

FINAL INVESTIGATION REPORT



SERIOUS INCIDENT OF GULF AIR FLIGHT GFA 770 BOEING 787-9 AIRCRAFT REG. NO. A9C-FF AT ISLAMABAD ON 02-06-2021

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
ACC	Area Control Centre
AMA	Area Minimum Altitude
AMSL	Above Mean Sea Level
ANS	Air Navigation Services
AOR	Area of Responsibility
APM	Approach Path Monitoring
APW	Area Proximate Warning
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
ATCL	Air Traffic Controller Licence
BASI	Bureau of Aircraft Safety Investigation
CLAM	Cleared Level Adherence Monitoring Alert
CTR	Control Zone
CWP	Controller Work Position
EGPWS	Enhanced Ground Proximity Warning System
FCOM	Flight Crew Operations Manual
FDR	Flight Data Recorder
FL	Flight Level
FO	First Officer
ft	Feet
GND	Ground
GPWS	Ground Proximity Warning System
h	Hour
hPa	Hectopascal
HRP	Heliport Reference Point
ICAO	International Civil Aviation Organization
IIAP	Islamabad International Airport
ILS	Instrument Landing System
IOU	Incident Occurrence and Unserviceability Report
Kg	Kilogram(s)
Km(s)	Kilometre(s)
kts	Knots
L	Liter(s)
LNAV	Lateral Navigation
MATS	Manual of Air Traffic Services
MET	Metrological

MFD	Multi-Function Display
min	Minute(s)
MONA	Monitoring Aid
MORA	Minimum Off Route Altitude
MSA	Minimum Sector Altitude
MSAW	Minimum Safe Altitude Warning
MSL	Mean Sea Level
MTCD	Medium Term Conflict Detection
MTT	Ministry of Transportation and Telecommunications
NCW	Non-Compliance Warning
ND	Navigational Display
NM	Nautical Miles
NTSB	National Transportation Safety Board
PCAA	Pakistan Civil Aviation Authority
PF	Pilot Flying
PFD	Primary Flying Display
PIC	Pilot In Command
PM	Pilot Monitoring
R/W	Runway
RAM	Route Adherence Monitoring
SATI	Station Air Traffic Instructions
SCT	Scattered
SNET	Safety Net
STCA	Short Term Conflict Alert
TMA	Terminal Control Area
TSRA	Thunderstorm Rain
UNL	Un-limited
USA	United States of America
UTC	Universal Time Coordinated
VOR	Very High Frequency Omni-Directional Range
VSD	Vertical Situation Display
BAH	Bahrain International Airport

INTRODUCTION

This serious incident was reported to Bureau of Aircraft Safety Investigation (BASI), Pakistan previously known as Aircraft Accident Investigation Board (AAIB), Pakistan, by Pakistan Civil Aviation Authority (PCAA) vide Incident Occurrence and Unserviceability Report (IOU)¹. Ministry of Aviation, Government of Pakistan issued Memorandum and Corrigendum² issued by BASI, Pakistan to investigate the serious incident. This serious incident was notified³ to ICAO, National Transportation Safety Board (NTSB), United States of America (USA) and Ministry of Transportation and Telecommunications (MTT), Bahrain in line with ICAO Annex-13. The investigation has been conducted by BASI, Pakistan.

¹ PCAA IOU Report dated 04th June, 2021

² Ministry of Aviation Memorandum No. 18-2/2021 AT-III dated 28th June, 2021 & BASI Corrigendum No. BASI/1904/435/Inv

³ ICAO Notification dated 06th December, 2021

SYNOPSIS

On 02nd June, 2021, Gulf Air flight, call sign GFA 770, Boeing 787-9 aircraft, Reg. No. A9C-FF, was a scheduled flight from Bahrain International Airport (BAH), Bahrain to Islamabad International Airport (IIAP), Islamabad. Weather around Islamabad as well as in the surrounding areas was reported as Thunderstorm / Rain. After passing HANGU, GFA 770 deviated left of track due to severe weather. When GFA 770 was 15 Nautical Mile (NM) North-West of KALMI, it was given descent to 5,000 feet (ft) on pilot's request due to weather. As GFA 770 was descending through 5,300 ft, pilot reported climbing to 7,000 ft and subsequently to 10,000 ft due Ground Proximity Warning System (GPWS) warning just short of position KALMI. GFA 770 subsequently landed at IIAP, Islamabad after remaining in hold for 01 hour (h) 50 minutes (min) for weather improvement. All corresponding timings are mentioned in Universal Time Coordinated (UTC).

SECTION 1 - FACTUAL INFORMATION

1.1. History of the Flight

1.1.1. On 02nd June, 2021, Gulf Air flight GFA 770, Boeing 787-9 aircraft, Registration No. A9C-FF took off from BAH, Bahrain to IIAP, Islamabad on route G325 – LAKRA - HANGU – KALMI – ISLAMABAD.

1.1.2. From aircraft departure till it had changed over to Area Control Islamabad, the flight remained uneventful.

1.1.3. At 22:52:00 h, GFA 770 came in contact with Area Control Islamabad while approaching position LAKRA and descending Flight Level (FL) 290. Aircraft was identified and given arrival clearance with descent to FL150.

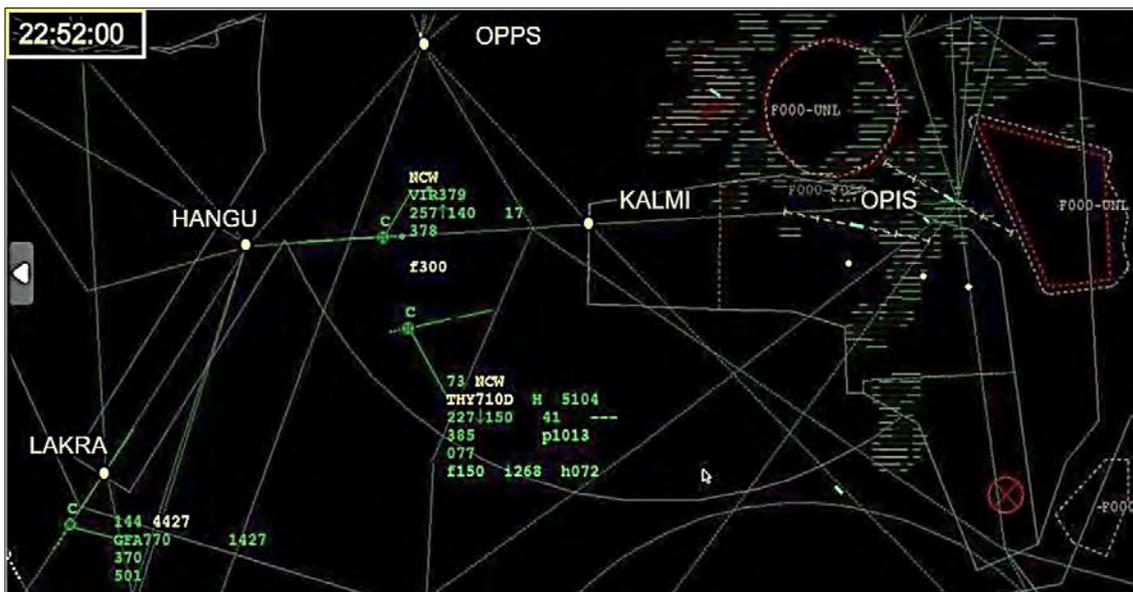


Figure 1 GFA 770 came in contact with Area Control Islamabad

1.1.4. Expected time of arrival at IIAP, Islamabad was 2312 h.

1.1.5. At 22:57:15 h, approaching South of HANGU, aircraft requested to maintain heading 060° for 10 NM to avoid flying into inclement weather. Weather deviation was approved by Area Radar Controller. The weather reported at that time was Thunderstorm / Rain at IIAP, Islamabad and surrounding areas.



Figure 2 Weather at IIAP, Islamabad and Surrounding Areas

1.1.6. At 23:01:14 h, GFA 770 requested for further descent. Area Control Islamabad inquired “how long you will maintain this heading”. GFA 770 informed that they are turning right heading 060°. GFA 770 was given descent 9,000 ft on QNH 1006 Hectopascal (hPa) (QNH for IIAP, Islamabad). Same was acknowledged by GFA 770.

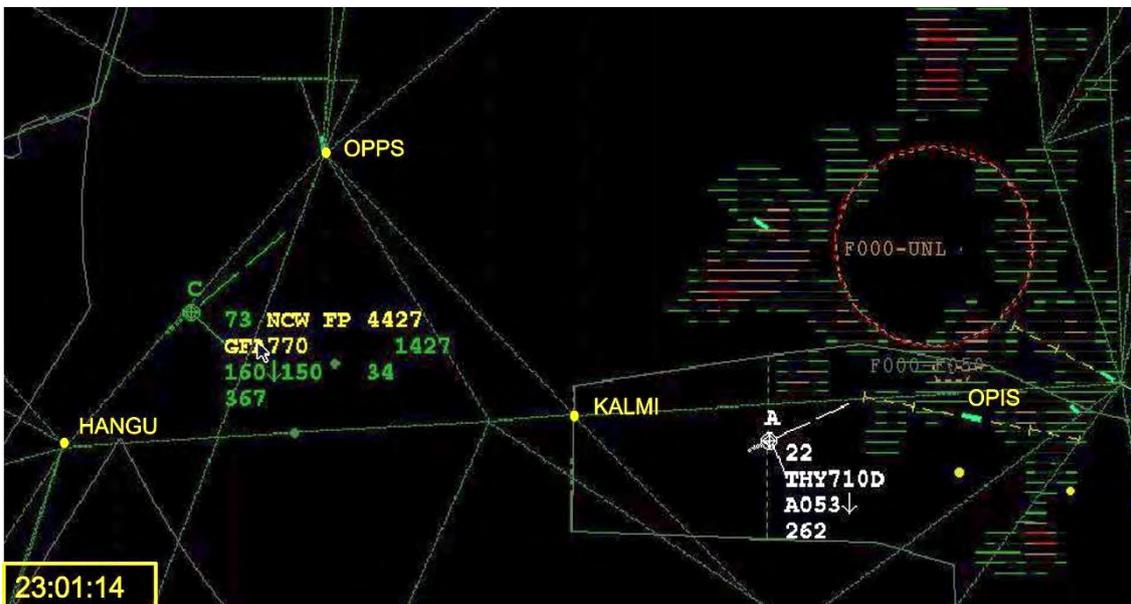


Figure 3 GFA 770 given descent to 9,000 ft

1.1.7. At 23:01:42 h, GFA 770 changed over to Approach Control Islamabad frequency.

1.1.8. At 23:02:12 h, GFA 770 came in contact with Approach Control Islamabad crossing FL144 descending 9,000 ft on heading 050°. Approach Control Islamabad inquired whether the aircraft was turning right upon which GFA 770 informed that they would be turning right if given descent otherwise will be entering bad weather. Approach Control Islamabad advised GFA 770 to descend 10,000 ft, to which GFA 770 informed that they had been cleared to 9,000 ft. Approach Control Islamabad cleared GFA 770 to descend to 9,000 ft. The descent given by Area Control Islamabad (9,000 ft) was not updated electronically as it showed FL150 as cleared level.

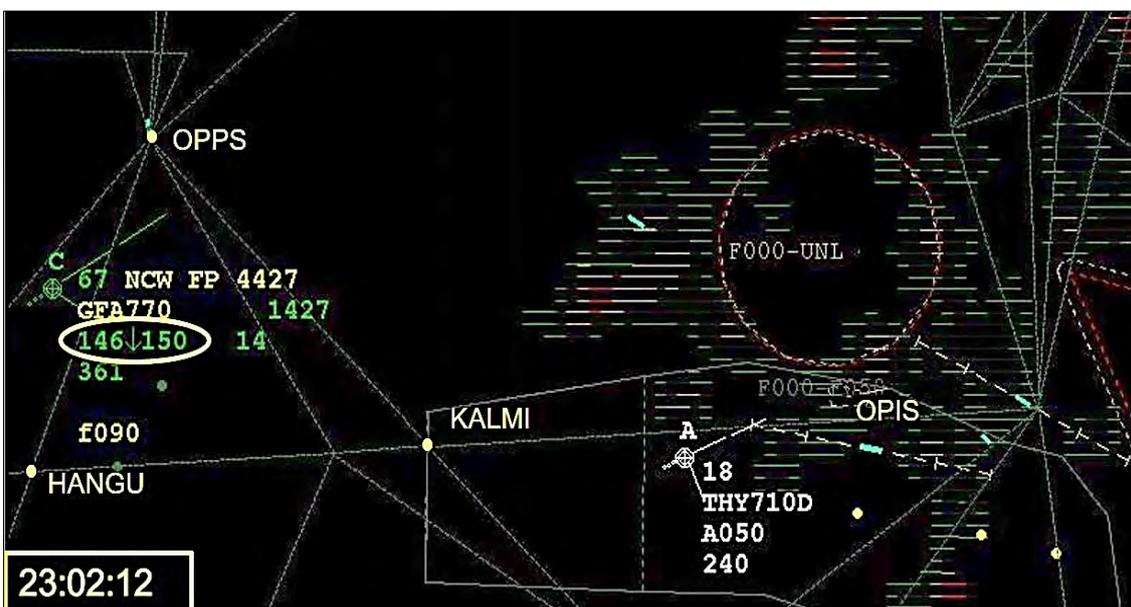


Figure 4 GFA 770 cleared 9,000 ft but not updated electronically

1.1.9. At 23:03:00 h, GFA 770 informed turning right heading 080°. Approach Control Islamabad inquired “for how long you will maintain heading 080°”. GFA 770 replied that they would be maintaining heading for another 05 miles and informed Approach Control Islamabad that they need to descend otherwise they will enter into weather at this level.

1.1.10. Approach Control Islamabad informed GFA 770 that on present heading they will be proceeding towards hilly terrain and they have to turn right for descent.



Figure 5 GFA 770 turning right heading 080°

1.1.11. At 23:03:30 h, GFA 770 requested direct position KALMI, which was approved by Approach Control Islamabad. GFA 770 also requested for further descent.

1.1.12. At 23:04:00 h, GFA 770 requested descent again to which the Approach Control Islamabad cleared GFA 770 to descend 5,000 ft on QNH 1006 and advised GFA 770 to expect further descent 25 NM short of Islamabad.

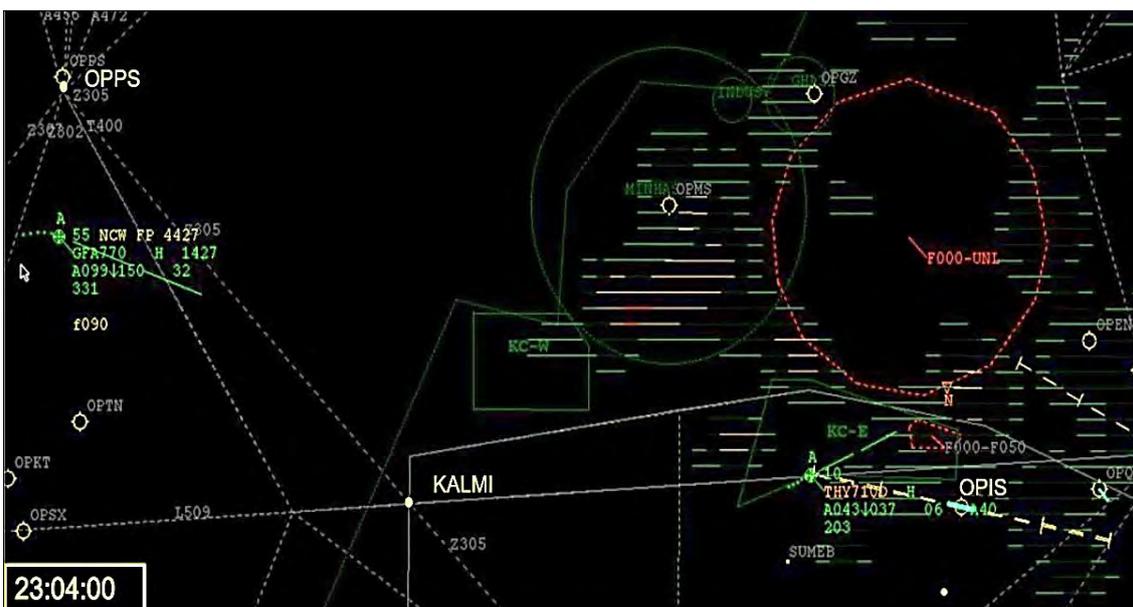


Figure 6 GFA 770 given descent to 5,000 ft

1.1.13. At 23:05:36 h and 23:05:50 h, GFA 770 requested latest weather at IIAP, Islamabad which was provided by Approach Control Islamabad.

1.1.14. At 23:06:46 h, passing 5,300 ft, GFA 770 informed Approach Control Islamabad that “GFA 770 climbing Terrain React”.

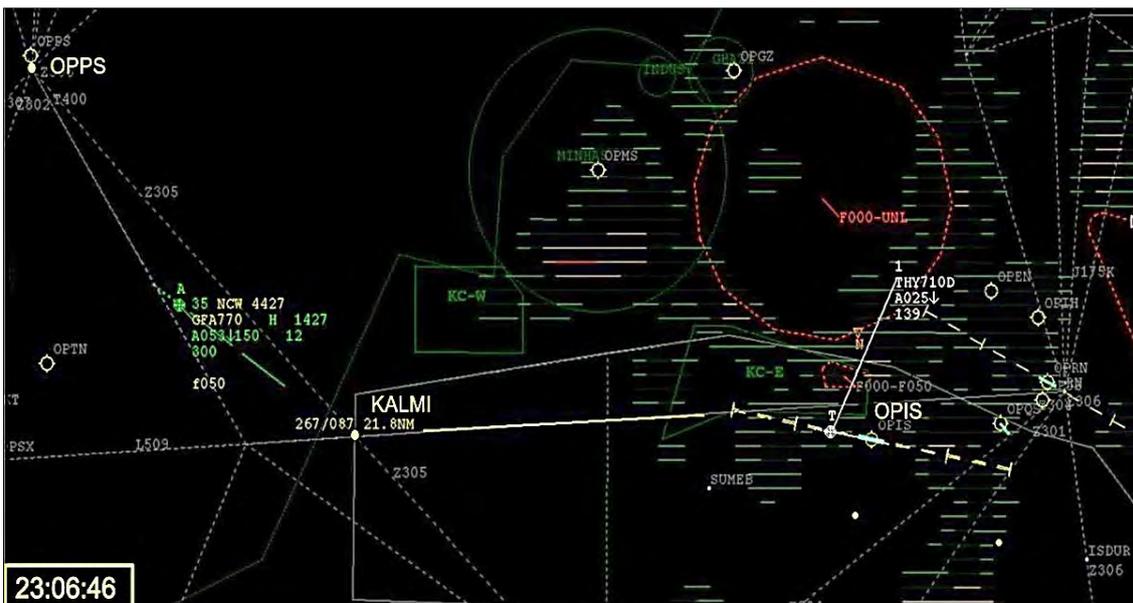


Figure 7 GFA 770 Climbing Terrain React

1.1.15. At 23:06:50 h, GFA 770 reported climbing 7,000 ft and subsequently 10,000 ft. GFA 770 informed Approach Control Islamabad that they had to climb due to GPWS warning. Same was acknowledged by Approach Control Islamabad.

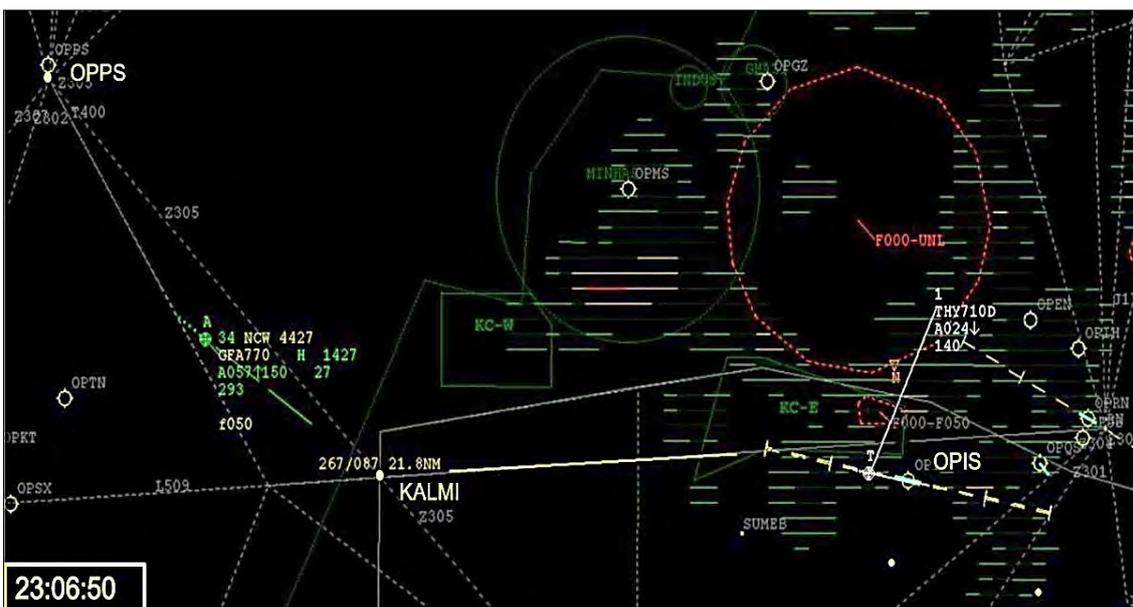


Figure 8 GFA 770 reported climbing 7,000 ft and then 10,000 ft

1.1.16. At 23:08:10 h, when GFA 770 was 08 NM short of position KALMI, it requested descent which was cleared for 6,000 ft by Approach Control Islamabad.

1.1.17. At 23:08:26 h, GFA 770 informed Approach Control Islamabad that earlier they had been given descent to 5,000 ft and had been under Radar coverage but received GPWS warning due to which they had to climb to 10,000 ft. Approach Control Islamabad informed that repeated descent requests were made by Pilot upon which they had been given descent to avoid bad weather. GFA 770 acknowledged that they asked for lower level due to weather but also informed Approach Control Islamabad that they were under radar control descending to 5,000 ft.

1.1.18. AT 23:10:15 h, position KALMI, GFA 770 was cleared for Instrument Landing System (ILS) Approach Runway (R/W) 10R via position SUMEB and then turn left IS416 which was acknowledged by GFA 770.

1.1.19. At 23:11:30 h, while proceeding towards position KIMUL, GFA 770 inquired whether they were cleared to descent to 6,000 ft which was confirmed by the Approach Control Islamabad.

1.1.20. At 23:12:50 h, Approach Control Islamabad instructed GFA 770 to descend 5,000 ft and further descend as per Approach chart. GFA 770 was asked to report established for ILS R/W 10R.

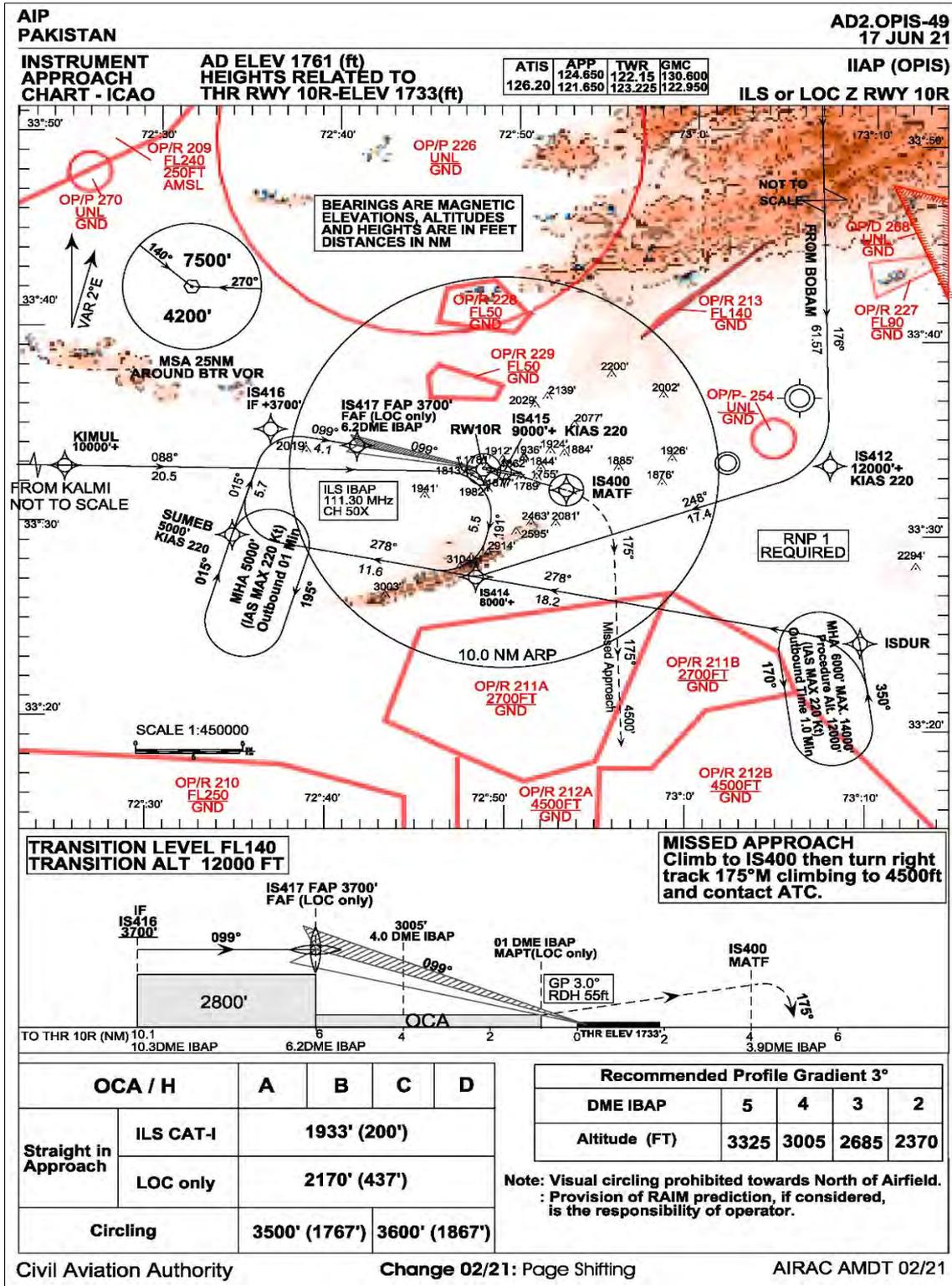


Figure 9 ILS Z Approach IIAP, Islamabad

1.1.21. At 23:14:00 h, GFA 770 was informed about the latest wind {360° 35 knots (kts)}.

1.1.22. At 23:14:14 h, while passing 6,200 ft, GFA 770 decided to discontinue Approach and hold present position at 6,000 ft.



Figure 10 GFA 770 decided to hold for Weather Improvement

1.1.23. Between 23:15:00 h to 23:21:00 h, GFA 770 was provided the weather updates by Approach Control Islamabad at different intervals. GFA 770 was informed about light rain over the airfield and as per Meteorological (MET) Office the weather would persist for one hour with heavy rain and wind may gust up to 40 kts. GFA 770 was also informed about the weather warning for thunderstorm rain which was valid up to 00:15:00 h. GFA 770 requested to proceed to KALMI and hold over KALMI. Approach Control Islamabad cleared GFA 770 to proceed to KALMI and climb 9,000 ft. Same was acknowledged by GFA 770.

1.1.24. At 23:39:04 h, Approach Control Islamabad informed GFA 770 that heavy rain was in progress over the airfield and visibility had reduced to less than 100 meters (m) which was acknowledged by GFA 770.

1.1.25. At 23:39:46 h, GFA 770 requested for higher level. Approach Control Islamabad cleared GFA 770 to climb FL200.



Figure 11 GFA 770 climbing to FL200

1.1.26. At 23:43:42 h, Tower informed Approach Control Islamabad about heavy rain and wind up to 17 kts but improvement in visibility. Same was conveyed to GFA 770.

1.1.27. At 00:25:01 h, Approach Control Islamabad informed GFA 770 that visibility towards R/W 10R had improved to 10 kilometres (kms) with wind 120° 12 kts.

1.1.28. At 00:33:32 h, GFA 770 inquired about any briefing from MET office regarding weather improvement in next 30 mins. Approach Control Islamabad informed GFA 770 that wind 110° 09 kts, visibility more than 07 kms with weather warning for thunderstorm rain valid till 03:15:00 h.

1.1.29. At 00:51:00 h, Approach Control Islamabad informed GFA 770 that rain has stopped, wind 110° 15 kts and weather has moved towards South.

1.1.30. At 00:54:26 h, GFA 770 acknowledged that as per their weather radar, weather is improving but they will wait for another 10 to 15 mins for further improvement.

1.1.31. At 00:59:24 h, Approach Control Islamabad informed GFA 770 that weather has moved towards South and Approach Path R/W 10R seems to be clear.

1.1.32. At 01:07:36 h, GFA 770 reported ready for Approach. Approach Control Islamabad cleared GFA 770 for ILS 'Z' Approach for R/W 10R.



Figure 12 GFA 770 Approach for ILS Z for R/W 10R

1.1.33. At 01:23:00 h, GFA 770 landed safely at IIAP, Islamabad.

1.2. Injuries to Person(s)

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

Injuries	Crew	Passengers	Total in the Aircraft	Others
Fatal	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil
Minor	Nil	Nil	Nil	Nil
None	13	Nil	13	Nil
Total	13	Nil	13	Nil

Table 1 Details of Injuries to Persons On-Board

1.3. **Damage to Aircraft**

1.3.1. Not Applicable.

1.4. **Other Damage**

1.4.1. Not Applicable.

1.5. **Personnel Information**

Captain / Pilot Monitoring	
Age / Nationality / Gender	53 Years / Bahrain / Male
License Type / Validity / Rating	ATPL / 03-03-2022 / B787
Medical Class / Validity	Class 1 / 24-08-2022
Flying Hours in past 24 hours	Nil "Day Off"
Flying Hours in previous 07 days	21:55
Flying Hours in previous 90 days	194:34
Total Flying Hours	11280:06
Type rated aircraft	496:10
Type of aircraft flown	A320 / A330 / A340 / B787 / E170 / E190
Pilot flying / Pilot monitoring at the time of occurrence	Pilot Monitoring
Date of Recent Training	20-02-2021

Table 2 Captain's Brief Description

First Officer (FO) / Pilot Flying	
Age / Nationality / Gender	31 Years / Bahrain / Male
License Type / Validity / Rating	ATPL / 02-02-2025 / B787
Medical Class / Validity	Class 1 / 01-09-2022
Flying Hours in past 24 hours	Nil "Day Off"
Flying Hours in previous 07 days	12:23
Flying Hours in previous 90 days	99:27
Total Flying Hours	4178:16
Type rated aircraft	726:01
Type of aircraft flown	A320 / B787
Pilot flying / Pilot monitoring at the time of occurrence	Pilot Flying
Recent Training	03-04-2021

Table 3 FO's Brief Description

Approach Controller / Team Leader	
Date of Birth	01-12-1965
Type of License and Validity	ATCL / 30-09-2021
Class and Validity of Medical	Class III / 31-12-2021
Air Traffic Control (ATC) Rating (Aerodrome Control)	Since 21-08-2019
ATC Unit Rating (Approach Surveillance)	Since 01-09-2007
ATC Unit Rating (Approach Control)	Since 14-07-2014
ATC Unit Rating (OJTI Approach Control)	Since 24-05-2021

Table 4 Approach Controller / Team Leader's Brief Description

Approach Controller	
Date of Birth	08-09-1973
Type of License and Validity	ATCL / 31-01-2022
Class and Validity of Medical	Class III / 31-12-2021
ATC Unit Rating (Approach Surveillance)	Since 08-07-2008
ATC Unit Rating (Approach Control)	Since 29-02-2012

Table 5 Approach Controller's Brief Description

Area Surveillance Controller	
Date of Birth	20-06-1982
Type of License and Validity	ATCL / 31-01-2022
Class and Validity of Medical	Class III / 31-12-2021
ATC Unit Rating (Aerodrome Control)	Since 26-12-2017
ATC Unit Rating (Approach Surveillance)	Since 08-01-2020
ATC Unit Rating (Area Surveillance)	Since 14-01-2021
ATC Unit Rating (Area Control)	Since 04-01-2021

Table 6 Area Surveillance Controller's Brief Description

Area Controller	
Date of Birth	25-12-1977
Type of License and Validity	ATCL / 30-09-2021
Class and Validity of Medical	Class III / 31-12-2021
ATC Unit Rating (Approach Surveillance)	Since 01-12-2016
ATC Unit Rating (Area Control)	Since 01-03-2021
ATC Unit Rating (Approach Control)	Since 14-10-2013
ATC Unit Rating (OJTI Approach Surveillance)	Since 24-05-2021

Table 7 Area Controller's Brief Description

1.6. Aircraft Information

GFA 770	
Aircraft Make & Model	Boeing 787-9
Registration Marking	A9C-FF
Manufacturer Serial No.	39985
Operator	Gulf Air
Sector	Bahrain – Islamabad
Maximum Take-off Weight	227,930 kilograms (kgs)
Maximum Landing Weight	172,000 kg
Maximum Fuel Capacity	126,206 Liters (L)
Flight conditions	Normal

Table 8 Aircraft Information

1.7. Meteorological Information

1.7.1. At the time of the incident, the weather at Islamabad as well as its surrounding areas including Approach was reported to be Thunderstorm / Rain. Meteorological data for IIAP, Islamabad⁴ is as mentioned below: -

Meteorological Aerodrome Report (METAR) IIAP, Islamabad
021955Z 13006KT 5000 HZ FEW040 29/19 Q1006 TEMPO 4500=
022155Z 09011KT 4000 -TSRA FEW030CB SCT040 BKN100 26/20 Q1005 TEMPO 09020G30KT 3000 TSRA=
022255Z 09011KT 5000 -TSRA FEW030CB SCT040 BKN100 24/20 Q1006 TEMPO 09020G30KT 3000 TSRA=
022325Z 09047KT 0300 R28L/0400 RMID0800 R10R/400 +TSRA FEW030CB SCT040 OVC100 19/19 Q1009 TEMPO 09020G50KT 0050 +TSRA=
022355Z 18028KT 1000 R28L/2000 RMID/2000 RIOR/2000 TSRA FEW030CB SCT040 OVC100 17 /16 Q1009 TEMPO 09020G30KT 2000 TSRA=
030025Z 13018KT 4000 -TSRA FEW030CB SCT040 OVC100 18/17 Q1008 TEMPO 09020G50KT 0500 +TSRA=
030055Z 13015KT 4000 TSRA FEW030CB SCT040 OVC100 19/17 Q1009 TEMPO 09020G30KT 2000 +TSRA=
030125Z 09037KT 2500 TSRA FEW030CB SCT040 OVC100 19/19 Q1009 TEMPO 09020G40KT 1000 +TSRA=

Table 9 METAR details IIAP, Islamabad

⁴ Pakistan Meteorological Department – Weather report around IIAP, Islamabad
Final Report – Serious Incident of Gulf Air GFA 770 B787 A9C-FF on 02/06/2021

METAR IIAP, Islamabad	
022255Z	Day: 02 Time: 22:55 UTC (Date & Time)
09011KT	Wind Direction: Wind 90° Speed: 11 kt (Wind Direction and Speed)
5000	5000 m (Visibility in meters)
-TSRA	Light(-) Thunderstorm(TS) Rain(RA)
FEW030CB	Few (FEW) 3,000 ft AGL Cumulonimbus
SCT040	Scattered (SCT) 4,000 ft AGL
BKN100	Broken (BKN) 10,000 ft AGL
24/20	24°C (Temperature) / 20°C (Dewpoint)
Q1006	Air pressure is 1006 hPa (Altimeter setting)
TEMPO	Conditions are expected to change temporarily within next 2 hours
09020G30KT	Wind Direction: 090° Speed: 20 kt, Gusts: 30 kt
3000	3000 meters (Visibility in meters)
TSRA	Thunderstorm (TS) Rain (RA)
SCT040	Scattered (SCT) 4,000 ft AGL

Table 10 METAR description at time 022255Z

METAR IIAP, Islamabad	
022325Z	Day: 02; Time: 23:25 UTC (Date and Time)
09047KT	Wind Direction: 090° Speed: 47 kt (Wind Direction and Speed)
0300	0300 m (Visibility in meters)
R28/L0400	Runway 28 / Visibility 400 m
RMID0800	Runway Mid Visibility 800 m
R10/R400	Runway 10 / Visibility 400 m
+TSRA	Heavy (+) Thunderstorm (TS) Rain (RA)
FEW030CB	Few (FEW) 3,000 ft AGL Cumulonimbus
SCT040	Scattered (SCT) 4,000 ft AGL
OVC100	Overcast (OVC) 10,000 ft AGL
19/19	19°C (Temperature) / 19°C (Dewpoint)
Q1009	Air pressure is 1009 hPa (Altimeter setting)
TEMPO	Conditions are expected to change temporarily within next 2 hours
09020G50KT	Wind Direction: 090° Speed: 20 kt, Gusts: 50 kt
0050	0050 m (Visibility in meters)
+TSRA	Heavy (+) Thunderstorm (TS) Rain (RA)

Table 11 METAR description at time 022325Z

1.7.2. Weather Warning data for IIAP, Islamabad: -

1.7.2.1. On 02nd June, 2021 weather warning for Thunderstorm Rain, Gusty Wind and Poor Visibility for the period from 022115 to 030015 with surface wind possibly gusting to 20-30 kts or more in North East – South East direction. Surface visibility may reduce 03-01 kms or less due to precipitation.

1.7.2.2. On 03rd June, 2021 previous weather warning for Thunderstorm Rain, Gusty Wind and Poor Visibility was extended for the duration 030015 to 030315.

1.8. Aids to Navigation

1.8.1. Navigational aids for IIAP, Islamabad are provided below. At the time of incident, no abnormality was reported.

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 (2/2017)	BTR	114.6 MHz CH93X	H24	333239.54N 0725121.84E	535.11M	Coverage 200 NM
GP/TDME 10R	DOTS / DASHES	332.3 MHz CH50X	H24	333306.34N 0724834.23E	545.95M	-
GP/TDME 28R	DOTS / DASHES	330.2 MHz CH44X	H24	333254.84N 0725031.54E	549.50M	-
GP/TDME 28L	DOTS / DASHES	334.7 MHz CH18X	H24	333240.29N 0725029.68E	546.89M	-

Table 12 Radio Navigation & Landing Aids IIAP, Islamabad

1.9. Communications

1.9.1. Communication frequencies for IIAP, Islamabad are provided below. At the time of incident, no abnormality was reported: -

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

Table 13 Communication Facilities, IIAP, Islamabad

1.10. Aerodrome Information

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

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	Slope of RWY/SWY
1	2	3	4	5	6	7
10R	100.58°	3658 x 60	110/F/C/X/T ASPH Flexible	333304.28N 0724821.81E	THR 528.06 M/ 1732.49 FT	0.12% UP
28L	280.60°	3658 x 60	110/F/C/X/T ASPH Flexible	333242.42N 0725041.37E	THR 532.53 M/ 1747.14 FT	0.12% DOWN
10L	100.58°	3658 x 45	110/F/C/X/T ASPH Flexible	333310.98N 0724823.30E	THR 529.03 M/ 1735.67 FT	0.12% UP
28R	280.60°	3658 x 45	110/F/C/X/T ASPH Flexible	333249.12N 0725042.87E	THR 533.41 M/ 1750.04 FT	0.12% DOWN
SWY dimension (M)	CWY dimension (M)	Strip dimension (M)	RESA dimension (M)	Arresting system	Obstacle Free Zone	Remarks
8	9	10	11	12	13	14
-	1000 x 150	3778 x 300	240 x 150	-		Runway Shoulders: 7.5 m on each side of Both Rwy's
-	190 x 150	3778 x 300	240 x 150	-		-
-	1000 x 150	3778 x 300	240 x 150	-		-
-	1000 x 150	3778 x 300	240 x 150	-		-

Table 14 Aerodrome Information – R/W Physical Characteristics IIAP, 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. Both the Captain and the First Officer had valid medical category and were fit to undertake the flight.

1.13.2. All the Duty Air Traffic Controllers had valid medical category.

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. AIR TRAFFIC CONTROL:

1.17.1.1. Air Traffic Services (ATS) within Islamabad ACC are being provided by Area Control Islamabad, Cherat Approach (which is further divided into North and South sector) and Approach Control Islamabad.

1.17.1.2. Area Control Islamabad is manned by the following two Control Positions:

- (a) Area Surveillance Control
- (b) Area Procedure Control.

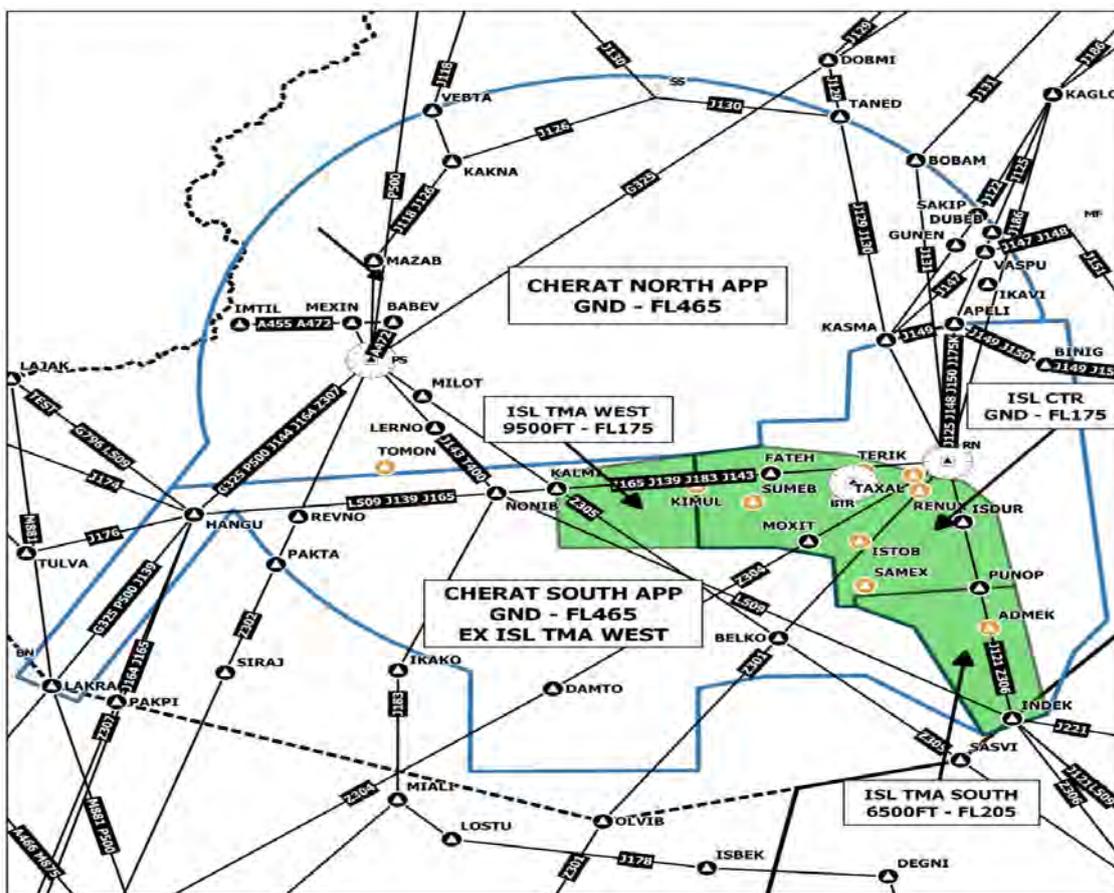


Figure 13 Area Control Zone

1.17.2. Area of Responsibility (Vertical limits):

1.17.2.1. Area Control Islamabad: Station Air Traffic Instruction (SATI) IIAP, Islamabad describes area of responsibility of:

- (a) Area Control Islamabad as – “GND - UNL (Outside lateral limits of Cherat (South / North) / Nur Khan and FL280 - UNL within lateral limits of Cherat (South / North) / Nur Khan on ATS Routes”.
- (b) Cherat Approach South as – “From GND to Unlimited (excluding ATS routes at or above FL280 and excluding airspace falling within IIAP TMA / CTR)”.

- (c) Cherat Approach North as – “From GND to Unlimited (excluding ATS routes at or above FL280)”
- (d) Approach Control Islamabad as: -
 - (i) Within Islamabad Control Zone GND to FL175.
 - (ii) Within Islamabad Terminal Control Area South 6,500 ft Above Mean Sea Level (AMSL) to FL205.
 - (iii) Within Islamabad Terminal Control Area West 9,500 ft AMSL to FL175.

1.17.3. At the time of the incident the duty roster contained following controlling positions: -

- (a) Area Surveillance Controller.
- (b) Area Procedure Controller.
- (c) Approach Surveillance / Procedure Controller or Alternate night Approach Controller (from 2200 h to 0400 h).

Note: Due to manpower shortage and to facilitate training, Senior most Controller in shift was to act as Team Leader till deployment of dedicated Team Leader⁵.

(a) **Area Surveillance Controller** – The Area Surveillance Controller handled GFA 770 as it entered in its Area of Responsibility (AOR) till the time it was supposed to be handed over to Cherat Approach South. However, due to non-availability of duty Controller at Cherat Approach South position, GFA 770 was kept on Area Control Islamabad frequency. Later, GFA 770 entered Cherat Approach North AOR. GFA 770 was subsequently handed over to Approach Control Islamabad by Area Control Islamabad. No evidence is available with reference to the coordination between: -

- (i) Area Control Islamabad and Cherat Approach North.
- (ii) Area Control Islamabad and Approach Control Islamabad.

(b) **Area Controller (Procedure)** – At the time of the incident, since there was only one aircraft in the AOR of ACC, the controller left his position with the consent of the Area Surveillance Controller to offer Morning (Fajar) Prayers.

(c) **Approach Controller** – Alternate night Approach Controller was on duty at the time of the incident. Shift Approach Controller who was also acting as Team Leader being the Senior most Controller in the shift, had left ACC for washroom.

(d) **Cherat Approach South Controller** – The Controller responsible for handling traffic in the AOR of Cherat Approach South was not available at the time of incident.

1.17.4. SATI, IIAP Islamabad has Coordination and Contingency Procedures between different ATS units⁶. These includes: -

1.17.4.1. Between Islamabad and Lahore

1.17.4.2. Between Islamabad and Nur Khan

1.17.4.3. Between Islamabad and Qasim

⁵ PCAA – Duty Roaster for ATCOs

⁶ SATI, IIAP, Islamabad – Coordination and Contingency Procedures

1.17.5. The distribution of airspace has been clearly demarcated and mentioned in the Aeronautical Information and Publications (AIP), Pakistan and SATI, IIAP Islamabad⁷.

1.18. Additional Information

1.18.1. Ground Proximity Warning System (GPWS)⁸: -

1.18.1.1. GPWS automatically provides a timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth's surface.

1.18.1.2. GPWS provides, unless otherwise specified herein, warnings of the following circumstances:

- (a) Excessive descent rate ("SINK RATE" "PULL UP").
- (b) Excessive terrain closure rate ("TERRAIN" "PULL UP").
- (c) Altitude loss after Take-off or with a high-power setting ("DON'T SINK").
- (d) Unsafe terrain clearance ("TOO LOW – TERRAIN" "TOO LOW – GEAR" "TOO LOW – FLAPS").
- (e) Excessive deviation below glideslope ("GLIDESLOPE").
- (f) Excessive steep bank angle ("BANK ANGLE").
- (g) Windshear protection ("WINDSHEAR").

1.18.1.3. More advanced systems, introduced in 1996, are known as Enhanced Ground Proximity Warning Systems (EGPWS).

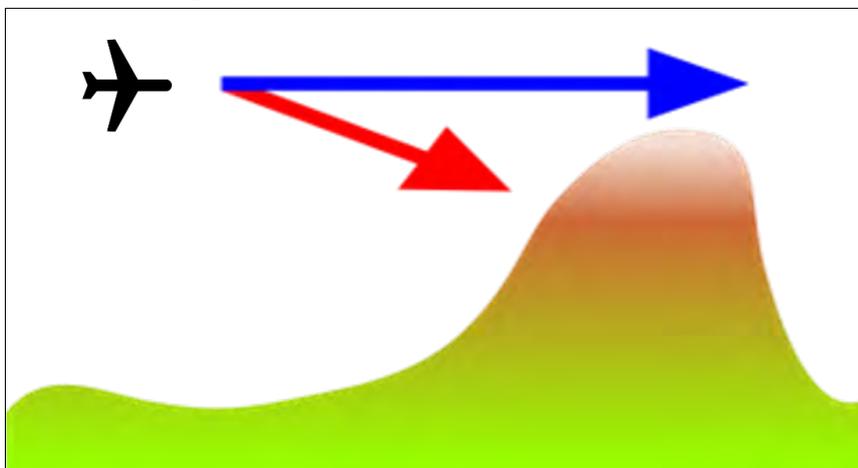


Figure 14 A diagram showing two aircraft paths, the lower of which would trigger GPWS warning.

1.18.2. Minimum Off-Route Altitude (MORA)

1.18.2.1. MORA provides a quick way for an aircraft pilot to read the minimum altitude required for terrain and obstacle clearance.

- (a) MORAs give at least 1,000 ft altitude clearance above terrain and obstacles in areas where highest elevations are 5,000 ft Mean Sea Level (MSL) or lower, such as radio masts.

⁷ SATI, IIAP, Islamabad – Distribution of Airspace

⁸ https://en.wikipedia.org/wiki/Ground_proximity_warning_system

(b) MORAs give 2,000 ft altitude clearance where the terrain and obstacles exceed 5,000 ft MSL.

1.18.2.2. **Types of MORA** – There are two types of MORA, the Route MORA and the Grid MORA:

(a) **Route MORA** – Route MORA provides an obstacle clearance within 10 NM on both sides of the airways and within a 10 NM radius around the ends of the airways.

(b) **Grid MORA** – Grid MORA provides an obstacle clearance altitude within a latitude and longitude grid block, usually of 1°x1°.

1.18.3. **Minimum Sector Altitude (MSA)⁹** – The lowest altitude which may be used, will provide a minimum clearance of 300 m (1,000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centred on a significant point, the Aerodrome Reference Point (ARP) or the Heliport Reference Point (HRP).

1.18.4. **Area Minimum Altitude (AMA)¹⁰** – The minimum altitude to be used under Instrument Meteorological Conditions (IMC) that provides a minimum obstacle clearance within a specified area, normally formed by parallels and meridians.

1.18.4.1. AMA is sometimes referred to as MORA as it provides minimum obstacle clearance above all obstacles in the area. Normally this means 2,000 ft clearance over high terrain or in mountainous areas and 1,000 ft clearance otherwise but different figures can be specified by the Competent Authority.

1.18.5. **Minimum Safe Altitude Warning (MSAW)¹¹:**

1.18.5.1. MSAW is a ground-based safety net intended to warn the air traffic controller about the increased risk of controlled flight into terrain by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles. The main purpose of MSAW is to enhance safety and not to monitor adherence to any specified minima. In practice, MSAW is a part of the ATC system and from this perspective; it can be regarded as a “function”.

1.18.5.2. The MSAW function compares the levels reported by the aircraft transponders that have pressure-altitude reporting capability against defined minimum safe altitudes. When the level / altitude of an aircraft is detected or predicted to be lower than the applicable minimum safe altitude, a visual and, in some implementations, audible warning is generated to the ATCO within whose area of responsibility the aircraft is operating.

1.18.5.3. SATI, IIAP Islamabad mentions the availability of MSAW feature at Islamabad Radar ATM system¹² as: -

“ATM system (SI-ATM) has the capability to provide controller with the MSAW and STCA Alerts.”

1.18.5.4. SATI, IIAP, Islamabad section 5.5.2 (Duties of Area Procedure Control) sub-section 5.5.2.4 states: -

⁹ ICAO Doc 8168 PANS – OPS, Vol 1

¹⁰ ICAO Doc 8168 PANS – OPS, Vol 1

¹¹ <https://skybrary.aero/articles/minimum-safe-altitude-warning-msaw>

¹² SATI, IIAP, Islamabad – Section 5.15

“Acknowledgement & manipulation of FPL(s) showing alerts such as Monitoring Aid (MONA) {Reminders / Non-Compliance Warning (NCW), Medium Term Conflict Detection (MTCD), Short Term Conflict Alert (STCA), Safety Net (SNET) / Minimum Safe Altitude Warning (MSAW) / Area Proximate Warning (APW) / Cleared Level Adherence Monitoring Alert (CLAM) / Approach Path Monitoring (APM) / Route Adherence Monitoring (RAM)}”.

However, MSAW feature was not operational at the time of incident as it was inactive.

1.18.5.5. Non activation of MSAW feature was contrary to ICAO Doc 4444 – PANS-ATM¹³ which states: -

“Information derived from ATS surveillance systems, including safety-related alerts and warnings such as conflict alert and minimum safe altitude warning, should be used to the extent possible in the provision of air traffic control service in order to improve capacity and efficiency as well as to enhance safety.”

1.19. Use of Effective Investigation Techniques

1.19.1. Standard investigation procedures and techniques were used.

¹³ ICAO Doc 4444 – PANS-ATM – Chapter 8, Section 8.4.1

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SECTION 2 – ANALYSIS

2.1. General

2.1.1. Gulf Air Flight GFA 770 was a scheduled flight from BAH, Bahrain to IIAP, Islamabad with ETA 2312 h. Weather at IIAP, Islamabad and surrounding areas including Approach was reported to be Thunderstorm Rain at the time of the incident. GFA 770 was handled by Area Control and Approach Control Islamabad during the period of the incident.

2.2. Flight Operations

2.2.1. Crew qualifications

2.2.1.1. Flight crew were certified and fulfilled desired qualification and fitness criteria for flight crew, and were scheduled to operate the event flight in the respective assigned roles.

2.2.2. Operational Procedures

2.2.2.1. Flight crew Responsibility

(a) Pilot in command (PIC) – The PIC is the pilot, as stated in ICAO Doc 4444 – PANS-ATM, designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

(b) The B787 has a Multi-Function Display (MFD), and each pilot can display terrain + weather, weather + weather, terrain + terrain on Navigational Display (ND) and a small (mini) display under the Primary Flying Display (PFD). Both pilots had a combination of weather (on the ND) and terrain on the mini display. As per Boeing 787-9 Flight Crew Operations Manual (FCOM), the flight crew is responsible for monitoring weather as well as the terrain. During descent, the Pilot Flying (PF) selects the weather on the MFD and the terrain on the mini-map while the Pilot Monitoring (PM) does the opposite. Thus, the PF while piloting the aircraft avoids the weather whereas the PM keeps a watch on the terrain to ensure safety of aircraft. However, the FCOM also gives the provision of modifying these settings as per the prevailing situation and if terrain is not a factor to be considered.

(c) As per Gulf Air B 787-9 FCOM extracts (provided by Gulf Air): -

“Use of Terrain and Weather Display:

Crews should be aware of terrain that may affect the safe operation of the aircraft during all phases of flight to enhance situational awareness, terrain may be selected at any time. Normally, terrain is selected on MFD & Mini map:

Before Take-off:

- *PF selects weather on the MFD and terrain on the mini map (on PFD).*
- *PM selects terrain on MFD and weather on the mini map and retains until above the relevant sector MSA.*

During Descend:

- *PF retains weather on the MFD and terrain on the mini map.*
- *PM selects terrain on MFD and weather radar on the mini map when cleared below highest sector MSA.*

Note: These requirements may be modified with significant weather or if terrain is not a factor.”

(d) As per flight crew, both pilots were concerned about significant weather and had their ND set to display the weather radar which is contrary to the FCOM B 787-9 procedures.

(e) Additionally, although the flight crew were familiar with GRID MORA, they did not consult it while deviating away from the planned route. On the contrary, they obtained the Minimum Sector Altitude (MSA) from the Approach Chart which specified 4,200 ft in the South West Sector within 25 NM from BTR (IIAP VOR), whereas aircraft was approximately 56 NM North West of IIAP, Islamabad (bearing 280° from IIAP, Islamabad), thus incorrectly identifying the MSA for the area.

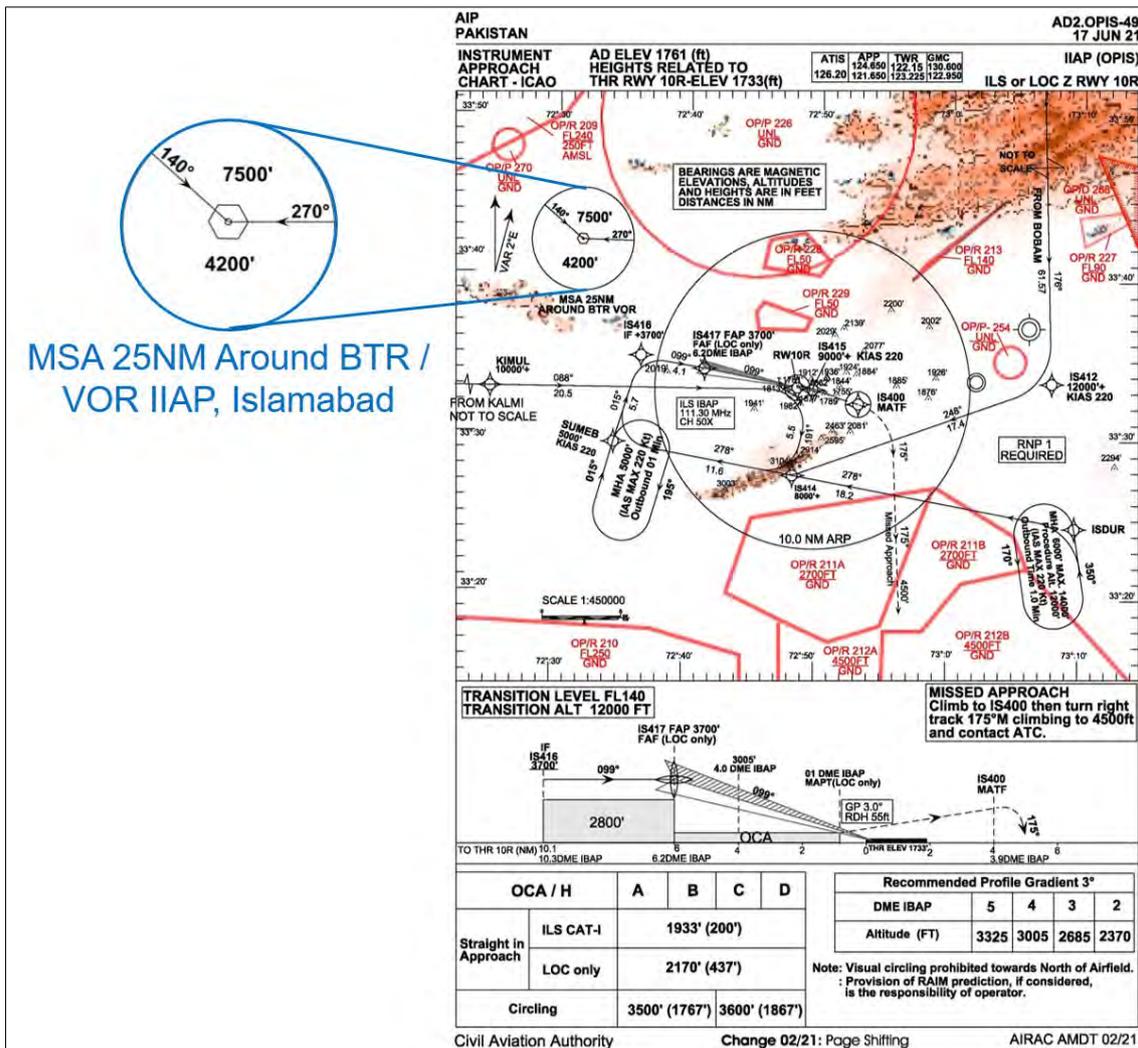


Figure 15 MSA 25 NM around BTR / VOR IIAP, Islamabad

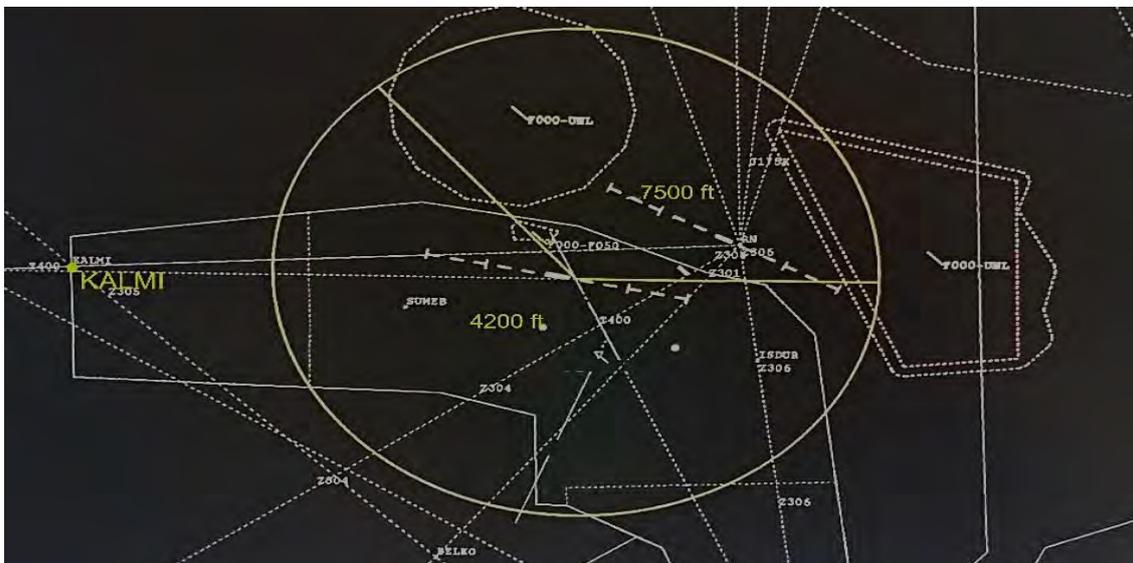


Figure 16 MSA around BTR / VOR IIAP, Islamabad in SI-ATM Radar Display

(f) The inclement weather may have distracted the flight crew from consulting the appropriate charts, yet the responsibility of ensuring safety of the aircraft especially where deviation from ATS route takes place, does not relieve the flight crew of their responsibility. ICAO Doc 4444 – PANS - ATM¹⁴ states: -

“(Note 3) The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect. When an IFR flight is vectored or is given a direct routing which takes the aircraft off an ATS route, the procedures in Chapter 8, 8.6.5.2 apply”.

4.5.1.3 “The issuance of air traffic control clearances by air traffic control units constitutes authority for an aircraft to proceed only in so far as known air traffic is concerned. ATC clearances do not constitute authority to violate any applicable regulations for promoting the safety of flight operations or for any other purpose; neither do clearances relieve a pilot-in-command of any responsibility whatsoever in connection with a possible violation of applicable rules and regulations.”

(g) **Aircraft Vertical Situation Display** – Boeing 787 has a Vertical Situation Display (VSD) where terrain is depicted along the projected aircraft vertical path, however; this only works in managed navigation mode (LNAV) on specified routes. Since the aircraft was off route due weather avoidance, therefore the VSD did not display any terrain.

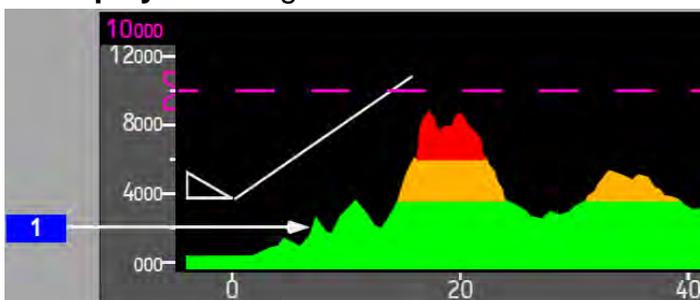


Figure 17 Aircraft Vertical Situation Display
Copyright © Boeing, Reprinted with the permission of The Boeing Company

2.2.3. Weather

2.2.3.1. At the time of the incident, the weather at Islamabad as well as its surrounding areas including Approach was reported to be Thunderstorm / Rain.

2.2.3.2. Weather Warning data for IIAP, Islamabad: -

(a) On 02nd June, 2021 weather warning for Thunderstorm Rain, Gusty Wind and Poor Visibility for the period from 022115 to 030015 with surface wind may gust 20-30 kts or more in North East – South East direction. Surface visibility may reduce 03-01 km or less due to precipitation.

(b) On 03rd June, 2021 Previous Weather warning for Thunderstorm Rain, Gusty wind and Poor Visibility was extended for the duration 030015 to 030315.

(c) The MET expert report after evaluation of the MET charts and data states that the area around position HANGU i.e. 15 NM West and North West of KALMI was under influence of scattered Western disturbance. Therefore, limited flight operations in the mentioned region were possible. However, considering the forecasted weather charts no significant weather was present in the South of HANGU region.

(d) The arrival ahead of GFA 770 was THY710D, which was vectored South of HANGU for traffic management and thereafter for ILS Approach R/W 10R. At the same time another flight bearing call sign VIR 379 departed from IIAP, Islamabad and was following standard ATS route for HANGU.

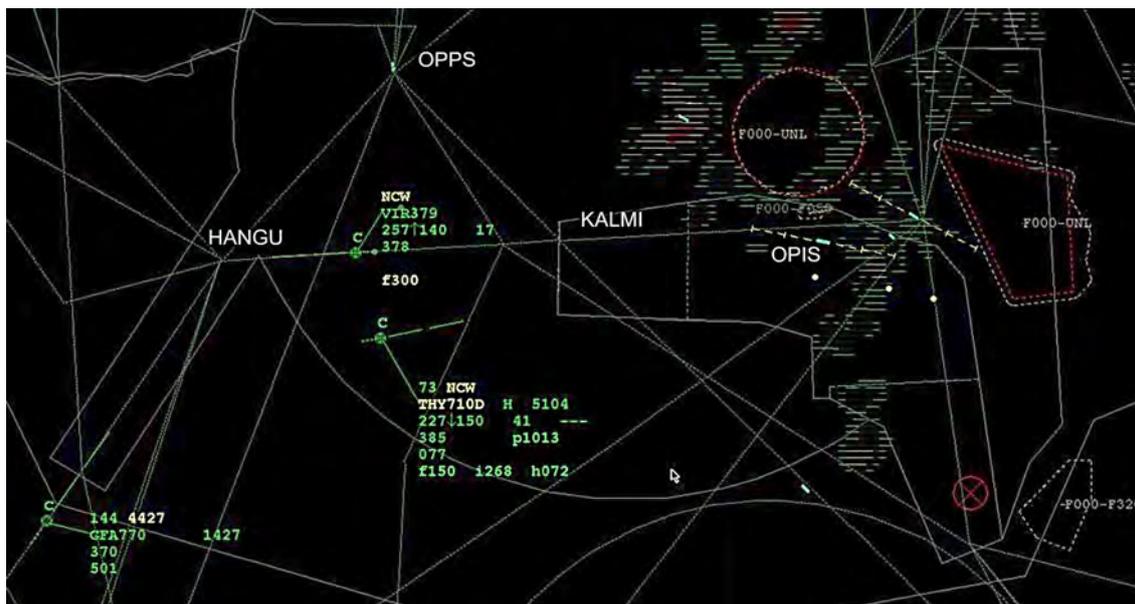


Figure 18 Arrival ahead of GFA 770

(e) GFA 770 decided to approach from Northern side of position HANGU and KALMI.

(f) Neither any briefing or advice was issued by Area Control Islamabad regarding weather, nor any information was obtained from arrival and departures from IIAP, Islamabad and passed to GFA 770.

2.2.4. Air Traffic Control

2.2.4.1. There are three ATS units, which provide ATS to arriving and departing aircraft within Area Control Islamabad airspace. These units are:

- (a) **Area Control Islamabad** having two controlling positions: -
 - (i) Area Surveillance Control position which was manned by qualified Area Surveillance and Procedure Controller.
 - (ii) Area Procedure Control position was vacant during the occurrence as the Controller went for morning prayers (Fajar).
- (b) **Cherat Approach South**
 - (i) During the incident Cherat Approach South position was unmanned during the occurrence as probably the Controller went for morning prayers (Fajar).
- (c) **Approach Control Islamabad**
 - (i) Approach Control position was manned by qualified duty controller.

2.2.4.2. The sequence of handling the air traffic is as follows: -

- (a) Area Control handles the air traffic till FL280 and thereafter hands over the air traffic to Cherat Approach which provides ATS within the AOR and then hands over the traffic to Approach Control Islamabad.
- (b) During the incident, the Area Surveillance Controller handled the aircraft as it entered in its AOR till the time it was supposed to be handed over to Cherat Approach. As Cherat Approach South position was unmanned, he kept the aircraft with him till handing over to Approach Control Islamabad outside the AOR of Approach Control Islamabad.

2.2.4.3. **Contact with Area Control Islamabad**

- (a) At 22:52:00 h, GFA 770 came in contact with Area Control Islamabad, approaching position LAKRA and descending to FL290.
- (b) GFA 770 was identified and given descent to FL150 in the AOR of Cherat Approach South. However, since Cherat Approach South position was unmanned at that time therefore Area Control Islamabad retained the traffic with itself. No evidence of coordination available with Cherat Approach South.
- (c) At 22:57:15 h, approaching position HANGU, GFA 770 requested to maintain heading 060° till 10 NM to avoid flying into inclement weather. Weather deviation was approved by Area Control Islamabad.
- (d) After crossing point HANGU, GFA 770 deviated left of ATS Route to avoid active weather in its flight path. At 23:01:14 h, GFA 770 requested for further descent and informed turning right heading 060°. At this time the GFA 770 was within Cherat Approach North AOR and position was approximately 18 NM South East of Peshawar airfield; however, no evidence of coordination is available with Cherat Approach North and Peshawar ATC.

(e) At 23:01:30 h, GFA 770 was given descent 9,000 ft on its request by Area Control Islamabad in AOR of Cherat Approach North contrary to Area Minimum Altitude (AMA) of 10,300 ft.

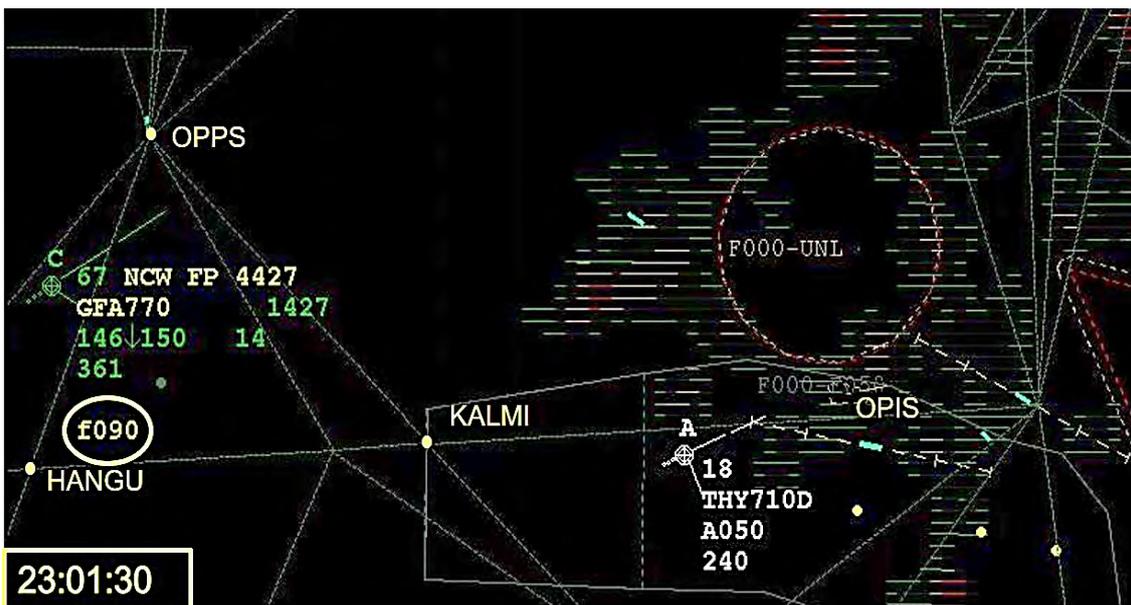


Figure 19 GFA 770 descending 9,000 ft in Cherat Approach North

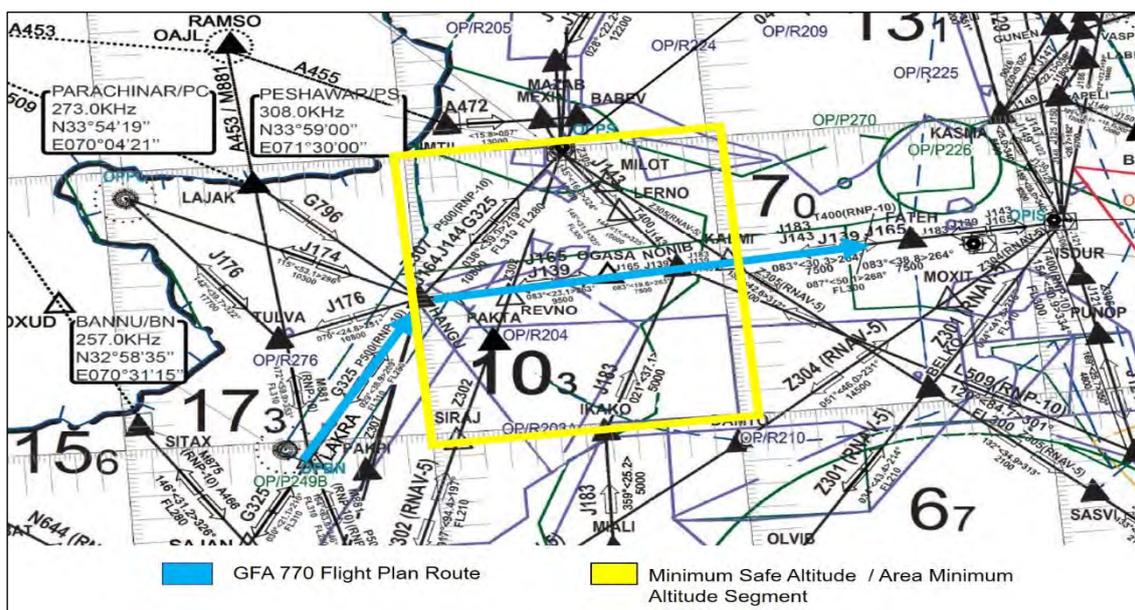


Figure 20 Enroute Chart 6-1 B (GFA 770 Flight plan route and MSA of 10,300 ft)

(f) **Non-activation of Minimum Safe Altitude Warning (MSAW) feature** – There was provision for MSAW feature within SI-ATM but it had not been activated at that time contrary to ICAO Doc 4444 PANS-ATM Chapter 8 Section 8.4.1. However, AIP and relevant documents were available for ready reference at ACC IIAP.

2.2.4.4. Approaching point KALMI from the North West direction at 23:01:42 h, (GFA 770 was passing FL151 for 9,000 ft on heading 050°) the control of GFA 770 was handed over by Area Control Islamabad directly to Approach Control Islamabad without coordination. No weather deviation and level to which GFA 770 was descending was coordinated with Approach Control Islamabad by Area Control.

2.2.4.5. After the incident, a map depicting AMA (as provided in AIP Pakistan) was provided in the SI-ATM system for the guidance of the controllers.

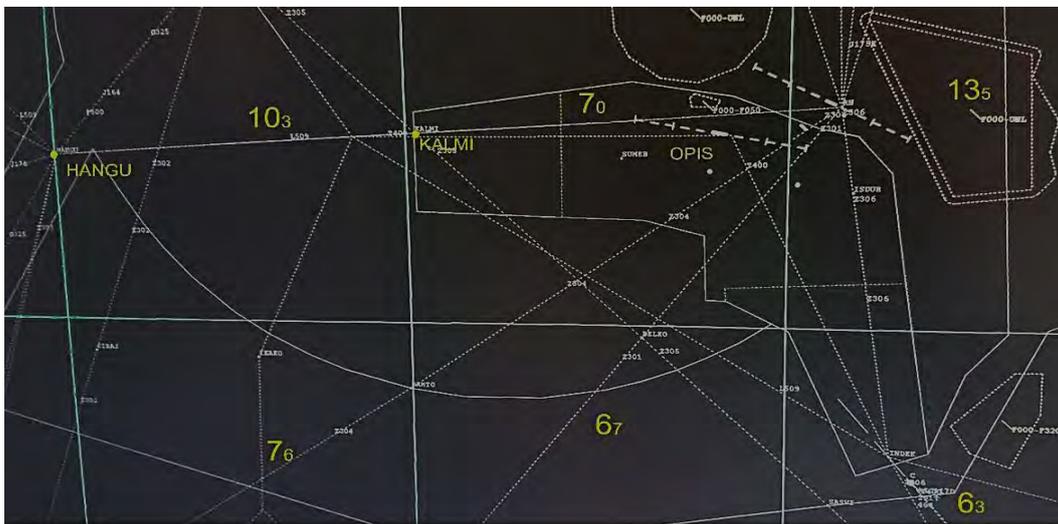


Figure 21 AMA on SI-ATM Display System

2.2.4.6. Area of Responsibility (AOR)

(a) AOR demarcated in SATI, IIAP, Islamabad and provision of ATS are mentioned with further clear instructions regarding transfer of control points¹⁵ which states:

“5.3 PROVISION OF AIR TRAFFIC SERVICES

Relevant Air Traffic Services in Islamabad AOR will be provided by Islamabad ACC. Air Traffic Services will be provided along all ATS routes as per classification contained in AIP Pakistan. Islamabad ACC will be responsible for the provision of ATCS, FIS and alerting service in this Area. Cherat Approach (North / South / NUR KHAN) will provide ATS service in their respective areas as per the LOAs.”

(b) In this case, although the aircraft was not yet in the AOR of Islamabad Approach, yet the aircraft was transferred over to Approach Control well before start of TMA west while the aircraft was flying in AOR of Cherat Approach North and without handing over to Cherat Approach.

¹⁵ SATI, IIAP Islamabad (Version 2.0) – Chapter 5, para 5.2, para 5.3 and 5.18.4
 Final Report – Serious Incident of Gulf Air GFA 770 B787 A9C-FF on 02/06/2021

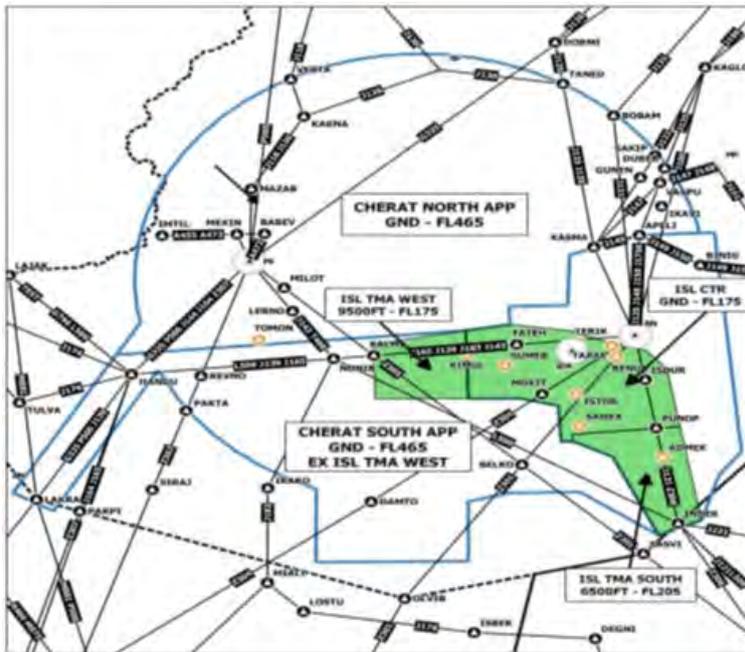


Figure 22 Cherat Control Zone

(c) Though the distribution of airspace has been clearly demarcated and mentioned in the AIP and SATI, IIAP, Islamabad however mutually agreed LOAs between Area control Islamabad and Cherat Approach South / North and between Approach Control Islamabad and Cherat Approach South units were not available.

2.2.4.7. Control with Islamabad Approach

(a) At 23:02:12 h, GFA 770 came in contact with Approach Control Islamabad crossing FL144 descending 9,000 ft on heading 050°. Approach Control Islamabad inquired whether the aircraft was turning right upon which GFA 770 informed that they would be turning right if given descent otherwise they will be entering into bad weather. Approach Control Islamabad gave descent to 10,000 ft to which GFA 770 replied that they are descending 9,000 ft as cleared by Area Control Islamabad. Approach Control Islamabad cleared GFA 770 to descent to 9,000 ft contrary to AMA of 10,300 ft.

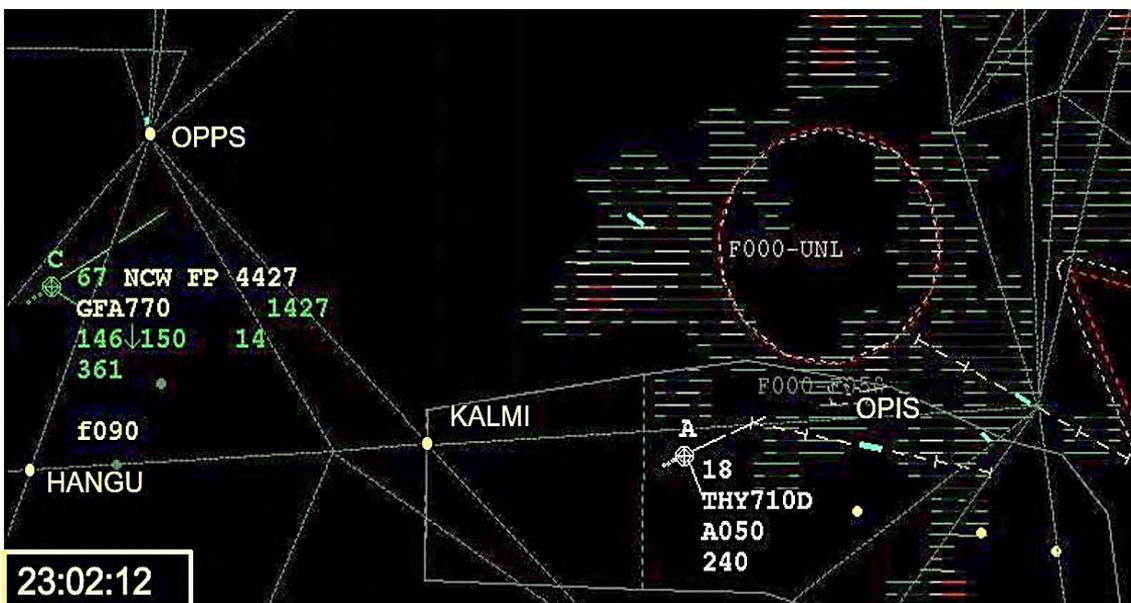


Figure 23 GFA 770 contact with Approach Control Islamabad crossing FL144

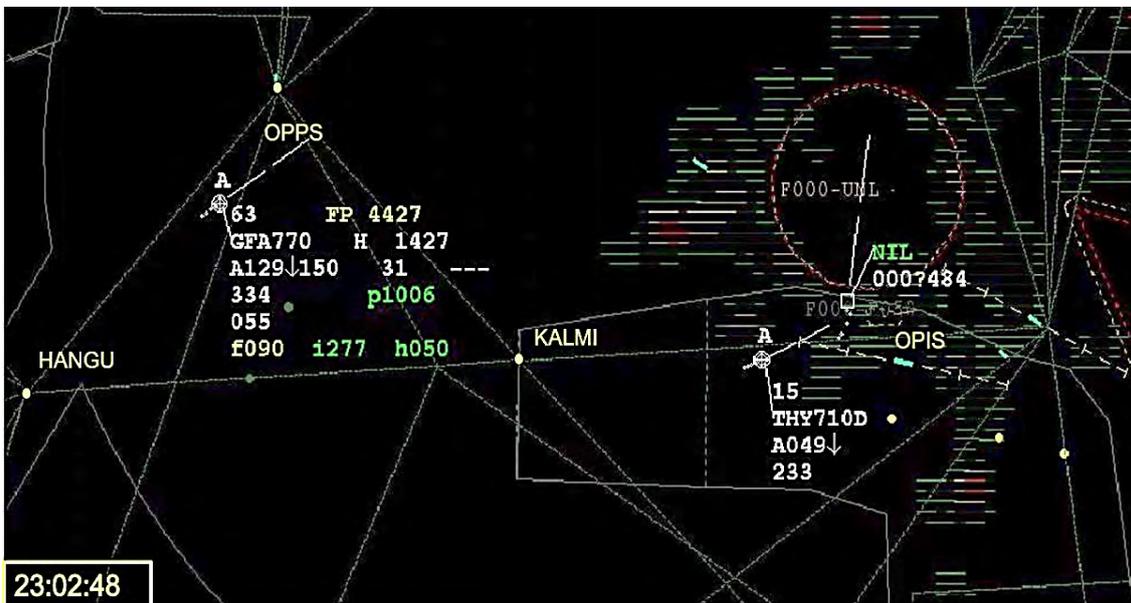


Figure 24 GFA 770 contact with Approach Control Islamabad

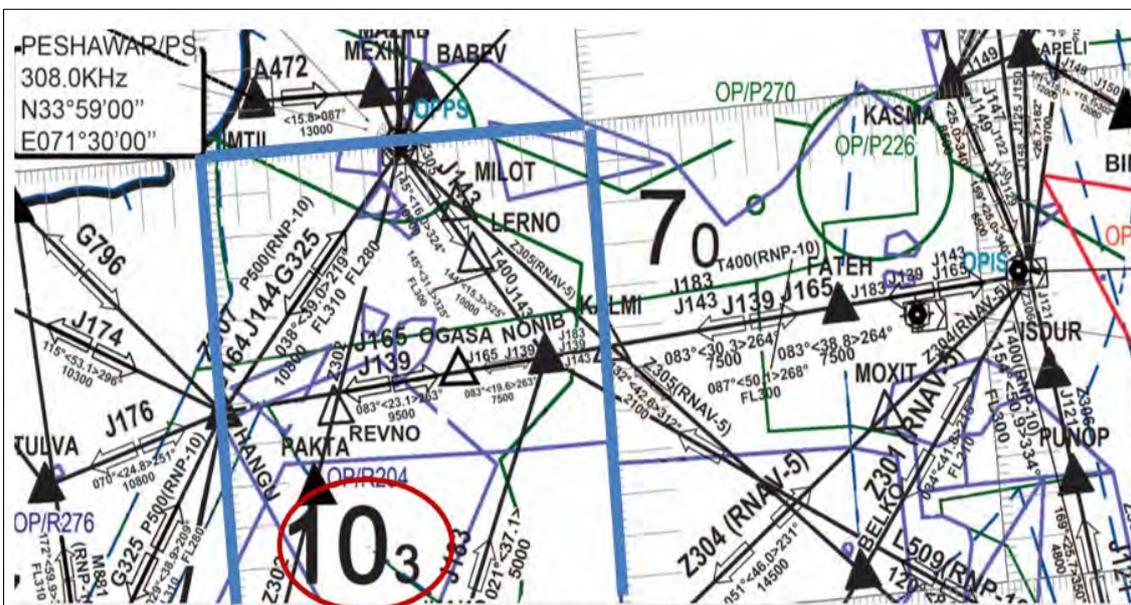


Figure 25 AMA of the Region

- (b) As GFA 770 was flying North of HANGU, no attempt was made by Approach Control Islamabad to transfer GFA 770 to Cherat Approach North. Instead, Approach Control Islamabad took control of the GFA 770 in AOR of Cherat Approach North.
- (c) At 23:03:00 h, GFA 770 informed turning right heading 080° and requested further descent in order to avoid bad weather. However, at 23:03:18, Approach Control Islamabad informed GFA 770 that descent was not possible unless it turned further right as it was heading towards hilly terrain.
- (d) At 23:03:30 h, GFA 770 decided to proceed direct to point KALMI which was approved.

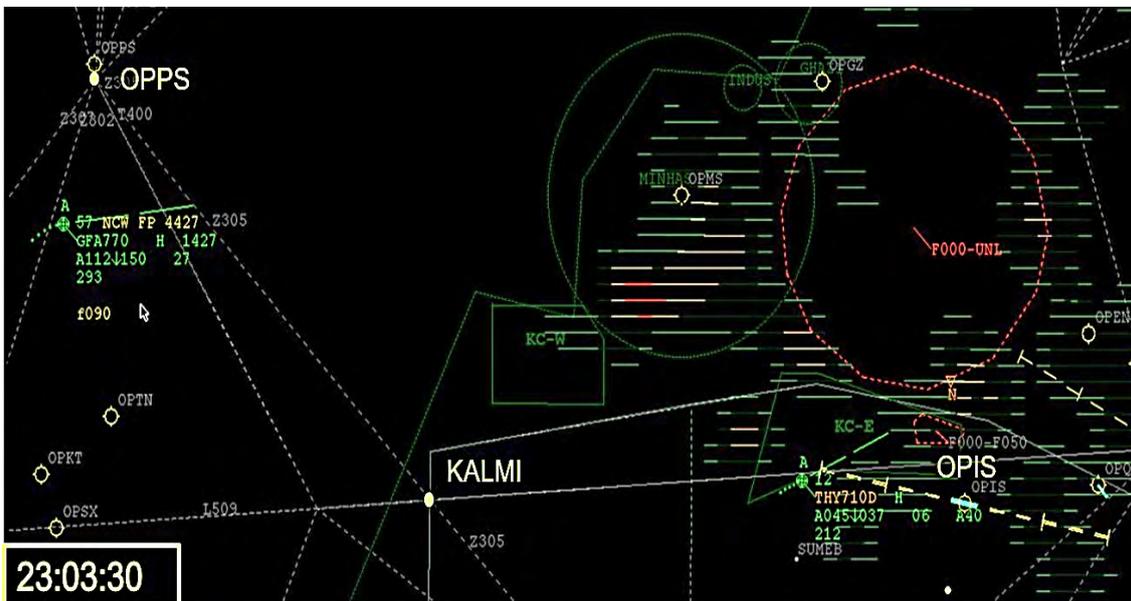


Figure 26 GFA 770 proceeding direct to point KALMI

(e) Approaching KALMI, at 23:04:00 h, GFA 770 requested for descent twice in response to which the Approach Control Islamabad cleared GFA 770 to descend to 5,000 ft contrary to AMA of 10,300 ft and advised GFA 770 to expect further descent 25 NM short of Islamabad (KALMI). GFA 770 was at this time approximately 15 NM North West of KALMI.

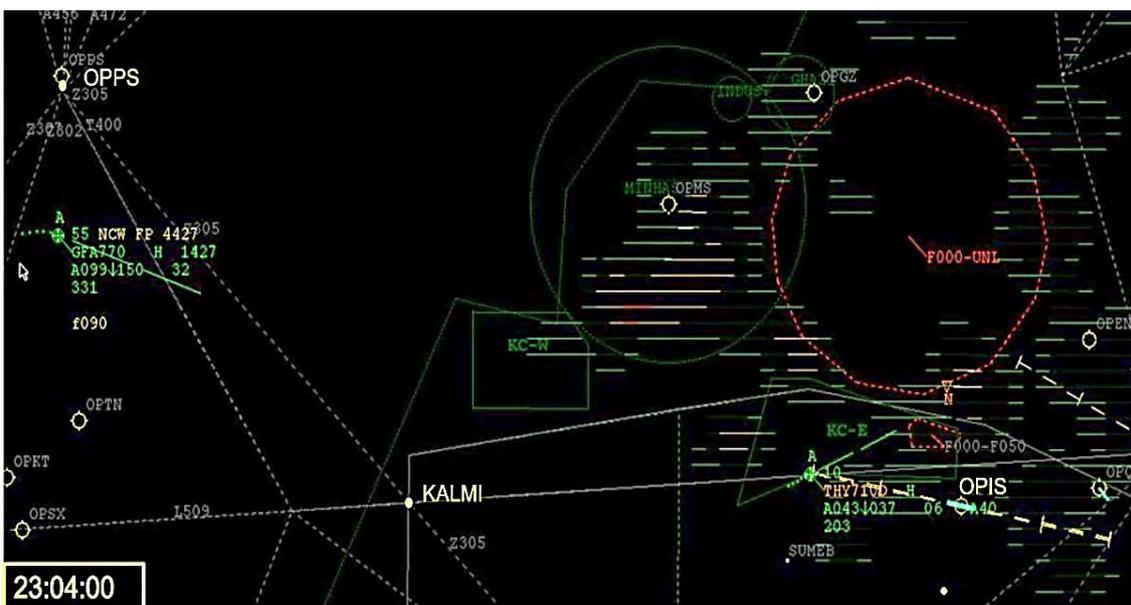


Figure 27 Descend to 5,000 ft Contrary to AMA of 10,300 ft

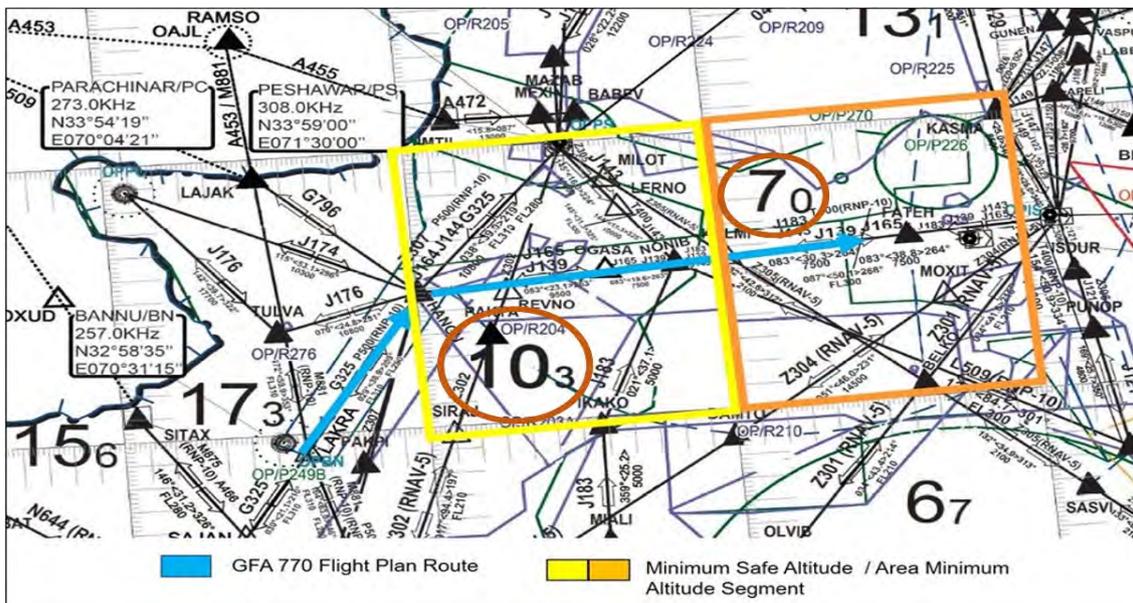


Figure 28 Enroute Chart 6-1 B (showing GFA 770 Flight Plan Route and AMA of 10,300 ft and 7,000 ft.)

- (f) At this time, the GFA 770 was still flying in AOR of Cherat Approach North.
- (g) At 23:05:36 h and 23:05:50 h, GFA 770 requested latest weather at IIAP, Islamabad which was provided by the Controller.
- (h) At 23:06:46 h, as GFA 770 was descending through 5,300 ft, it received the Terrain react (Ground Proximity warning from EGPWS). The pilot immediately discontinued descent, initiated climb and informed the controller passing 5,700 ft.

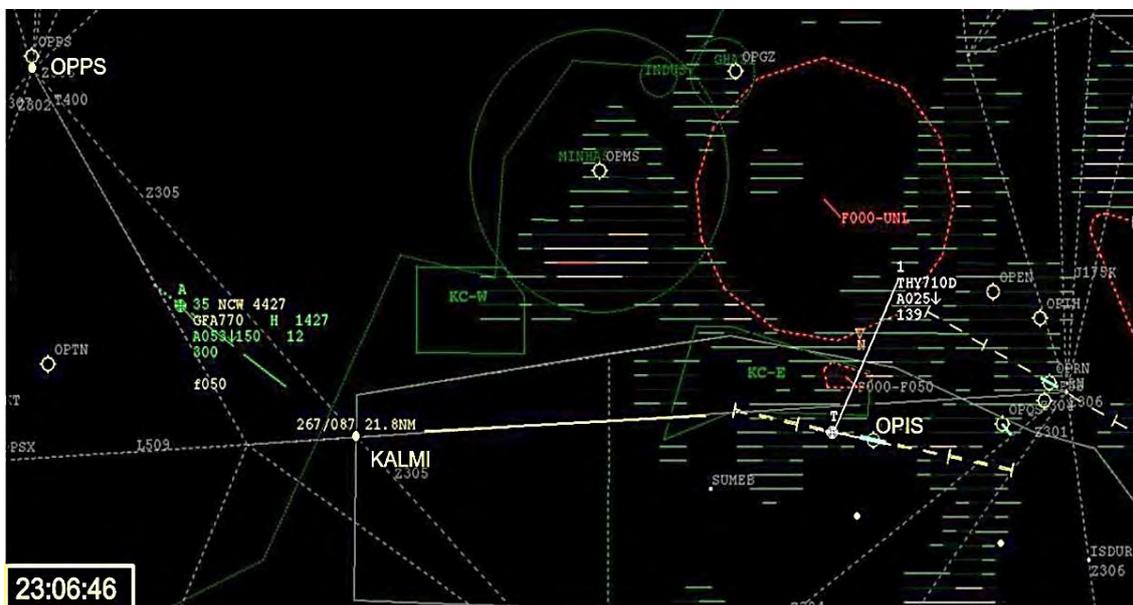


Figure 29 descending through 5,300 ft, GFA 770 received the Terrain react

- (i) At 23:06:49, GFA 770 reported climbing 7,000 ft and subsequently 10,000 ft.

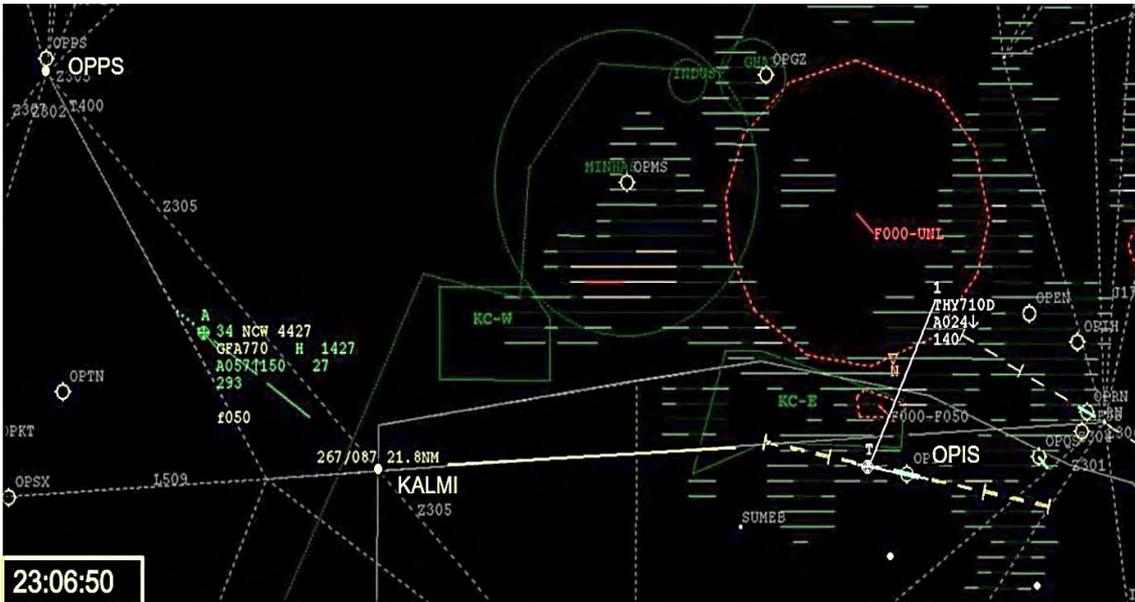


Figure 30 GFA 770 climbing 7,000 ft



Figure 31 GFA 770 climbing 10,000 ft

(j) At 23:08:10, 08 NM short of position KALMI, GFA 770 requested descent, which was cleared for 6,000 ft.

(k) At 23:08:26, GFA 770 informed Controller that earlier they had been given descent to 5,000 ft and had been under Radar coverage but received GPWS warning due to which they had to climb 10,000 ft. Approach Controller responded that repeated descent requests were made by Pilot upon which they had been given descent to avoid bad weather.

(e) The Objectives of ATS are mentioned in ICAO Annex-11¹⁹ as:

“The objectives of the air traffic services shall be to:

- a) Prevent collisions between aircraft;*
- b) Prevent collisions between aircraft on the maneuvering area and obstructions on that area;*
- c) Expedite and maintain an orderly flow of air traffic;*
- d) Provide advice and information useful for the safe and efficient conduct of flights;*
- e) Notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.”*

(f) The above stated objectives do not include prevention of an aircraft collision with terrain; however, Controller may provide advice and information useful for the safe and efficient conduct of flights. It is important to note that the final responsibility for the safety of the aircraft and its occupants lies with the Pilot as ICAO Annex-2²⁰ states:

“Section 2.3.1 - The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.”

“Section 2.4 - The pilot-in-command of an aircraft shall have final authority as to the disposition of the aircraft while in command.”

2.2.4.9. Roles & Responsibilities

(a) **Responsibility of Area Surveillance Controller²¹** – The Area Surveillance Controller is responsible for the provision of surveillance services within the area under his jurisdiction as stated in SATI, IIAP, Islamabad.

“5.13.1 Radar control service shall be provided by Islamabad Area Control Centre within area of jurisdiction in accordance with the directives contained in MATS-Pakistan.”

(i) In this case, the Area Surveillance Controller was qualified both as Area Procedure and Radar Controller.

(b) **Responsibility of Area Procedure Control²²** – The Area Procedure Control is responsible for the provision of procedural ATC services within the area under its jurisdiction and for ensuring timely and efficient coordination with all adjacent ATS units, which includes.

¹⁹ ICAO Annex-11, Section 2.2

²⁰ ICAO Annex-2, Para 2.3.1 & Para 2.4

²¹ PCAA – SATI, IIAP, Islamabad, Chap 5, para 5.13.1

²² PCAA – SATI, IIAP, Islamabad, Chapter 5, para 5.5.2

“5.5.2.4. Acknowledgement & manipulation of FPL(s) showing alerts such as MONA (Reminders / NCW), MTCD, STCA, SNET (MSAW / APW / CLAM / APM / RAM).

5.5.2.6. Ensuring updates CFL & ROUTE fields of FP label whenever a change is made by Radar controller.

5.5.2.7. Ensuring appropriate setting of Controller Working Position (CWP) for visualization of traffic entering / leaving the area of responsibility

5.5.2.19. Effecting co-ordination with relevant ATS units.”

(i) As per record, the area procedure control position was unmanned as Controller deployed was preparing for Fajar prayers at the time of the incident.

(ii) SATI, IIAP, Islamabad²³ states;

“EFFICIENCY AND DISCIPLINE:

1.2.2. ATS personnel are not permitted to leave their respective units / positions unmanned during their tenure of duty, unless properly relieved. Whenever it is absolutely necessary for any ATS official to leave his place of duty for a short period, necessary interim arrangement shall be made within the Team by Team Leader in such a manner that it should not impair the efficiency of any service being rendered by that ATS unit/position.”

(iii) There was no available evidence indicating that the Area Procedure Controller coordinated with the Team Leader before leaving his duty place. However, due to low traffic volume at that time, the Area Procedure Controller did inform the Area Surveillance Controller before departing.

(c) **Responsibility of Team Leader²⁴** – The Team Leader is responsible for the supervision of air navigation services provided by the Area Control Centre under his jurisdiction including proper manning of all positions and providing guidance in the handling of emergency situations. SATI, IIAP, Islamabad states;

“5.5.1.3. Ensure manning of all operational positions in ATS units for smooth and efficient provision of Air Traffic Services.

5.5.1.5. Provide guidance to ATS personnel handling emergency and / or when encountering any practical problems”

(i) Furthermore, the Job description ²⁵ of Team Leader assigns primary responsibilities which includes:

- To exercise effective administration and management of Air Navigation Services (ANS) personnel on duty.
- To ensure that all positions in all ATS units are properly and suitably manned.
- Arrange / provide short relief to controllers whenever genuinely required.
- To assist Controllers when an aircraft is in a state of emergency and handle the emergency in accordance with laid down procedures.

²³ PCAA – SATI, IIAP, Islamabad, Chapter 1, Para 1.2.2

²⁴ PCAA – SATI, IIAP, Islamabad, Chapter 5, para 5.5.1.3 & 5.5.1.5

²⁵ PCAA – Job Description of Controllers

- To assist Approach Controller in adverse weather conditions.

(ii) The Senior most Controller in the shift was also Team Leader but during the incident he was also not available in the unit to assist Approach Controller.

2.2.4.10. **Non-Availability of dedicated Team Leader** – Due to the lack of a dedicated Team Leader to oversee ATC operations at ATC Islamabad, the senior most Controller on duty was required to assume the responsibilities of the Team Leader, in addition to his regular duties as outlined in ATC Duty Roster.

2.2.4.11. **Responsibility of Approach Surveillance Controller** – The Surveillance Controller is responsible for the provision of surveillance services within the control zone and designated terminal control areas for all arriving / departing traffic under his jurisdiction. As per SATI instructions, Approach Radar Controller shall;

“3.1.2.13. Provide radar service to aircraft within area of responsibility, in accordance with provisions contained in AIP / MATS / ANO and supplementary instructions.”

2.2.5. Communications

2.2.5.1. Inter unit coordination procedures are mentioned in ICAO Doc 4444 – PANS-ATM²⁶ and further in the SATI, IIAP Islamabad which are: -

(a) ICAO Doc 4444 states: -

“4.3.3 Between a unit providing approach control service and a unit providing area control service.

4.3.3.1 When area control service and approach control service are not provided by the same air traffic control unit, responsibility for controlled flights shall rest with the unit providing area control service except that a unit providing Approach control service shall be responsible for the control of:

- a) Arriving aircraft that have been released to it by the ACC;*
- b) Departing aircraft until such aircraft are released to the ACC.*

4.3.3.2 A unit providing approach control service shall assume control of arriving aircraft, provided such aircraft has been released to it, upon arrival of the aircraft at the point, level or time agreed for transfer of control, and shall maintain control during approach to the aerodrome”.

(b) SATI IIAP, Islamabad chapter 3 states²⁷: -

“3.15.10. Adjacent ATS Units (LAH ACC or Cherat Approach or Nur Khan Approach) control will transfer the control of inbound traffic to Islamabad Approach at change over point or at any other position agreed by them. Islamabad Approach Controller shall not give climb above the last assigned level by Adjacent ATS Units (LAH ACC or Cherat Approach or Nur Khan Approach) to departing aircraft unless prior coordination has been affected with concerned Unit.”

²⁶ ICAO Doc 4444 – PANS-ATM, Chapter 4 Para 4.3.3

²⁷ PCAA – SATI, IIAP, Islamabad, Chapter 3, Para 3.15.10

(c) As the area controller was handling GFA 770 in the area of jurisdiction of Cherat Approach, therefore, relevant coordination with Approach Control Islamabad should have been implemented by area controller for the safety of aircraft.

(d) SATI, IIAP Islamabad states²⁸: -

“Islamabad ACC and approach shall affect coordination in accordance with the laid down procedures as contained in Manual of Air Traffic Services (MATS) and ICAO DOC 4444 – PANS-ATM”

(e) No evidence was available with respect to inter unit coordination by the Area Control Islamabad at the time of the incident (Cherat Approach North / South and Approach Control Islamabad).

(f) SATI, IIAP, Islamabad has Coordination and Contingency Procedures between different ATS units. These includes: -

- (i) Between Islamabad and Lahore
- (ii) Between Islamabad and Nur Khan
- (iii) Between Islamabad and Qasim

(g) SATI, IIAP, Islamabad do not have any Coordination and Contingency procedures with Cherat Approach South / North.

2.2.5.2. Letter of Agreement (LOA)²⁹

(a) ACC Islamabad has presently six (06) LOAs with adjacent ATS units which are as following:

- (i) Between Islamabad ACC and KABUL.
- (ii) Between Islamabad ACC and URUMQI.
- (iii) Between Islamabad ACC and Lahore ACC.
- (iv) Between Islamabad ACC and Gilgit Aerodrome Control Tower.
- (v) Between Islamabad ACC and Chitral Aerodrome Control Tower.
- (vi) Between Islamabad ACC and Skardu.

(b) The distribution of airspace (Cherat Approach North, Cherat Approach South, Islamabad TMA South and Islamabad TMA West) has been clearly demarcated and mentioned in the AIP and SATI, IIAP, Islamabad; however, mutually agreed LOAs between Area control Islamabad and Cherat Approach South / North and between Approach Control Islamabad and Cherat Approach South units were not available.

2.2.6. Subsequent Profile

2.2.6.1. After recovering from GPWS warning, at 23:10:15 h, GFA 770 was cleared for Approach via positions KALMI, KIMUL and SUMEB followed by ILS Approach for R/W 10R. However, due to the prevailing weather of Thunderstorm Rain as well as high winds, at 23:14:14 h, while passing 6,200 ft, aircraft decided to discontinue Approach and elected to enter and remain in hold over KIMUL at 6,000 ft and later at

²⁸ PCAA – SATI, IIAP, Islamabad, Chapter 5, Para 5.18.4

²⁹ PCAA – List of LOAs of IIAP, Islamabad

KALMI at 9,000 ft and thereafter FL200 to wait for improvement in weather conditions. Subsequently after 01 h and 50 mins and multiple updates of weather provided by Approach Control Islamabad, the aircraft was cleared for ILS Approach R/W 10R and landed at time 01:23:00 h.

2.2.7. Post Landing

2.2.7.1. After landing, the flight crew were asked by Tower to change over to Approach frequency where the controller asked the flight crew regarding details of the GPWS warning. After the incident was relayed by the flight crew, the controller asked if they would raise a report regarding the incident to which the flight crew replied in affirmative. The controller then asked the flight crew if they could refrain from filing the report but the flight crew replied that they were bound to raise the report of the incident as it had been recorded in Flight Data Recorder (FDR).

(a) In order to encourage operators to raise reports regarding GPWS warnings³⁰: -

“States shall encourage operators to report incidents involving activations of aircraft ground proximity warning systems so that their locations can be identified and altitude, routing and / or aircraft operating procedures can be altered to prevent recurrences”.

2.3. Human Factor

2.3.1. Situational Awareness and Adherence to Procedures

2.3.1.1. Flight crew

(a) Flight crew opted to proceed towards North of HANGU to avoid the weather laterally. While aircraft was North-East of HANGU, flight crew requested multiple times from Area and Approach Controller for lower altitude due weather. Flight crew while avoiding weather had selected weather on both MFDs (PF and PM) contrary to the procedures of FCOM, probably as they were giving more attention to weather.

(b) Flight crew obtained the MSA from the Approach Chart which specified 4,200 ft in the South West Sector within 25 NM from BTR (IIAP VOR), whereas aircraft was approximately 56 NM North West of IIAP, Islamabad (bearing 280° from IIAP, Islamabad), thus incorrectly identifying the MSA for the area.

(c) Throughout the weather deviation, flight crew asked multiple times for descent to avoid weather. Aircraft descended to initially 9,000 ft heading 060° after HANGU then while turning right to 080°, Approach Controller cautioned for hilly terrain and advised to turn right for descent. While heading for position KALMI, GFA 770 requested for further descent which was cleared to 5,000 ft by Approach Controller.

(d) Flight crew wrongly selected MSA of 4,200 ft from the Approach chart (25 NM from IIAP) instead of considering Grid MORA as they were distracted due to the weather conditions. Lack of Situational Awareness by both flight crew resulted in overlooking sector AMA of 10,300 ft.

³⁰ ICAO DOC 4444 – PANS-ATM, Chapter 8 para 8.6.5.4

(e) During the weather deviation GFA 770 was avoiding the weather laterally in the beginning. Afterwards, it was observed that flight crew were trying to avoid the weather by descending. Generally, the active weather avoidance techniques are either avoiding by crossing above or by circumnavigating the active developed weather for lateral avoidance; however, in no way weather is avoided by crossing below. It was observed that flight crew had asked for descent multiple times to avoid weather.

2.3.1.2. Air Traffic Controllers

(a) No briefing or advice issued by Area Control Islamabad regarding weather nor any information was obtained from arrival and departures from Islamabad.

(b) Area Control Islamabad provided ATS outside their AOR due to unmanned position of Cherat Approach South.

(c) No evidence of coordination available with Cherat Approach North or Peshawar ATC by Area Control / Approach Control Islamabad while GFA 770 was within Cherat Approach North AOR and position was approximately 18 NM South East of Peshawar airfield.

(d) Area Control Islamabad cleared GFA 770 to descend down to 9,000 ft upon Pilot's request in AOR of Cherat Approach without coordinating with Cherat Approach South / North and without considering AMA of 10,300 ft.

(e) GFA 770 was handed over to Approach Control Islamabad in AOR of Cherat Approach North by Area Control without any coordination.

(f) Approach Control Islamabad took control of the GFA 770 in AOR of Cherat Approach North and cleared GFA 770 to descend down to 5,000 ft upon Pilot's request without coordinating with Cherat Approach North and without considering AMA of 10,300 ft.

(g) The provision of ATS within the AOR of Cherat Approach South / North resulted in lack of Situational Awareness on part of Area Control and Approach Control Islamabad.

(h) Multiple descent requests (05 times) to avoid weather by GFA 770 to Area Control and Approach Control Islamabad resulted in both units involuntarily clearing GFA 770 below AMA resulting in activation of GPWS warning.

2.3.1.3. Dedicated Team Leader

(a) On the night of occurrence Team Leader was also shift Approach Controller from 15:00 h to 17:00 h and thereafter from 23:25 h till 03:10 h. During this time, Team Leader was performing dual duties due to shortage of manpower at location.

(b) During 17:00 h to 23:25 h, alternate Night Approach Controller took over the Approach Control duties. Shift Approach Controller acted as a dedicated Team Leader between this time.

(c) At 23:01 h, GFA 770 was given descent 9,000 ft by Area Control and handed over GFA 770 to Approach Controller. At 23:04 h, Approach Control cleared GFA 770 to 5,000 ft. At 23:06 h, passing 5,300 ft, GFA 770 informed Approach Control

Islamabad about GPWS warning. During the occurrence, Team Leader was not available at his position as he had left ACC for washroom.

(d) Team Leader returned back to his position at 23:12 h. He came to know about the occurrence by Approach Controller. Thereafter, he remained Team Leader / Approach Controller till 03:10 h and handled the aircraft as Approach Controller after the occurrence.

(e) GFA 770 came in contact with Area Control at 22:52 h. At that time Cherat South Control position was vacant. No evidence of any actions taken by Team Leader in absence of Cherat South Controller was available. It is important to highlight that Cherat South Control position remained vacant during the occurrence of GFA 770.

(f) It was observed that during the time of occurrence neither Cherat South Controller nor Team Leader was available at their positions. Additionally, the occurrence took place in AOR of Cherat Approach North and no evidence of coordination by Team Leader or Area / Approach Control with Cherat Approach North with respect to weather deviation was available. Lack of Situational Awareness and assertiveness on part of Team Leader also played an important role in handling the situation.

(g) The presence of Team Leader during emergencies and bad weather conditions enhances safety as he can be helpful in guiding / supervising Controllers with respect to aircraft's weather deviations / emergencies. A dedicated and preferably all rated Senior Controller being Team Leader can be useful while handling different ATC emergencies.

2.3.1.4. Cherat Approach South

(a) The route of GFA 770 was within the AOR of Cherat Approach South. Area and Approach Control Islamabad while observing the non-availability of Cherat Approach South Controller, provided ATS within the AOR of Cherat Approach despite having lack of knowledge about the airspace of Cherat Approach. Probably the presence of Cherat Approach South Controller, being more conversant with the airspace limitation within his AOR, may have avoided the occurrence.

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SECTION 3 – CONCLUSIONS

3.1. Findings

- 3.1.1. Gulf Air Flight GFA 770 was a scheduled flight from BAH, Bahrain to IIAP, Islamabad with ETA 2312 h.
- 3.1.2. The flight crew members were properly certified, met the required qualification and fitness criteria and were scheduled to operate the event flight in their respective assigned roles.
- 3.1.3. All the Duty Air Traffic Controllers had valid Air Traffic Controller License (ATCL) and medical category.
- 3.1.4. The weather at and around IIAP, Islamabad Approach as well as surrounding areas was Thunderstorm Rain.
- 3.1.5. At ACC Islamabad, there were 02 Air Traffic controlling positions manned i.e. Area Surveillance Control and Approach Surveillance Control.
- 3.1.6. At 22:52:00 h, GFA 770 came in contact with Area Control Islamabad, approaching position LAKRA and descending to FL290.
- 3.1.7. GFA 770 was given descent to FL150 by Area Control Islamabad contrary to its vertical AOR.
- 3.1.8. Area Control Islamabad did not coordinate descent (to FL150) with Cherat Approach South as the position of Cherat Approach South was unmanned.
- 3.1.9. At 22:57:15 h, after crossing position HANGU, GFA 770 deviated left of track to avoid weather thus heading towards South of Peshawar.
- 3.1.10. The MET expert analysed that the area around position HANGU i.e. 15 NM West and North West of KALMI was under the influence of scattered Western disturbance. Therefore, limited flight operations in the mentioned region were possible. The forecasted weather charts showed no significant weather was present in the South of HANGU region.
- 3.1.11. The arrival ahead of GFA 770 was THY710D, which was vectored South of HANGU for traffic management and thereafter for ILS Approach R/W 10R.
- 3.1.12. At the same time another flight bearing call sign VIR 379 departed from Islamabad and was following standard ATS route for HANGU.
- 3.1.13. GFA 770 decided to approach from Northern side of position HANGU and KALMI.
- 3.1.14. No briefing or advise was issued by Area Control Islamabad regarding weather nor any information was obtained from arrival and departures from Islamabad.
- 3.1.15. After crossing point HANGU, GFA 770 deviated left of ATS Route to avoid active weather in its flight path. At 23:01:14 h, GFA 770 requested for further descent and informed turning right heading 060°.
- 3.1.16. At this time GFA 770 was within Cherat Approach North AOR and position was approximately 18 NM South East of Peshawar airfield but no evidence of coordination available with Cherat Approach North and Peshawar ATC.
- 3.1.17. At 23:01:30 h, GFA 770 was given descent 9,000 ft on it's request by Area Control Islamabad in AOR of Cherat Approach North contrary to AMA of 10,300 ft.

- 3.1.18. There was provision for MSAW feature within SI-ATM but it had not been activated at that time contrary to ICAO Doc 4444. AIP and relevant documents were available for ready reference within ACC Islamabad.
- 3.1.19. GFA 770 was not changed over to Cherat Approach South / North despite being within their AOR at that time.
- 3.1.20. Cherat Approach South position was unmanned, therefore Area Control Islamabad provided ATS within AOR of Cherat Approach South without having proper knowledge about the airspace limitations.
- 3.1.21. When GFA 770 was flying North of HANGU, no attempt was made by Area Control or Approach Control Islamabad to transfer GFA 770 to Cherat Approach North. Instead, both units provided ATS without having proper coordination / knowledge of airspace limitations.
- 3.1.22. As GFA 770 was approaching point KALMI from the North West direction at 23:01:42 h, (GFA 770 was passing FL151 for 9,000 ft on heading 050°) the control of GFA 770 was handed over by Area Control Islamabad directly to Approach Control Islamabad without coordination.
- 3.1.23. Area Control Islamabad did not apprise the Approach Controller regarding aircraft's weather deviation. No interunit coordination was ensured by Area Control Islamabad before handing over GFA 770 (which was off track from ATS route) to Approach Control Islamabad. This is more evident as Approach Control Islamabad on the request of GFA 770 gave descent to 10,000 ft whereas GFA 770 was already cleared for 9,000 ft by Area Control Islamabad.
- 3.1.24. Area Control Islamabad also did not update the cleared level column while handing over the aircraft electronically.
- 3.1.25. At 23:02:12 h, GFA 770 came in contact with Approach Control Islamabad crossing FL144 descending 9,000 ft on heading 050°.
- 3.1.26. Approach Control Islamabad inquired whether GFA 770 was turning right upon which GFA 770 informed that they would be turning right if given descent otherwise they will be entering into bad weather.
- 3.1.27. At 23:03:00 h, GFA 770 informed turning right heading 080° and requested further descent in order to avoid bad weather. However, Approach Control Islamabad informed that descent was not possible unless GFA 770 turned further right as it was heading towards hilly terrain.
- 3.1.28. At 23:03:30 h, GFA 770 decided to proceed directly to position KALMI which was approved.
- 3.1.29. At 23:04:00 h, GFA 770 twice requested for descent in response to which Approach control Islamabad cleared GFA 770 to descend to 5,000 ft contrary to the AMA of 10,300 ft. GFA 770 was at this time approximately 15 NM North West of KALMI.
- 3.1.30. At this time, GFA 770 was still flying in AOR of Cherat Approach North.
- 3.1.31. At 23:05:36 h and 23:05:50 h, GFA 770 requested latest weather at IIAP, Islamabad which was provided by the Controller.
- 3.1.32. Both pilots were concerned about significant weather.

3.1.33. Both flight crew of GFA 770 had selected weather on MFD with terrain on mini display contrary to procedure specified in FCOM in which PM is to select terrain on MFD and weather on mini display.

3.1.34. Flight crew were familiar with GRID MORA; however, they did not consult it while deviating away from the planned route. On the contrary, they obtained the MSA from the Approach Chart which specified 4,200 ft in the South West Sector within 25 NM from BTR (IIAP VOR), whereas GFA 770 was approximately 56 NM North West of IIAP, Islamabad (bearing 280° from IIAP, Islamabad), thus incorrectly identifying the MSA for the area.

3.1.35. The inclement weather may have distracted the flight crew from consulting the appropriate charts, yet the responsibility of ensuring safety of the aircraft especially during deviation from ATS route does not relieve the flight crew of their responsibility.

3.1.36. At 23:06:46 h, as GFA 770 was descending through 5,300 ft, it received the Terrain React (GPWS warning). The pilot immediately discontinued descent, initiated climb and informed the Controller passing 5,700 ft.

3.1.37. At 23:06:49 h, GFA 770 reported climbing 7,000 ft and subsequently 10,000 ft.

3.1.38. At 23:08:10 h, when GFA 770 was 08 NM short of position KALMI, it requested descent which was given to 6,000 ft.

3.1.39. At 23:08:26 h, GFA 770 informed Controller that earlier they had been given descent to 5,000 ft and had been under Radar coverage but received GPWS warning due to which they had to climb 10,000 ft. Approach Controller responded that repeated descent requests were made by Pilot upon which they had been given descent to avoid bad weather.

3.1.40. The objectives of ATS do not include prevention of an aircraft collision with terrain; however, Controller may provide, advice and information useful for the safe and efficient conduct of flights.

3.1.41. The PIC of an aircraft shall have final authority as to the disposition of the aircraft while in command.

3.1.42. Due to the prevailing weather of Thunderstorm Rain as well as high winds, the flight crew elected to hold for weather improvement. GFA 770 remained in hold for 01 h and 50 min. Subsequently, as the weather improved, GFA 770 was cleared for ILS Approach R/W 10R and landed safely.

3.1.43. SATI, IIAP, Islamabad has Coordination and Contingency Procedures between different ATS units except with Cherat Approach South / North.

3.1.44. The distribution of airspace has been clearly demarcated and mentioned in the AIP and SATI, IIAP, Islamabad.

3.1.45. Mutually agreed LOAs between Area Control Islamabad and Cherat Approach South / North and between Approach Control Islamabad and Cherat Approach South units were not available.

3.1.46. **Human Factor** (Situational Awareness and Adherence to Procedures)

3.1.46.1. **Flight crew**

- (a) Flight crew while avoiding weather had selected weather on both MFDs (PF and PM) contrary to the procedures of FCOM, as they were probably giving more attention to weather.
- (b) Flight crew wrongly selected MSA of 4,200 ft from the Approach chart (25 NM from IIAP) instead of considering Grid MORA as they were distracted due to the weather conditions. Lack of Situational Awareness by both flight crews resulted in overlooking sector AMA of 10,300 ft.
- (c) During the weather deviation GFA 770 was avoiding the weather laterally in the beginning. Afterwards, it was observed that flight crew asked multiple times for descent to avoid weather.
- (d) Generally, the active weather avoidance techniques are either avoiding by crossing above or by circumnavigating the active developed weather for lateral avoidance; however, in no way weather is avoided by crossing below.

3.1.46.2. **Air Traffic Controllers**

- (a) No briefing or advice issued by Area Control Islamabad regarding weather nor any information was obtained from arrival and departures from Islamabad.
- (b) Area Control Islamabad provided ATS outside their AOR due to unmanned position of Cherat Approach South.
- (c) No evidence of coordination available with Cherat Approach North and Peshawar ATC by Area Control / Approach Control Islamabad while GFA 770 was within Cherat Approach North AOR and position was approximately 18 NM South East of Peshawar airfield.
- (d) Area Control Islamabad cleared GFA 770 to descend down to 9,000 ft upon Pilot's request in AOR of Cherat Approach without coordinating with Cherat Approach South / North and without considering AMA of 10,300 ft.
- (e) GFA 770 was handed over to Approach Control Islamabad in AOR of Cherat Approach North by Area Control without any coordination.
- (f) Approach Control Islamabad took control of the GFA 770 in AOR of Cherat Approach North.
- (g) Approach Control Islamabad cleared GFA 770 to descend down to 5,000 ft upon Pilot's request in AOR of Cherat Approach without coordinating with Cherat Approach North and without considering AMA of 10,300 ft.
- (h) The provision of ATS within the AOR of Cherat Approach South / North resulted in lack of Situational Awareness on part of Area Control and Approach Control Islamabad.
- (i) Multiple descent requests (05 times) to avoid weather by GFA 770 to Area Control and Approach Control Islamabad involuntary both units to clear GFA 770 below AMA resulting in activation of GPWS warning.

3.1.46.3. **Dedicated Team Leader**

- (a) On the night of occurrence Team Leader was also shift Approach Controller from 15:00 h to 17:00 h and thereafter from 23:25 h till 03:10 h. During this time, Team Leader was performing dual duties due to shortage of manpower at location.
- (b) During 17:00 h to 23:25 h, alternate Night Approach Controller took over the Approach Control duties. Shift Approach Controller acted as a dedicated Team Leader between this time.
- (c) It was observed that during the time of occurrence, neither Cherat South Controller nor Team Leader was available at their positions. Additionally, the occurrence took place in AOR of Cherat Approach North and no evidence of coordination by Team Leader or Area / Approach Control with Cherat Approach North with respect to weather deviation was available. Lack of Situational Awareness and assertiveness on part of Team Leader also contributed in handling the situation.
- (d) A dedicated and preferably all rated Senior Controller being Team Leader can be useful while handling bad weather conditions and different ATC emergencies.

3.1.46.4. **Cherat Approach South**

- (a) The route of GFA 770 was within the AOR of Cherat Approach South. Area Control Islamabad while observing the unmanned position of Cherat Approach South, provided ATS within the AOR of Cherat despite having lack of knowledge about the airspace of Cherat Approach. Probably the presence of Cherat Approach South Controller, being more conversant with the airspace limitation within their AOR, may have avoided the occurrence.

3.2. **Cause / Contributory Factors**

3.2.1. **Cause**

- 3.2.1.1. Aircraft descended below AMA which resulted in activation of GPWS warning **{Controlled flight into or toward terrain (CFIT)}** due to Non-adherence of SOPs and lack of Situational Awareness.

3.2.2. **Contributory Factors**

- 3.2.2.1. Non availability of dedicated Team Leader during the time of incident.
- 3.2.2.2. Unmanned position of Cherat Approach South during the time of incident.
- 3.2.2.3. Non activation of MSAW feature within the SI-ATM system at IIAP, Islamabad.
- 3.2.2.4. Lack of communication between the ATC units (Area Control Islamabad - Cherat Approach North / Peshawar and Approach Control Islamabad).
- 3.2.2.5. Selection of incorrect display of MSA charts / Grid MORA by flight crew.
- 3.2.2.6. Non-standard selection of weather and terrain on MFDs by flight crew.
- 3.2.2.7. Inadequate weather avoidance technique by flight crew.

Note: *Aviation Occurrence Category (ADREP Taxonomy)*

“Controlled flight into or toward terrain (CFIT): *In-flight collision or near collision with terrain, water, or obstacle without indication of loss of control.*

- *Use only for occurrences during airborne phases of flight.*
- *Includes collisions with those objects extending above the surface (for example, towers, trees, power lines, cable car support, transport wires, power cables, telephone lines and aerial masts).”*

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SECTION 4 – SAFETY RECOMMENDATIONS

4.1. Safety Recommendations

4.1.1. PAA

4.1.1.1. PAA may issue necessary instructions to field ATS Units for adhering to the laid down procedures for the provisioning of ATS in accordance with ICAO guidelines and SATIs procedures with special emphasis on handling the Air Traffic during bad weather

4.1.1.2. PAA may ensure the development of mutually agreed LOAs between different ATS units.

4.1.1.3. Regular simulator sessions of Area and Approach Control may be conducted to enhance and refine the skills in handling abnormal situations and identify areas of additional attention / training requirements etc.

4.1.1.4. PAA may ensure that ATC Field Units make optimum and judicious distribution of qualified and trained manpower including dedicated Team Leaders in the shift duty roster.

4.1.1.5. PAA may carry out study / feasibility at all locations with available facilities to ensure maximum usage of the different safety provisions provided in ATM system as per ICAO Doc 4444, PANS-ATM Para 8.4.1.

4.1.1.6. All ATC operational units should be under CCTV coverage. PAA is requested to install CCTV cameras at all locations at the earliest.

4.1.2. AHQs

4.1.2.1. AHQs to ensure manning of all ATC positions at all locations with adequate manpower

4.1.3. Gulf Air

4.1.3.1. Gulf Air may conduct refresher trainings for their flight crew with special emphasis on flying in adverse weather conditions and correct interpretation of data charts for the safety of aircraft and its occupants