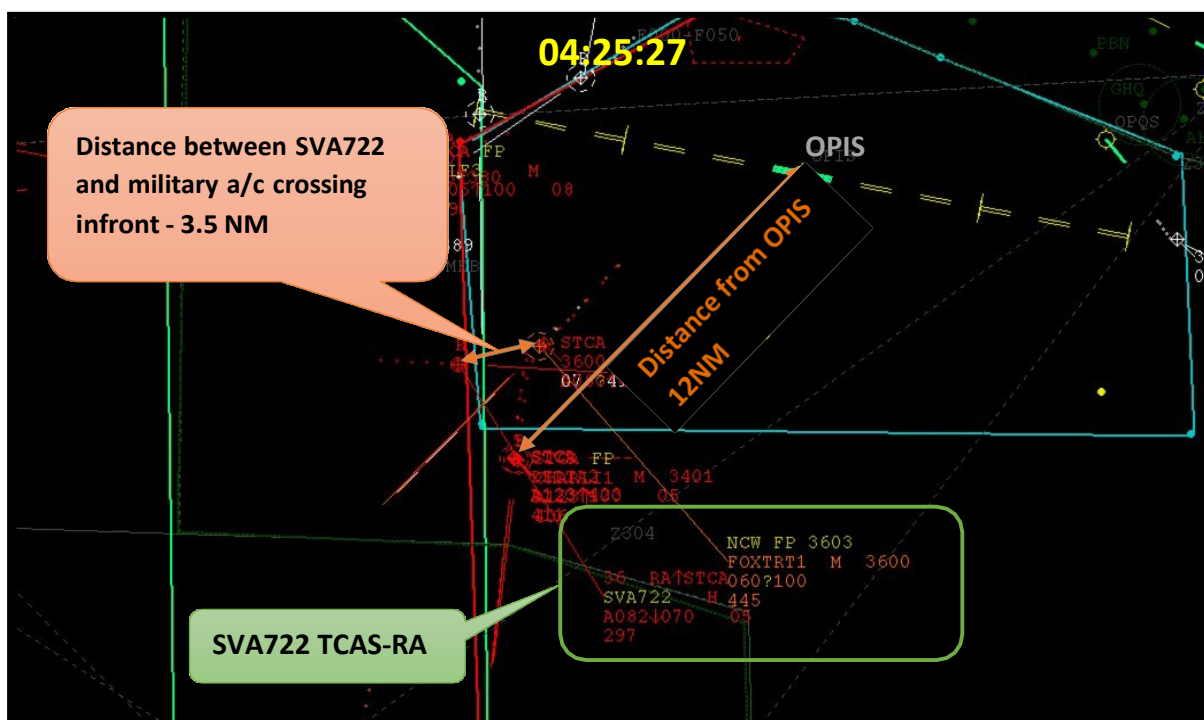


Figure 10 TCAS-RA SVA722

1.1.14. **04:25:42** In response to the RA, SVA722 initiated a climb and was observed on radar on a heading of 086°, passing 8,500 ft and climbing. The military aircraft were observed crossing the track of SVA722 from left to right at a distance of 1.7 NM. One military aircraft was observed passing 8,200 ft while climbing, closing further toward the level of SVA722.

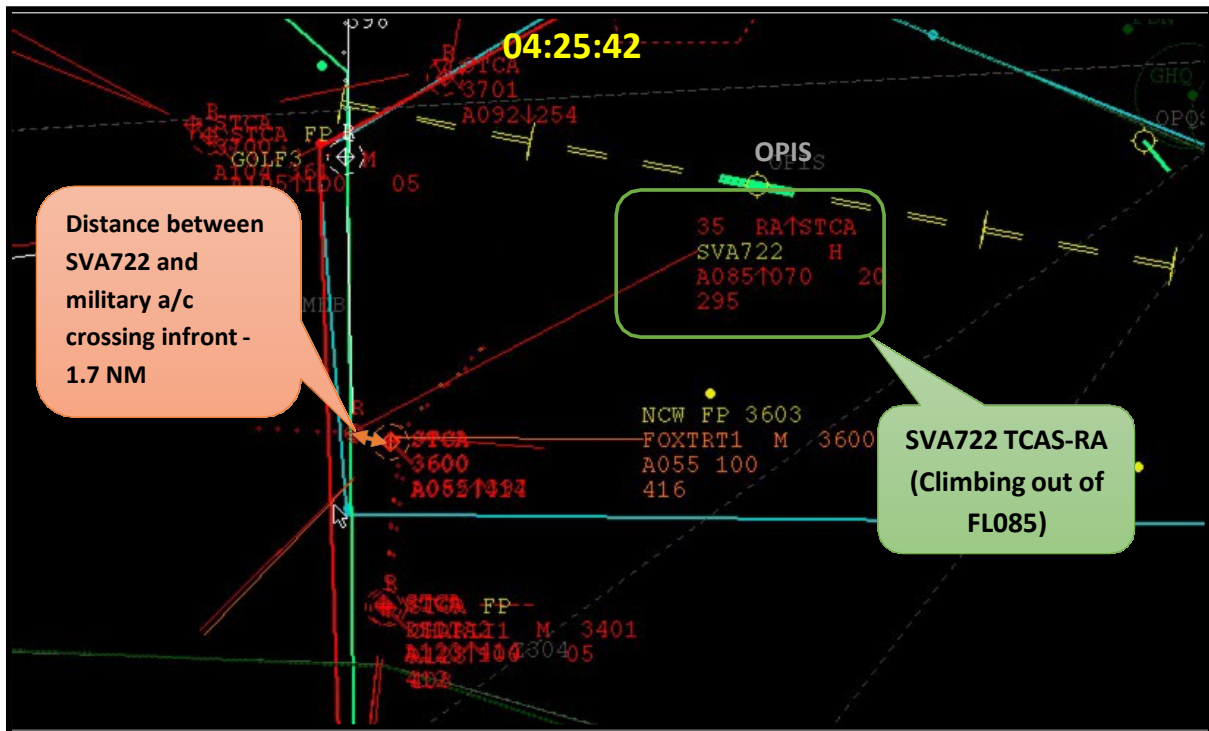


Figure 11 SVA722 climbing out of FL085

1.1.15. **04:25:47** SVA722 reported the RA to Cherat Approach South. The call was not acknowledged, as the controller was engaged in telephone coordination at the time.

1.1.16. **04:26:16** SVA722 climbed to 8,900 ft to avoid the conflicting traffic. Once clear of traffic, the aircraft resumed its descent to 7,000 ft.

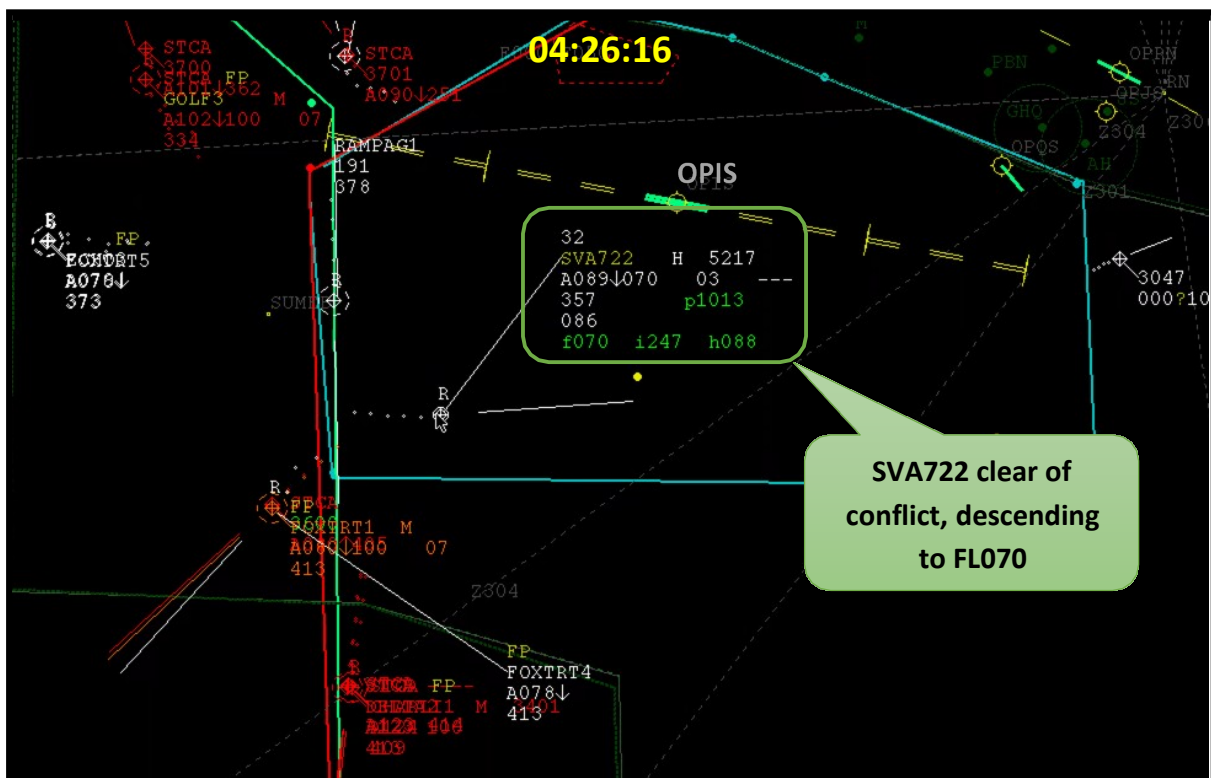


Figure 12 SVA722 clear of conflicting military aircraft

1.1.17. **04:26:45** SVA722 again informed the controller that the aircraft had experienced an RA. The controller responded by issuing a further descent clearance to 5,000 ft.

1.1.18. **04:27:04** Approximately 10 NM short of ISBAX, SVA722 was instructed to contact Islamabad Approach on frequency 121.650 MHz.

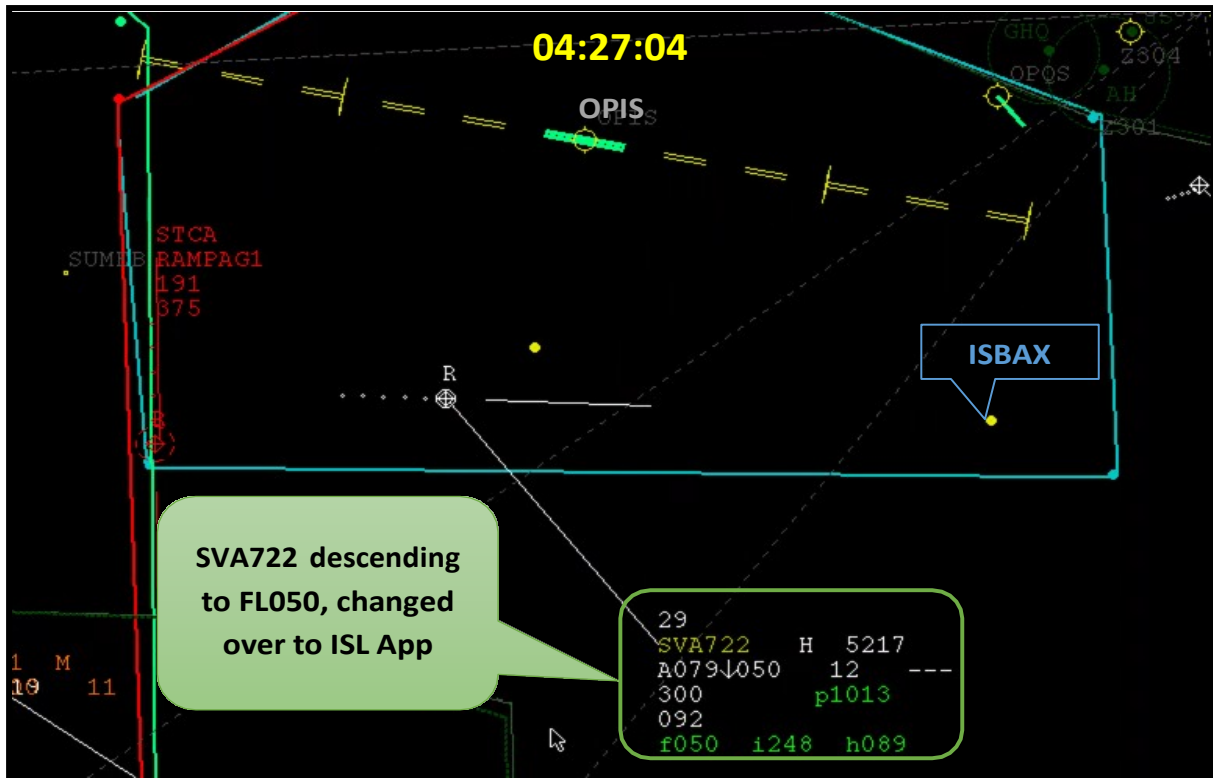


Figure 13 SVA722 changed over to Islamabad Approach

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

SVA722	
Aircraft Make & Model	Boeing 777-300ER
Registration Marking	HZ-AK32
Manufacturer Serial No.	61591
Operator	Saudia Airline
Sector	OEJN – OPIS

Table 2 SVA722 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.

METAR
OPIS 140400Z 27010KT 6000 NSC 23/13 Q1013 NOSIG RH54%

Table 3 METAR details for OPIS

METAR DESCRIPTION	
OPIS	(Station ID) Islamabad
140400Z	(Date and Time) Day 14, Time 04:00 UTC
27010KT	Wind Direction & Speed- Wind from 270° (West) at 10 knots (kts)
6000	Visibility- 6,000 meters (m).
NSC	No Significant Clouds
23/13	Temperature: 23°C, Dewpoint: 13°C
Q1013	Altimeter setting - Air pressure QNH 1013 Hectopascal (hPa)
NOSIG	No significant change expected in the near term
RH54%	Relative Humidity 54%

Table 4 METAR description

1.7.2. Islamabad weather at 0400 UTC: Westerly wind 10 kt, visibility 6 km, clear skies, temperature 23°C, pressure 1013 hPa, stable conditions expected.

1.8. Aids to Navigation

1.8.1. Navigational Aids for OPIS, are provided below: -

OPIS AD 2.19 RADIO NAVIGATION AND LANDING AIDS

TYPE OF AID	ID	Frequency	Hours of operation	Site of transmitting antenna coordinates	Elevation of DME transmitting antenna	Remarks
1	2	3	4	5	6	7
ILS/LOC CAT I 28R	IBIP	110.7 MHz	H24	333312.69N 0724812.32E	530.960000 M	-
ILS/LOC CAT III 28L	IBBA	108.1 MHz	H24	333306.01N 0724810.82E	535.390000 M	-
ILS/LOC CAT I 10R	IBAP	111.3 MHz	H24	333240.69N 0725052.37E	535.920000 M	-
DVOR/DME (2°E/2017)	BTR	114.6 MHz CH93X	H24	333239.54N 0725121.84E	535.11M	Coverage 200 NM
GP/TDME 10R	IBAP	332.3 MHz CH50X	H24	333306.34N 0724834.23E	545.95M	-
GP/TDME 28R	IBIP	330.2 MHz CH44X	H24	333254.84N 0725031.54E	549.50M	-
GP/TDME 28L	IBBA	334.7 MHz CH18X	H24	333240.29N 0725029.68E	546.89M	-

Figure 14 Navigational Aids for OPIS

1.9. Communications

1.9.1. Communications facilities for OPIS are provided below: -

OPIS AD 2.18 ATS COMMUNICATION FACILITIES

Service designation	Call sign	Frequency	Hours of operation	Remarks
1	2	3	4	5
Aerodrome Control Service	Islamabad Ground	124.350 MHz	H24	Fire
Aerodrome Control Service	Islamabad Departure	118.550 MHz	H24	Clearance Delivery
Aerodrome Control Service	GMC (N)	125.150 MHz	H24	Secondary
Emergency Service	Islamabad	121.500 MHz	H24	Function Emergency
Approach Control Service	Islamabad APP	124.650 MHz	H24	Secondary
Military Frequency	Islamabad APP	241.200 MHz	HX	Secondary
Aerodrome Control Service	GMC (N)	123.050 MHz	H24	Primary
Aerodrome Control Service	Islamabad Tower	122.150 MHz	H24	Primary
Approach Control Service	Islamabad APP	121.650 MHz	H24	Primary
Aerodrome Control Service	Islamabad Ground	122.950 MHz	H24	Secondary
Aerodrome Control Service	Islamabad Departure	119.650 MHz	H24	Departure Frequency
Aerodrome Control Service	Islamabad Tower	123.225 MHz	H24	Secondary
Military Frequency	Islamabad APP	240.500 MHz	HX	Primary
Aerodrome Control Service	Islamabad Ground	121.850 MHz	H24	Vehicle / Follow-Me
Aerodrome Control Service	Islamabad Ground	130.600 MHz	H24	Primary
D-ATIS	D-ATIS	126.200 MHz	H24	Weather Broadcast Service

Figure 15 Communication Facilities for OPIS

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 and Research**

1.16.1. Not Applicable.

1.17. **Organizational and Management Information**

1.1.19. The occurrence took place within airspace that is published in the AIP as being under the responsibility of Islamabad Approach. However, due to the scheduled fly-past activity and associated airspace restrictions, the provision of air traffic services for this portion of airspace was temporarily transferred to Cherat Approach South as an interim arrangement. This handover was intended to facilitate civil and military operations during the fly-past period and was based on coordination between the involved ATS units.

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 16 TCAS (RA) alert

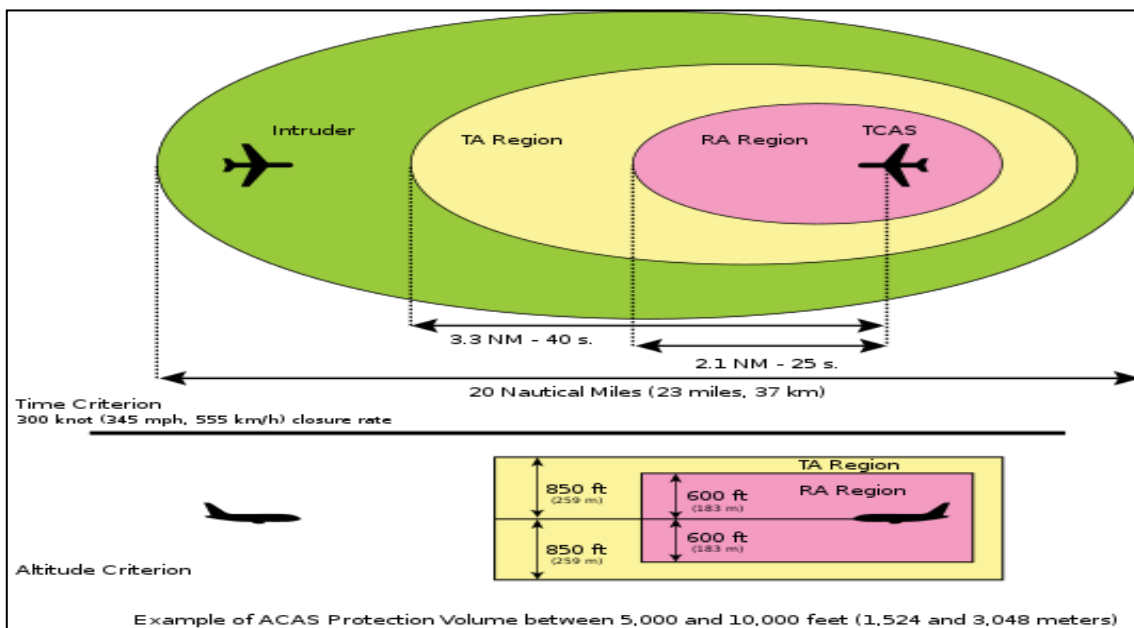


Figure 17 TCAS TA & RA ranges

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).

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).

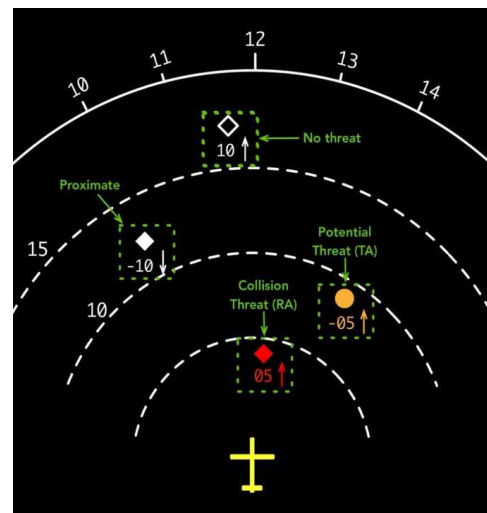


Figure 18 Traffic Display

1.19. Useful or 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 Flight Path and Descend profile

2.1.1.1 SVA722 was under the control of the Military controller at Cherat Approach South during its descent toward HANGU and subsequent routing toward KIMUL and SUMEB. During this phase, the aircraft received successive descent clearances from FL335 to 7,000 ft and was vectored right onto heading 110°, placing it approximately 10 NM South of its intended track. Although the aircraft was later instructed to proceed direct to KIMUL and subsequently SUMEB, this vectoring altered the aircraft's lateral geometry.

2.1.1.2 SVA722's vertical profile shows a continuous descent, passing 8,200 ft for 7,000 ft when the Short-Term Conflict Alert (STCA) and subsequent TCAS-RA were triggered. This positioned the aircraft within the altitude band assigned to the recovering military formation (FL080 and above), increasing the potential for conflict. A proactive strategy to manage SVA722's routing and descent clearances, with the objective of keeping the civil aircraft clear of recovering military traffic, would have increased vertical separation margins and reduced the likelihood of conflict during the recovery phase.

2.1.1.3 Furthermore, no specific traffic information regarding the recovering formation was issued to SVA722, limiting the flight crew's situational awareness of the developing conflict.

2.1.2 Loss of Separation

2.1.2.1 Radar data shows that the military formation initially crossed ahead of SVA722 with 3.5 NM lateral spacing, later reducing to 1.7 NM as the aircraft continued climbing. Simultaneously, one aircraft in the formation was observed crossing through 8,200 ft, momentarily occupying the same level as SVA722, which was descending through that altitude. This combination of narrowing lateral spacing and loss of vertical separation triggered the STCA, followed by the TCAS-RA onboard SVA722.

2.1.3 Controller Task Saturation

2.1.3.1 At the time of the occurrence, the Cherat South controller was handling both the Civil IFR traffic and multiple military formation recoveries, increasing real-time coordination demands. The controller was simultaneously required to manage SVA722's descent profile, coordinate the recovery of the military formation with Islamabad Approach, and impose altitude restrictions on civil departures.

2.1.3.2 The presence of several recovering military aircraft generated a dense concentration of radar target labels, creating visual clutter that reduced the prominence of SVA722's label on radar screen. As attention shifted toward other aircraft, the monitoring of SVA722's track and descent profile reduced. This diminished scan effectiveness contributed to a delayed recognition of the developing conflict and reduced the controller's ability to respond to the RA transmissions in a timely manner.

2.1.3.3 This operating environment left little tolerance for distraction or delayed detection, increasing dependence on automated safety nets such as Short-Term Conflict Alert (STCA) and TCAS-RA.

2.1.4 **Communication and Situational Response**

2.1.4.1 SVA722 transmitted its initial RA report during the developing conflict, but the transmission was not acknowledged by the military controller due to concurrent coordination tasks. Although the lack of response did not affect the crew's compliance with the TCAS-RA, it demonstrated a temporary reduction in situational awareness of Military controller during a critical phase.

2.1.4.2 Upon receiving the second RA notification, the controller again did not acknowledge the report or provide any information regarding conflicting traffic. Instead, a further descent clearance to 5,000 ft was issued, followed by transfer of control to Islamabad Approach. The absence of acknowledgement limited the controller's awareness of the aircraft's RA manoeuvre and reduced overall communication effectiveness in the sector.

2.1.5 **STCA and TCAS Resolution Manoeuvre**

2.1.5.1 The STCA alert functioned as intended by identifying a developing loss of separation before the TCAS-RA was triggered but remained unnoticed by the Military controller.

2.1.5.2 The flight crew responded correctly to the TCAS-RA by discontinuing descent at 8,200 ft and initiated climb eventually reaching 8,900 ft to re-establish separation from the military aircraft. Radar data confirms that the RA manoeuvre was effective in restoring safe spacing and acted as the primary barrier to further loss of separation.

2.1.6 **Civil-Military Coordination**

2.1.6.1 International guidance, including ICAO Doc 10088, emphasizes the need for clearly defined civil–military coordination frameworks to ensure that state aircraft operations give due regard to the safety of civil aviation.

2.1.6.2 The provision of air traffic services to civil IFR aircraft by military controllers at Cherat Approach North / South is mentioned in the Aeronautical Information Publication AIP, Pakistan and Station Air Traffic Instructions (SATI), OPIS, Islamabad. However, the absence of finalized Letters of Agreement defining roles, responsibilities, and separation assurance mechanisms between PAF ATS units and PAA ATS units introduces systemic vulnerabilities, particularly during periods of high operational demand such as fly-past activities.

2.1.6.3 In this occurrence, the combination of interim arrangements, high traffic density, and complex recovery operations increased reliance on individual controller performance rather than structured system defences.

SECTION 3 – FINDINGS

3.1. Findings

3.1.1 On 14 March 2022, Saudia Arabian Airlines flight SVA722, a Boeing 777-368(ER), was operating from Jeddah, Saudia Arabia (OEJN) to Islamabad, Pakistan (OPIS) and was under the control of Cherat Approach South during the descent phase.

3.1.2 The occurrence took place during a period of scheduled military fly-past activity, during which several standard civil ATS route segments were unavailable as promulgated by NOTAM, and multiple military aircraft were recovering in formation through controlled airspace.

3.1.3 The airspace in which the occurrence took place is normally delegated to Islamabad Approach; however, due to the fly-past activity, air traffic services were being provided by Cherat Approach South under interim civil–military arrangements.

3.1.4 SVA722 received successive descent clearances from FL335 to 7,000 ft and was vectored right onto heading 110°, resulting in a lateral deviation of approximately 10 NM South of its intended route before being cleared direct to KIMUL and subsequently SUMEB.

3.1.5 The lateral vectoring and continuous descent profile placed SVA722 within the altitude band used by the recovering military formation (FL080 and above), increasing conflict potential during the recovery phase.

3.1.6 The recovering formation consisted of four military aircraft climbing toward Mianwali, creating a high-density traffic environment around Islamabad.

3.1.7 Radar data indicated that the military formation crossed ahead of SVA722, with lateral separation reducing from approximately 3.5 NM to about 1.7 NM and one of the military aircraft was observed climbing through approximately 8,200 ft while SVA722 was descending through the same altitude, resulting in a loss of vertical separation.

3.1.8 The combination of reduced lateral spacing and loss of vertical separation led to the activation of a Short-Term Conflict Alert (STCA), followed shortly by a TCAS Resolution Advisory (RA) onboard SVA722.

3.1.9 No specific traffic information regarding the recovering military formation was provided to the crew of SVA722, limiting the flight crew's situational awareness of the developing conflict.

3.1.10 In response to the TCAS RA, the flight crew of SVA722 discontinued the descent at 8,200 ft and initiated a climb, reaching approximately 8,900 ft, which restored vertical separation from the military aircraft.

3.1.11 SVA722 reported TCAS-RA to Cherat Approach South Controller twice but neither transmission was acknowledged by the controller.

3.1.12 At the time of the occurrence, the Cherat Approach South controller was managing civil IFR traffic, military formation recoveries, and inter-unit coordination simultaneously, resulting in elevated workload and task saturation.

3.1.13 The recovery of several military aircraft generated a high density of radar target labels on the surveillance display, reducing the prominence of SVA722's radar label and adversely affecting scan effectiveness. This delayed the recognition of the

developing loss of separation and limited the controller's ability to acknowledge and respond to SVA722's TCAS-RA reports in a timely manner.

3.1.14 The TCAS system functioned as intended and acted as the final safety barrier when ATS tactical separation assurance had been compromised.

3.1.15 The civil–military ATS interface at Cherat Approach South, operating under interim arrangements during the fly-past activity, increased operational complexity and reliance on individual controller performance. This was influenced by the absence of finalized Letters of Agreement defining roles, responsibilities, and separation assurance mechanisms between PAF ATS units and PAA ATS units.

3.2. Cause / Contributory Factors

3.2.1. Cause

3.2.1.1. The serious incident resulted from a loss of separation between SVA722 and the military aircraft during fly-past operations, resulting in a **TCAS Resolution Advisory-RA (MAC – Mid Air Collision)** activation on SVA722 during descent.

3.2.2. Contributory Factors

3.2.2.1. The lateral vectoring of SVA722 and continuous descent clearances placed the aircraft within the altitude band used by the recovering military aircraft, reducing available vertical separation margins.

3.2.2.2. The controller at Cherat Approach South was required to manage civil IFR traffic, military formation recoveries, and inter-unit coordination simultaneously, resulting in elevated workload and task saturation.

3.2.2.3. The high density of radar target labels associated with multiple recovering military aircraft reduced the prominence of SVA722's radar label, adversely affecting scan effectiveness and delaying recognition of the developing loss of separation.

3.2.2.4. The interim civil–military ATS arrangements at Cherat Approach South during the fly-past activity resulted in increased dependence on controller actions rather than established and fully documented procedural safeguards.

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 It is recommended that Pakistan Airports Authority (PAA) and Pakistan Airforce (PAF) formalize civil–military ATS coordination through Letters of Agreement (LoAs) and documented procedures, clearly defining airspace responsibility, separation assurance, coordination processes, and communication protocols for both routine and special operations. Interim arrangements implemented during special events should be supported by structured briefings to ensure a common understanding of roles, responsibilities, and traffic management strategies among all involved ATS units.