

FINAL INVESTIGATION REPORT



SERIOUS INCIDENT OF PAKISTAN INTERNATIONAL AIRLINES FLIGHT PIA 517, ATR 72-500 AIRCRAFT, REGISTRATION NO. AP-BKY AT PANJGUR AIRPORT ON 10TH NOVEMBER, 2018

Dated: 8th March, 2024

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SCOPE

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ABBREVIATIONS

AAIB	Aircraft Accident Investigation Board
AD	Aerodrome
AGL	Above Ground Level
AIP	Aeronautical Information Publication
AMSL	Above Mean Sea Level
AP	Auto Pilot
ARP	Airport Reference Point
ATPL	Airline Transport Pilot License
CAT	Category
CG	Centre of Gravity
CONFIG	Configuration
CPL	Commercial Pilot License
CWY	Clearway
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
FAB	Frequency Allocation Board
FCOM	Flight Crew Operating Manual
FI	Flight Idle
GNSS	Global Navigation Satellite System
GS	Ground Speed
FAF	Final Approach Fix
FO	First Officer
ft / min	Feet per minute
ft	Feet
h	Hour(s)
hPa	Hectopascal
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IF	Initial Fix
IOU	Incident, Occurrence & Unserviceability
JIAP	Jinnah International Airport
kg	Kilogram(s)
kt	Knot(s)
L/G	Landing Gears
LNAV	Lateral Navigation
MAPT	Missed Approach Point

MEL	Minimum Equipment List
METAR	Meteorological Aerodrome Report
MHz	Mega Hertz
MLG	Main Landing Gear
MOR	Mandatory Occurrence Report
MSA	Minimum Sector Altitude
NDB	Non-Directional Radio Beacon
NLG	Nose Landing Gear
NM	Nautical Mile(s)
NOC	No Objection Certificate
NOTAM	Notice To Airmen
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
PCAA	Pakistan Civil Aviation Authority
PCN	Pavement Classification Number
PF	Pilot Flying
PIA	Pakistan International Airlines
PM	Pilot Monitoring
RA	Radio Altimeter
RAIM	Receiver Autonomous Integrity Monitoring
RESA	Runway End Safety Area
REV	Reverse
RNAV	Area Navigation
ROD	Rate of Descent
R/W	Runway
SDF	Simplified Directional Facility
SOP	Standard Operating Procedure(s)
SWY	Stopway
t	Tonne
TAF	Terminal Aerodrome Forecast
TAS	True Airspeed
TDZ	Touchdown Zone
THR	Runway Threshold
TO	Take-off
TOGW	Take-off Gross Weight
TWR	Aerodrome Control Tower / Aerodrome Control
UTC	Universal Time Coordinated
VFTO	Final Take-off Speed

VGA	Go-Around Speed
VmHB	Landing FLAPS Configuration Approach Speed
VmLB	Minimum Manoeuvre Speed
VOR	VHF Omni-Directional Radio Range
V SPEEDS: -	
V₁	Decision Speed
V₂	Take-off Safety Speed
V_R	Rotation Speed
V_S	Vertical Speed

INTRODUCTION

The incident was reported to Aircraft Accident Investigation Board (AAIB) (then SIB), Pakistan, by M/s Pakistan International Airlines (PIA) vide Mandatory Occurrence Report (MOR) dated 12th November, 2018. Ministry of Aviation, Government of Pakistan issued Memorandum and Corrigendum authorizing AAIB, Pakistan to investigate the incident. The investigation has been conducted by AAIB, Pakistan. All corresponding timings are mentioned in Universal Time Coordinated (UTC).

SYNOPSIS

On 10th November, 2018, Pakistan International Airlines Flight PIA 517, ATR 72-500 aircraft, Reg. No. AP-BKY was operating from Jinnah International Airport (JIAP), Karachi to Panjgur Airport as a scheduled passenger flight. The aircraft took off from JIAP, Karachi at 0207 hours (h) with 61 persons (passengers & crew) on-board. Take-off and flight enroute remained uneventful. For Landing, the aircraft made a high-speed Approach for Runway (R/W) 31 and landed almost halfway down the R/W at 0305 h. After Landing, the aircraft could not stop within the remaining R/W length and departed the R/W. It stopped in the overrun of R/W 31 at a distance of 400 feet (ft) from the end of the R/W, 100 ft to the right from the R/W centreline. All persons were safely evacuated.

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SECTION 1 – FACTUAL INFORMATION

1.1. History of the flight

1.1.1. On 10th November, 2018 PIA 517 operating with ATR 72-500 aircraft, Reg. No. AP-BKY was a scheduled passenger flight from JIAP, Karachi to Panjgur Airport. Panjgur Airport is located at an altitude of 3,289 ft Above Mean Sea Level (AMSL) with R/W dimensions 5,000 x 75 ft. The meteorological conditions at Panjgur were reported to be fair with no significant weather. Aircraft loading was within normal limits of 26.2% Centre of Gravity (CG) with Take-off Gross Weight (TOGW) 21,332 kilograms (kg). No. 2 brake assembly (left side internal wheel) was deactivated as per the provision of Minimum Equipment List (MEL) for flight. The anomaly was pointed out by both the Captain and First Officer (FO) keeping in view the reduced R/W dimensions; however, it was not addressed by the Operator. The aircraft departed from JIAP at 0207 h with ground operations, Take-off and enroute flight being uneventful. Once the aircraft came into contact with Panjgur Airport, the Tower cleared the aircraft to approach for R/W 31 and also passed the wind as 050 degrees (050°), 10 knots (kt) gusting up to 15 kt. While approaching R/W 31 at Panjgur Airport, the aircraft encountered tail wind. The reference Approach speed for Landing was 107 kt as per Flight Crew Operations Manual (FCOM); however, the aircraft speed on Final Approach varied between 118 to 135 kt which was well above the calculated Approach speed. While Landing at Panjgur at 0305 h, the aircraft touched down approximately halfway down the R/W at a speed of 116 kt. Realizing the extended touchdown distance, the Captain decided to execute a “Rejected Landing” procedure. He advanced throttles to add power, but then again retarded the throttles and decided to continue with the Landing Roll. However, the aircraft could not stop and departed from the far end of the R/W, coming to a stop at a distance of 400 ft from the edge of R/W, 100 ft to the right of the R/W centreline. This incident was reported to AAIB Pakistan through Incident, Occurrence & Unserviceability (IOU) Report and MOR dated 12th November, 2018. Ministry of Aviation, Government of Pakistan issued memorandum vide Letter No. HQCAA/1901/416/SIB/503 dated 16th November, 2018 and Corrigendum authorizing AAIB Pakistan to investigate the occurrence. Initial notification of the incident was sent to Bureau of Enquiry and Analysis for Civil Aviation Safety (BEA), France on 14th November 2018 classifying it as a “Serious Incident”.

1.2. Injuries to person(s)

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

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	4	57	Nil
Total	4	57	Nil

Table 1 Injuries to Person(s)

1.3. Damage to aircraft

1.3.1. 02 brake assemblies replaced along with wheel assemblies at Panjgur.

- 1.3.2. 02 wheel assemblies replaced as preventive measure at Panjgur.
- 1.3.3. Main Landing Gears (MLG) and Nose Landing Gear (NLG) replaced once ferried back to JIAP, Karachi after clearance by M/s ATR.

1.4. Other damage

- 1.4.1. Not Applicable.

1.5. Personnel information

Captain	
Date of Birth	2 nd January, 1980
Date of Joining PIA	25 th February, 2008
License type	Airline Transport Pilot License (ATPL)
Last medical examination	31 st August, 2020
Total in Command ATR 72-500	183:15 h
Total in Command	343:30 h
Grand Total	6809:33 h
Last Simulator Training	13 th July, 2018

Table 2 Captain's Brief Description

First Officer	
Date of Birth	26 th February, 1987
Date of Joining PIA	23 rd October, 2017
License type	Commercial Pilot License (CPL)
Total Experience ATR 72-500	130:00 h
Grand Total	400:00 h
Last Simulator Training	7 th October, 2018

Table 3 First Officer's Brief Description

- 1.5.1. **Fake License** – Inquiries revealed that the Airline Transport Pilot License (ATPL) of the Captain had been obtained through fraudulent means. This indicates ambiguities in the examination and assessment system which is the domain of the Pakistan Civil Aviation Authority (PCAA).

1.6. Aircraft information

Aircraft	
Call Sign	PIA 517
Aircraft Make & Model	ATR 72-21A
Registration Marking	AP-BKY
Year of Manufacture	2012
Manufacturer Serial No.	994
Owner / Lessor	Abric Leasing Limited
Operator	Pakistan International Airlines (PIA)
Certificate of Maintenance Review	Issue Date: 15 th May, 2018, Expiry Date: 11 th November, 2018 Hours: 9275:40

Daily Inspection	Date: 10 th November, 2018
Total Aircraft Hours	10255:30 h

Table 4 Aircraft Details

Engine Details		
	Engine No. 1	Engine No. 2
Engine Serial No.	ED1536	ED0480
Manufacturer	PWC	PWC
Engine Type	PW127M	PW127M
Total Hours Flown	TSN: 2675	TSN: 10242
Date of Installation	2 nd July, 2017	5 th September, 2017

Table 5 Engine Details

1.7. Meteorological information

1.7.1. No significant weather was reported at Panjgur at the time of occurrence. Meteorological Aerodrome Report (METAR) at arrival is as follows:

1.7.2. METAR OPPG 100300Z 05008KT 8000 SKC 14/01 Q1016 RH40%

Description of METAR - Panjgur	
Station:	OPPG
Time:	10 th day of month, 0300 UTC
Wind direction:	050°
Wind speed:	08 kt
Visibility:	08 km
Sky condition:	pClear
Temperature:	

1.9. Communications

1.9.1. Communication frequencies for Panjgur Airfield are as follows. No abnormality was reported at the time of the incident

Service designation	Call sign	Frequency	Hours of operation	Remarks
1	2	3	4	5
Apron	Panjgur Tower	121.80 MHZ	NOTAM	-
TWR	Panjgur Tower	118.10 MHZ	NOTAM	Primary Frequency

Table 8 Communication Facilities Panjgur Airport, Panjgur

1.10. Aerodrome Information

1.10.1. Panjgur aerodrome data is as follows:

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
13	131.86°	1524 x 23	14/F/B/Y/T Bitumen	265732.76N 0640736.64E	THR 993.54 M / 3259.65 FT	-
31	311.86°	1524 x 23	14/F/B/Y/T Bitumen	265659.97N 0640817.48E	THR 1002.46 M /3288.91 FT	0.800% UP till 457M then 0.5 % UP

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
		-		-		-
		-		-		-

Table 9 Runway Physical Characteristics Panjgur Airport, Panjgur

1.10.2. **Unrecorded Obstruction** – Post incident investigation and discussion with the Captain revealed the presence of a microwave antenna in line with the Take-off path of R/W 31; however, the same was not depicted in Aeronautical Information Publication (AIP) but a Notice To Airmen (NOTAM) had been issued in

regard.

In approach/TKOF areas			Remarks
1			2
RWY/area effected	Obstacle type Elevation Markings/ LGT	Coordinates	
a	b	c	
31/TKOF 13/APCH	Tower 1010.00 M / 3314 FT	265833.23N 0640556.36E	
31/TKOF 13/APCH	Levi thana 1005.53 M / 3299 FT	265837.24N 0640624.43E	
31/TKOF 13/APCH	T&T tower 1022.32 M / 3354 FT	265834.80N 0640621.91E	
In circling area and at AD			Remarks
3			4
Obstacle			

Table 10 Aerodrome Obstruction

1.10.3. **Runway (R/W) Dimensions and Re-carpeting** – Although the R/W width is 75 ft, the re-carpeted width is roughly 52 ft. The old R/W surface is visible on both sides and is approximately 1.5 to 2 inches lower than the re-carpeted surface.

1.11. Flight recorders

1.11.1. Digital Flight Data Recorder (DFDR) was analysed to ascertain Landing parameters and to observe anomalies, if any. It was ascertained that the aircraft approached the R/W for Landing with speeds higher than the Approach speed calculated. The Approach speed calculated by the flight crew as recorded on CVR was 107 kt; however, the actual speeds remained much higher. These are as follows:

1.11.1.1. At 10.5 Nautical Miles (NM) from R/W, the speed with Landing configuration was 125 kt (18 kt above Approach speed).

1.11.1.2. At 6.5 NM from R/W, the speed was 123 kt (16 kt above Approach speed).

1.11.1.3. At 5 NM from R/W, the speed was 118 kt (11 kt above Approach speed).

1.11.1.4. At 3.5 to 1.6 NM from R/W, the speed varied between 117 to 119 kt (10 to 12 kt above Approach speed).

- 1.11.1.5. At 0.7 NM from R/W, the speed was 120 kt (13 kt above Approach speed).
- 1.11.1.6. Just short of entering R/W, the speed was 134 kt which was 27 kt above Approach speed (highest exceedance).
- 1.11.1.7. Aircraft entered R/W at 130 kt (23 kt above Approach speed).
- 1.11.1.8. The aircraft landed 2,200 ft down the R/W.

1.12. Wreckage and Impact Information

- 1.12.1. Not Applicable.

1.13. Medical and Pathological Information

1.13.1. The crew had valid medical fitness to undertake the flight. Post incident medical examination revealed no alcohol or psychoactive substances present for the aircrew.

1.13.2. **Pathological Investigations** – After the incident, blood and urine samples of the aircrew were collected as per protocol. However, there is no laboratory available at Panjgur that undertakes specialized toxicology investigations. The nearest such laboratory is located in Quetta which is 8 to 10 h of travel by road. Similarly, the second option is Karachi which also requires 10 to 12 h of road travel. Hence, the only way to transport the samples is by air which may not be possible in case of R/W blockage or non-availability of flights. Subsequent to this occurrence, PCAA suggested measures for preservation of samples at remote locations for their subsequent investigation.

1.14. Fire

- 1.14.1. There was no fire reported in the incident.

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. **Minimum Equipment List (MEL) Policy** – The aircraft scheduled for Panjgur was planned with one brake inoperative as per allowance by MEL. However, the R/W at Panjgur is both short in length (5,000 ft) as well as narrow in width (75 ft). the maximum Landing weight without wind on the day with one brake deactivated was around 20,600 kg.

1.17.2. **Command Training** – As per the Captain's statement, he did not attend any classroom lectures during his command training. This reflects on inadequate training standards by the operating organization whereby classroom lectures and

theoretical knowledge are not given due regard. This in turn adversely affects practical flying skills as it is not backed by a strong academic base which can help aircrew to anticipate situational abnormalities.

1.17.3. **FDR Data Review and Debrief** – Prior to the year 2020, PIA did not indulge in the practice of analysis / review of FDR data of any ATR flight due to which debrief of flight crew was not undertaken regarding any violation of parameters or un-stabilized approaches. This resulted in flight crew going unchecked for any unsafe practices.

1.18. **Additional information**

1.18.1. Not applicable.

1.19. **Useful or effective investigation techniques**

1.19.1. Standard investigation procedures and techniques were used.

SECTION 2 - ANALYSIS

2.1 General

2.1.1 PIA 517 was a scheduled passenger flight of ATR 72-500 aircraft from JIAP, Karachi to Panjgur. Panjgur Airport is located at an altitude of 3,289 ft AMSL with R/W dimensions 5,000 x 75 ft and deemed fit for operations under PCAA regulations. The combination of high altitude, short R/W length and narrow width requires the aircrew to ensure strict adherence to parameters and accuracy on approach.

2.2 Pre-Departure

2.2.1 As per meteorological information, weather at Panjgur was fair with no significant weather reported; however, there was a tail wind component for R/W 31. The aircrew was current on type with a valid medical category.

2.2.2 Aircraft loading was within normal limits of 26.6% CG with TOGW 21,332 kg. The aircraft was scheduled for the flight with No. 2 brake assembly (left hand side internal wheel) deactivated as per the provisions of MEL.

	APPROACH-LANDING		3.08.03	
	P 1	200		
			SEP 10	
LANDING DISTANCES				

AA

GENERAL

The actual distance to land an aircraft and come to a complete stop, is measured from a point 50 ft above the landing surface.

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- **Normal landing** - No significant failure:
Check before departure that available runway length with forecasted landing weight is at least equal to the required landing length
- **Abnormal landing** - Significant failure known before departure (in accordance with MEL):
Check before departure that available runway length is at least equal to actual landing distance, taking into account performance abatements due to failures and is increased by operational regulatory coefficients.
- **Abnormal landing** - Significant failure resulting from in-flight events :
Check before landing that available runway length is at least equal to actual landing distance, taking into account performance abatements due to failures.

Figure 1 Notes on Landing with MEL

- **Normal landing** - No significant failure:
Check before departure that available runway length with forecasted landing weight is at least equal to the required landing length
- **Abnormal landing** - Significant failure known before departure (in accordance with MEL):
Check before departure that available runway length is at least equal to actual landing distance, taking into account performance abatements due to failures and is increased by operational regulatory coefficients.
- **Abnormal landing** - Significant failure resulting from in-flight events :
Check before landing that available runway length is at least equal to actual landing distance, taking into account performance abatements due to failures.

ACTUAL LANDING DISTANCE (M)

NORMAL CONDITIONS - FLAPS 30°

R U N W A Y C O N D I T I O N B Y	WEIGHT (x 1000 kg)	13	14	15	16	17	18	19	20	21	22	22.5	23
	DRY	530	530	530	530	530	550	570	590	610	630	640	660
	WET	690	690	690	690	700	730	760	780	810	840	850	860
	WATER OR SLUSH 1/2 in	640	680	710	750	780	820	860	900	940	980	1000	1020
	COMPACT SNOW	690	720	760	790	830	860	900	930	970	1000	1020	1030
	ICE	1010	1070	1120	1170	1230	1280	1340	1390	1450	1500	1530	1560

Figure 2 Landing Distances

2.2.3 The Landing weight after the flight was calculated to be 20,432 ~ 21,000 kg for which the Landing distance comes out to be 2,000 ft. With one brake on MEL the Landing distance is increased to 2,200 ft.

2.2.4 The following calculations are based on the actual Landing conditions encountered at Panjgur Airport R/W.

CORRECTION ON LANDING DISTANCES	
1. Runway	1000 ft
2. Elevation	1000 ft
3. Wind	1000 ft
4. Temperature	1000 ft
5. Humidity	1000 ft
6. Pressure	1000 ft
7. Visibility	1000 ft
8. Clouds	1000 ft
9. Surface	1000 ft
10. Obstacles	1000 ft
11. Noise	1000 ft
12. Other	1000 ft
13. Total	1000 ft
14. Correction	1000 ft
15. Final	1000 ft

Figure 3 Landing Calculation Corrections

2.2.5 The wind reported at Panjgur at 0300 h was 050° 10 kt. As the aircraft was Landing from R/W 31, the wind constituted a tail wind component for the aircraft.

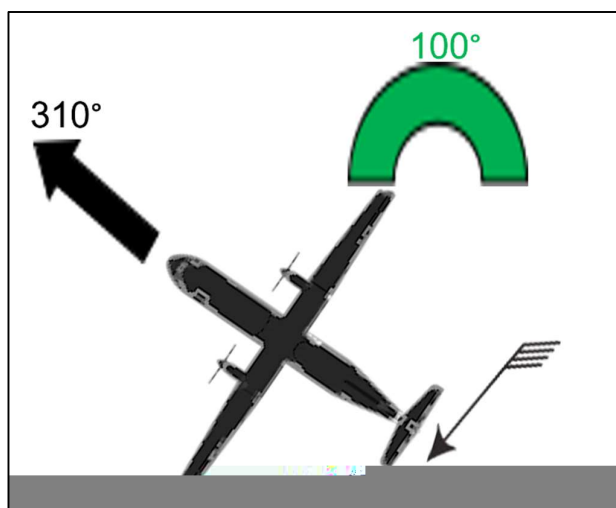


Figure 4 Wind Details

2.2.6 The tail wind component for the aircraft is calculated as follows:

$$\begin{aligned}
 \text{Wind component} &= \text{Wind speed} \times \cos (\text{R/W Heading} - \text{Wind direction}) \\
 &= 10 \times \cos (310^{\circ} - 050^{\circ}) \\
 &= 10 \times \cos 260^{\circ} \\
 &= 10 \times -0.17 \\
 &= -1.7 \text{ (-ve sign indicates tail wind)}
 \end{aligned}$$

2.2.7 Therefore, the tail wind component comes out to be 1.7 kt. Applying the corrections as per aforementioned criteria:

Correction for wind: 80 ft (rounding out to 02 kt tail wind)

Correction for elevation: 240 ft (as per 4,000 ft elevation)

Correction for thrust reversal: -40 ft

Landing distance after applying affecting factors: 2,280 ft

2.2.8 Thus, Landing distance in normal conditions with no MEL is **2,280 ft**.

 PK / 75 MMEL	OPERATIONAL PART ATA 32 LANDING GEAR	MOP.32 Page n°02
LIMITATIONS Operation on contaminated runways is prohibited. Landing braking energy limitation..... 8.3 MJ Delayed braking procedure is prohibited.		
PROCEDURES No change.		
PERFORMANCES Takeoff - Multiply ASD by 1.1. - Check $V_1 < 0.8$ of V_1 MAX brake energy. Landing - Multiply landing distance by 1.1 (valid for all configurations). - Landing brake energy: Apply landing dispatch with one wheel brake deactivated correction (Refer to DEV.2.5.01.3 Operation on Dry or Wet Runway) on landing brake energy (Flaps 30)		

Figure 5 Landing Distance Calculation with MEL

2.2.9 With one brake inoperative, the Landing distance can be obtained by multiplying normal configuration Landing distance by a factor of 1.1. Thus, Landing distance with one brake on MEL comes out to be **2508 ft**.

2.2.10 The MEL is designed is to be able to dispatch an aircraft with failed equipment with limited reduction in safety margin. Applying the MEL may impact the aircraft's performance, potentially the operating procedures, and add supplemental constraints to increase margins. Consequently, when applying the MEL, certain

airports such as Panjgur Airport (5000 x 75 ft) might be restricted depending on the type of malfunction and its potential impact on safety. Adherence to these procedures ensures the safety of the aircraft.

The standard performances computation gives the following results:

Limitation: brake energy

Wind	Max Landing Weight	Actual Landing Distance
None	20.7t	704m
5kts rear	19.4t	730m
10kts rear	18.3t	756m

Table 11 Weight Limitations with Tail Wind

2.2.11 The consideration of Landing weight was overlooked for Landing calculations with one brake inoperative. The Landing weight of the aircraft was calculated to be 20,700 kg which is as per the Landing weight limit with no limitation of tail wind.

Aircraft data

The gross weight rotator was set at 21.5t prior to take off:

Based on recorded fuel flow since engines were running, the estimated fuel burnt during the whole flight was 796kg. The estimated landing weight was $21.5 - 0.8 = 20.7t$.

Referring to the QRH (PERFORMANCE chapter), a 21t gross weight at landing leads to VmHB (flaps 30) at 107kts.

Figure 6 Landing Weight of the Aircraft

2.2.12 The calculation for maximum Landing weight with 02 kt wind is as follows:

Max Landing weight with 0 kt tail wind: 20,700 kg

Max Landing weight with 05 kt tail wind: 19,400 kg

$$\begin{aligned} \text{Max Landing weight with 02 kt tail wind} &= 20700 - \left\{ \frac{(20700 - 19400) \times 2}{5} \right\} \\ &= 20,180 \text{ kg} \end{aligned}$$

2.2.13 Due to tail wind factor (02 kt), the maximum Landing weight was to be **20,180 kg** which was exceeded by 520 kg.

2.3 Ground operations

2.3.1 Ground operations were all normal and aircraft departed from Karachi at 0207 h.

2.4 Flight enroute

2.4.1 The departure and enroute flight to Panjgur remained uneventful with no abnormalities. For the flight, the Captain of the aircraft was Pilot Flying (PF) while the FO was Pilot Monitoring (PM).

2.5 Descent for approach

2.5.1 The descent for approach to Panjgur was carried out in accordance with the specified procedures for R/W 31.

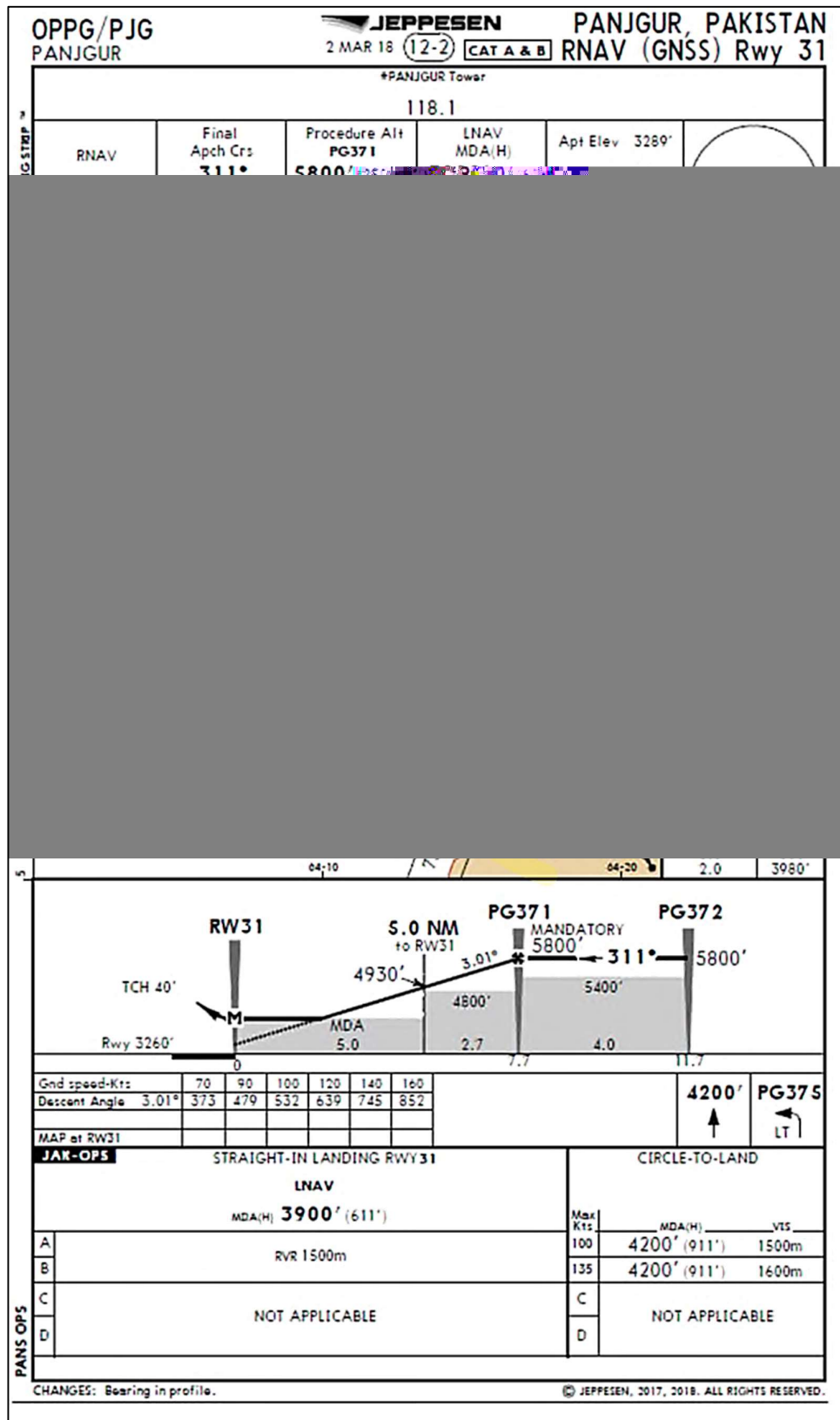


Figure 7 Instrument Approach Chart for Panjgur Airport

2.6 Final approach

2.6.1 The aircraft approached R/W 31 for Landing as per procedure. The Approach speed as per maximum weight of 21,000 kg was to be 107 kt.

ATR	OPSDATA	PER 3	
PK / 75	21 T	Page n°09	
1c84eb41-12c2-4b19-a032-f1131dd9bc7c		1.2	
		ALL	
	Speeds	Normal	Icing
NON LIMITING RWY TAKEOFF Flaps 15	V1 = VR V2	108 111	117 121
FINAL TAKEOFF	VFTO	136 (Flaps 0)	125 (Flaps 15)
DRIFT DOWN	VmLB	136 (Flaps 0)	128 (Flaps 15)
MINI EN ROUTE			162 (Flaps 0)
FINAL APPROACH	VmHB (Flaps 30)	107	116
GO AROUND	VGA (Flaps 15)	120	122

Table 12 Approach Speed Calculations

2.6.2 However, the aircraft made the approach at higher than calculated speeds. At 03:01:00 h once the aircraft was 10.5 NM from the R/W at 2,500 ft Above Ground Level (AGL), the aircraft was brought to Landing configuration by lowering the Landing Gears (L/G) and selecting 30° Flaps. The Indicated Airspeed (IAS) decreased and stabilized around 125 kt (18 kt above Approach speed). Descent was initiated with Auto Pilot (AP) engaged in Vertical Speed (VS) mode and VS target -700 ft/min. This Rate of Descent (ROD) was maintained till 6.5 NM from the threshold and 2,100 ft AGL with airspeed stabilized at 123 kt (16 kt above Approach speed).

2.6.3 At time 03:02:36 h at a distance of 6.5 NM from the R/W at a height of 2,100 ft AGL, the VS target was set to -900 ft/min for a duration of 24 seconds (s) after which it was again set to -700 ft / min. During this time the ROD of the aircraft increased as a consequence of which the speed also increased from 123 kt to 125 kt.

2.6.4 At 03:03:18 h, once the aircraft was 5 NM from R/W threshold at a height of 1,600 ft AGL, the altitude selection for AP was set to 7,500 ft in case a Missed Approach Procedure had to be executed from Final Approach. The IAS also decreased gradually from 123 kt to 118 kt (11 kt above Approach speed).

	1000 ft	500 ft	200 ft	100 ft	Touchdown
Ground Speed (kts)	131	135	139.5	142	131
TAS (kts)	131	130	134	141	125
IAS (kts)	121	121	126	135	119
TQ1 / TQ2 (%)	27 / 27	30.8 / 30.8	29.5 / 29.3	27.3 / 27	0.8 / 1.8
VS (fpm)	-700	-700	-900	-700	-50 approx
Wind Direction (Degree) and Speed (kts)	19405	12706	9012	6711	10404
NB: All altitudes are Above Ground Level (AGL)					

Table 13 Flight Recorder Data (PIA Report)

2.6.5 The AP was disengaged at time 03:04:15 h, 2.9 NM from R/W threshold at 900 ft AGL. From 900 ft AGL (3.5 NM from R/W Threshold) till 520 ft AGL (1.6 NM from R/W Threshold), the ROD varied between -400 to -800 ft/min whereas the speed varied between 117 kt to 119 kt (10 to 12 kt above Approach speed).

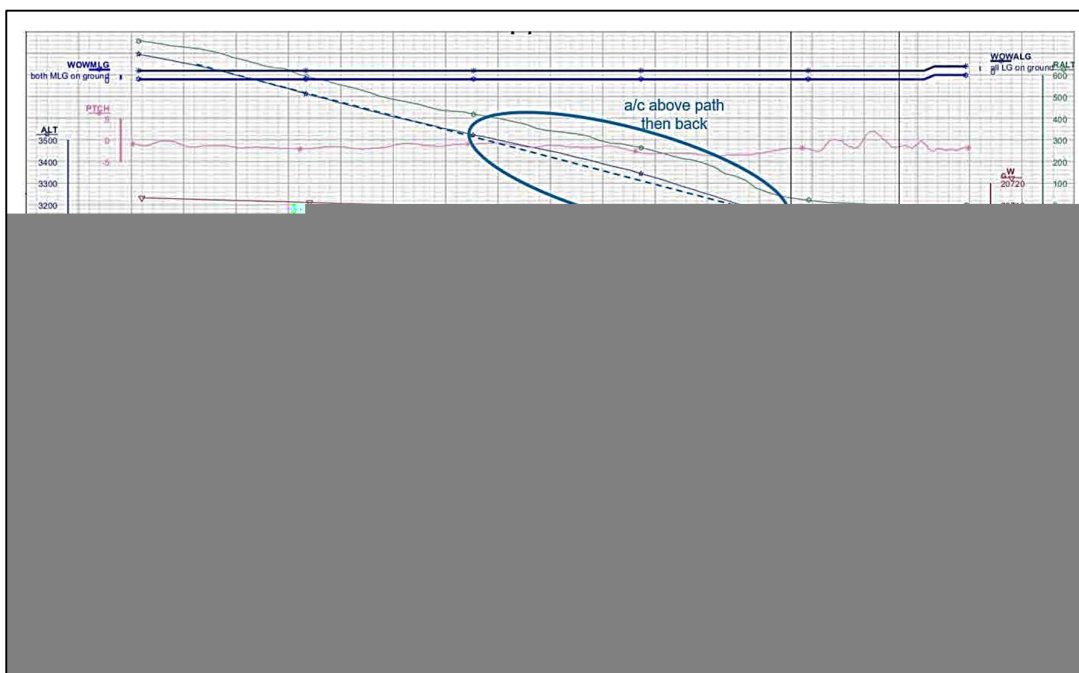


Figure 8 DFDR Data

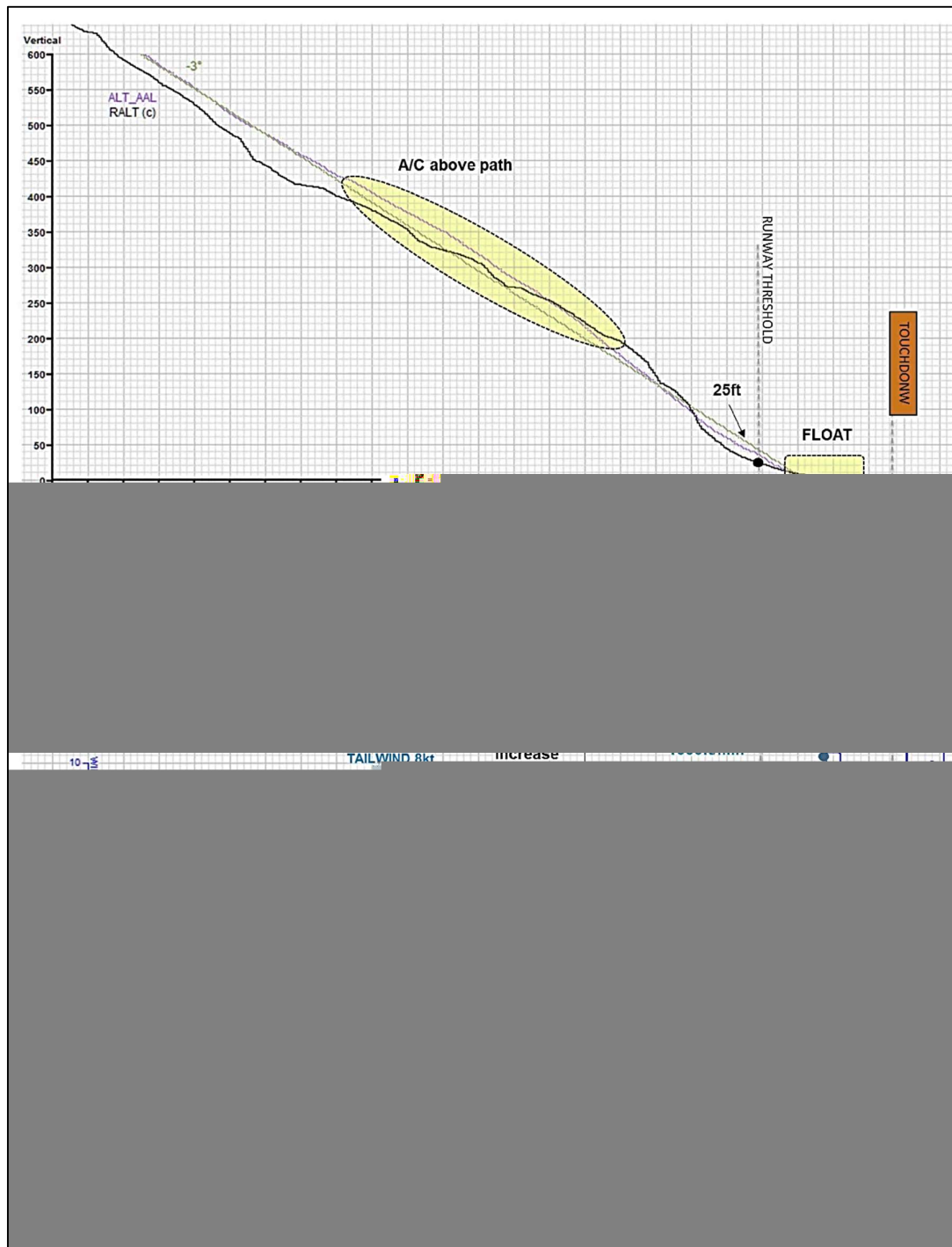


Figure 9 Aircraft Handling without Auto Pilot

2.6.6 The speed maintained by the aircraft during the Final Approach was much higher than calculated (13 to 27 kt). At 03:04:09 h, once the aircraft was 1.6 NM from R/W Threshold at a height of 520 ft AGL, the aircraft pitch angle increased from -2.0° to -1.0° and the ROD reduced from -750 ft/min to -650 ft/min.

2.6.7 At 03:05:13 h at a distance of 0.7 NM from R/W Threshold at a height of 270 ft AGL, the pitch angle again decreased from -1.6° to -3.5° , the ROD increased to -900 ft/min and speed started to increase from 120 kt (13 kt above Approach speed); meanwhile the Captain started to reduce the throttles progressively.

2.6.8 Just short of entering R/W at 03:05:24 h, the speed continued to increase from 124 kt with speed exceedance at 130 ft AGL being the highest recorded, i.e. 27 kt which was announced by the FO and acknowledged by the Captain; however, approach was still continued. This higher IAS on approach resulted in higher True Airspeed (TAS) due to high density altitude, thereby resulting in a very gradual reduction of the IAS itself.

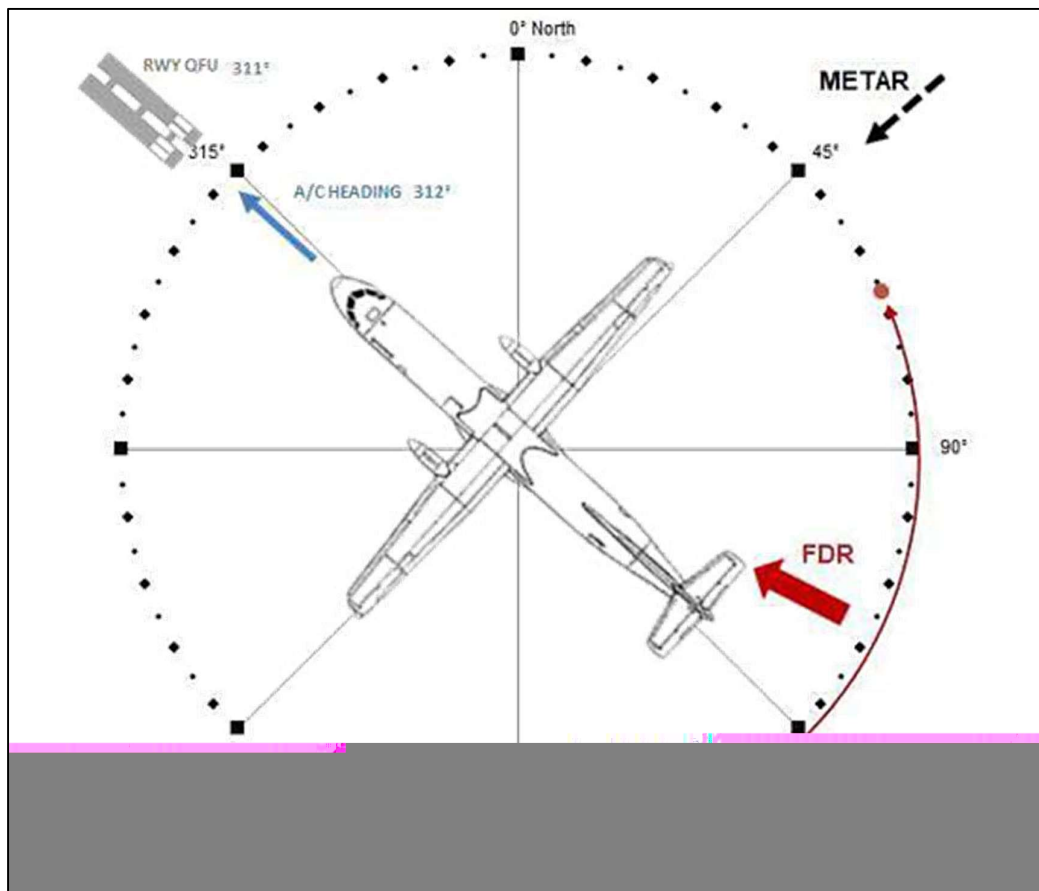


Figure 10 Average Wind 500 ft TO 50 ft

2.6.9 The following graph also depicts an increase in tail wind component as the aircraft descended close to the ground for Landing.

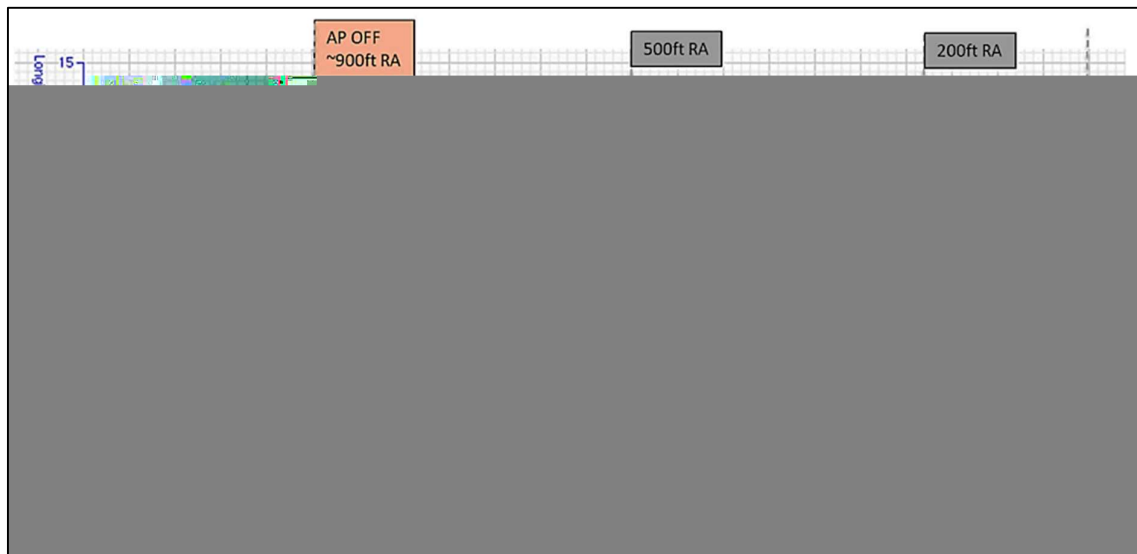


Figure 11 Wind Data

2.6.10 The Meteorological data given in the MET report for the airfield depicts wind as 050° 08 kt. However, as the aircraft descended below 1000 ft, the tail wind started to increase from 04 kt to 09 kt which is consistent with the MET observation. Below 200 ft, according to FDR data, the wind shifted from crosswind to tailwind within approximately 3 s and speed also increased to 10 to 11 kt after which it subsequently started to reduce. This change in wind speed and direction was, in all probability, a local phenomenon of wind gust due to location of airfield in proximity of mountains as the wind speed initially started to reduce for 3 s, then picked up again and then again started to reduce after 7 s.

2.7 Flare Out

2.7.1 At 03:05:31 h, the aircraft crossed the R/W Threshold at 25 ft Radio Altimeter (RA) height at a speed of 130 kt [23 kt above Approach speed {Ground Speed (GS) 141 kt}]. At 03:05:32 h flare out was initiated at a height of 15 ft at a speed of 127 kt (18 kt above Approach speed). At 03:05:36 h, once the aircraft was 1,280 ft down the R/W at 121 kt (GS 138 kt), the Captain retarded the throttles to Flight Idle (FI).

2.8 Touchdown

2.8.1 As a result of higher speed coupled with tail wind, the aircraft float was longer than anticipated. The Captain realized this and assisted the aircraft in touching down which resulted in a firm Landing. At 03:05:40 h, the aircraft touched down 2,200 ft down the R/W at 116 kt (GS 131 kt) with 2,800 ft remaining to stop the aircraft. The tail wind contributed towards high GS which translated into longer Landing Roll and greater momentum. Additionally, higher speeds also resulted in greater energy absorption by the brakes which could result in brakes overheating or ultimately brake failure.

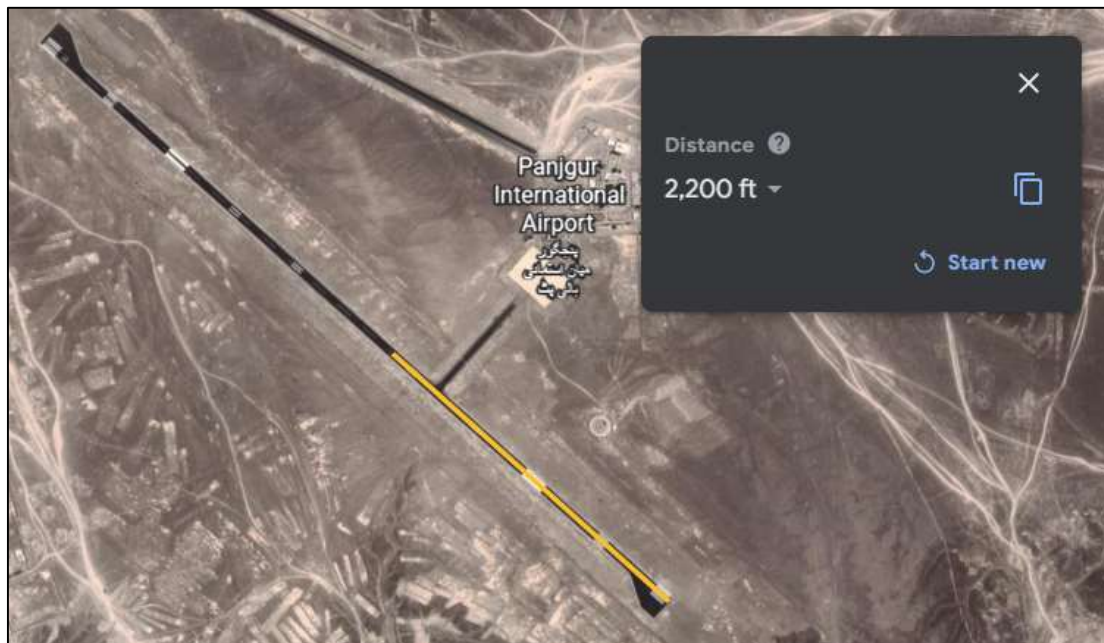


Figure 12 Aircraft Touchdown Distance at Panjgur Airport R/W

2.9 Landing roll

2.9.1 As the aircraft touched down, the Captain realized that he had landed almost halfway down the R/W and at very high speed. At 03:05:42 h, once the aircraft was 2,700 ft down the R/W at 112 kt (GS 126 kt), the Captain initially applied the brakes. However, subsequently the Captain decided to execute a “Rejected Landing” as per PIA Standard Operating Procedure (SOP) for SHORT FIELD LENGTH APPROACH AND LANDING TECHNIQUE.

2.9.2 At 03:05:43 h, once the aircraft was 2,755 ft down the R/W at 111 kt (GS 126 kt), the captain called out “GO” and advanced the throttles full open within two seconds to add power. Simultaneously, brake pressure was also increased resulting in inadequate acceleration. At 03:05:44 h, the MASTER CAUTION and TO CONFIG warning triggered because of incorrect Take-off configuration (Flaps 30° instead of Take-off position). The throttles remained at this position for a total of 3 s.

2.9.3 At 03:05:46 h, as the aircraft was about 3,280 ft down the R/W, the Captain decided to continue with the Landing Roll and started to retard the throttles to FI position. At 03:05:48 h, once the aircraft was 3,600 ft down the R/W at GS 114 kt, the throttles reached the REV position and remained there for two seconds while the brake pressure was simultaneously increased. As per the “Rejected Landing” SOP, once the decision to Go-Around in case of a Rejected Landing has been made, it should not be changed. This non-decisive action of first advancing the throttles and then again retarding them caused a sudden acceleration and then deceleration resulting in a longer Landing Roll. When inquired from the captain, he stated that he had initially wanted to execute a Go-Around. However, he changed his decision once he realized that there was an antenna in line with the Take-off path which may have jeopardized the safety of the aircraft.

2.9.4 **Unauthorized antenna** – The microwave antenna located in line with Take-off path of R/W 31 is of a height of 191 ft. Moreover, it is located 1.5 NM from

threshold of R/W 13. The said antenna had been installed after provisional approval by the Frequency Allocation Board (FAB) without obtaining a PCAA “No Objection Certificate (NOC)” which is in violation of agreed procedure. Such provisional approval resulted in an unrecorded obstruction in line with the R/W.

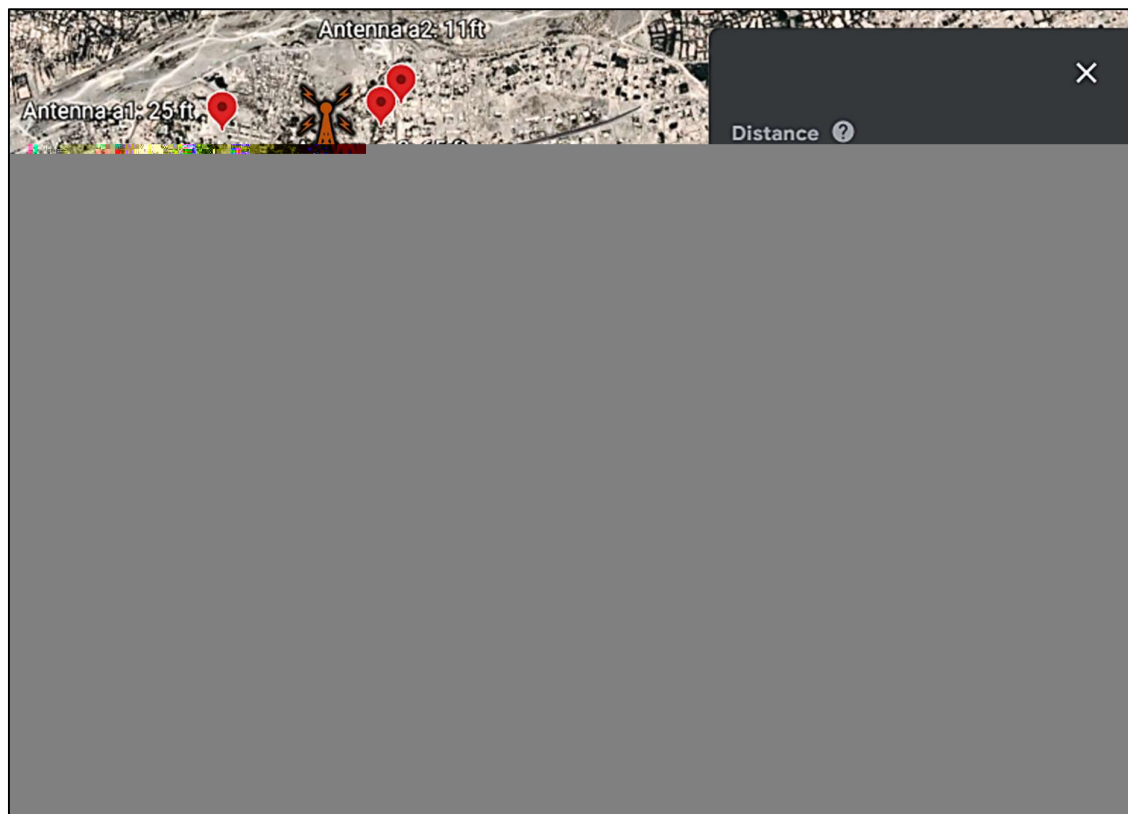


Figure 13 Antenna Location and Distance

2.9.5 Additionally, after subsequent inclusion in AIP, no special instructions have been spelled out for arriving or departing aircraft which implies that the antenna in question is not a factor during Take-off from R/W 31. Although, a NOTAM (C0125/17 NOTAMR C0102/16) instructs pilots to exercise caution while taking off or Landing; it does not prohibit any operations or specifies any special procedures. Any obstacle inline with the Take-off path with a minimum slope of 1.2% {ICAO Annexure – 15 Para 5.3.3.4.6 (a)} is to be considered. However, the obstacle slope of antenna is:

Height of antenna: 191 ft

Distance of antenna from R/W: 9359 ft

Slope of obstacle: (Height of obstacle / Distance from R/W end) x 100

Slope of obstacle: $(191 / 9359) \times 100 = 2.04\%$

2.9.6 The antenna slope is 0.84% higher than the minimum slope specification. As the aircraft was already at high speed, Take-off was possible along with avoidance of antenna.

2.9.7 Moreover, the aircraft would have gotten airborne before reaching end of R/W. As per ATR 72-500 FCOM Climb Gradient chart, the climb gradient comes out to be approximately 7.0° at an IAS of 170 kt with both engines at max climb power.

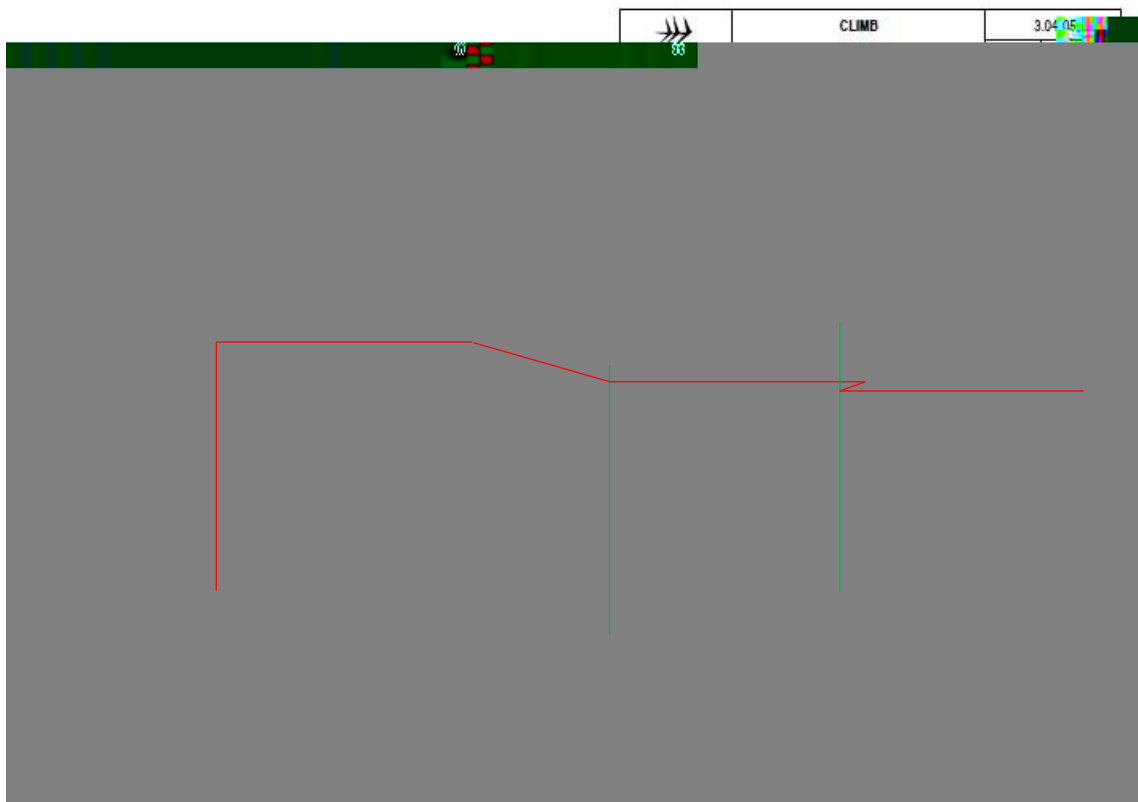


Figure 14 ATR 72-500 Climb Gradient Chart & Calculation

2.9.8 In case it is assumed that the aircraft got airborne at the edge of the threshold of R/W 13, the aircraft height is calculated as follows:

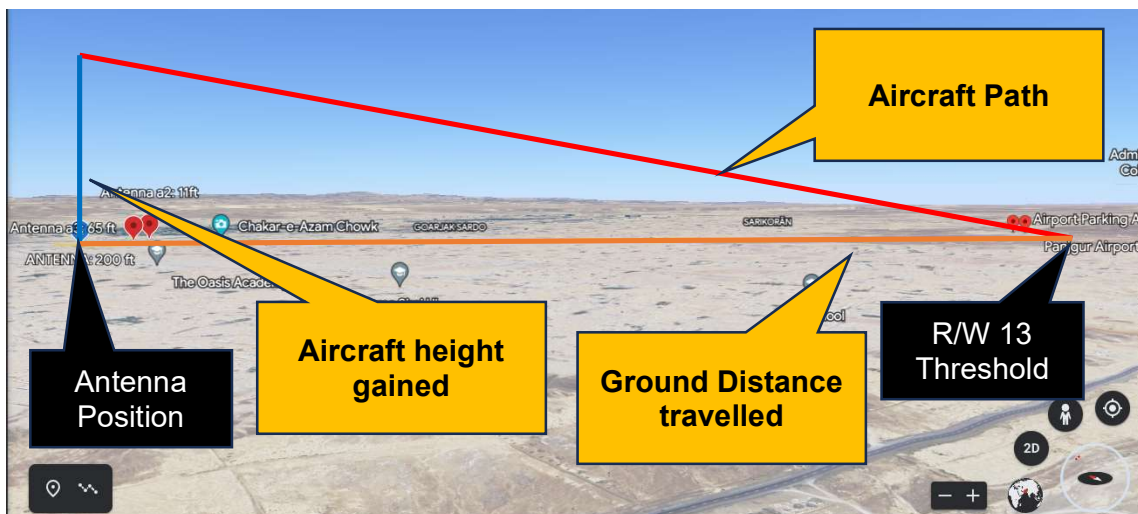


Figure 15 Height Calculation

2.9.9 The calculations for height which could have been gained by the aircraft had it taken off are as follows:

$$\text{Climb Gradient} = \frac{\text{Feet / Nautical Mile}}{6000} \times 100$$

$$\text{Feet / Nautical Mile} = \frac{\text{Climb Gradient}}{100} \times 6000$$

$$= \frac{7 \times 6000}{100}$$

$$= \mathbf{420 \text{ ft/NM}}$$

2.9.10 As the antenna is located at a distance of 1.5 NM from R/W 13 threshold, therefore the height gained overhead the antenna would be:

$$\begin{aligned} \text{Height over antenna from ground} &= 420 \times 1.5 \\ &= \mathbf{630 \text{ ft}} \end{aligned}$$

2.9.11 As the antenna height is 191 ft, therefore the height of the aircraft overhead the antenna would be:

$$\begin{aligned} \text{Height of aircraft over antenna} &= 630 - 191 \\ &= \mathbf{439 \text{ ft}} \end{aligned}$$

2.9.12 Thus, in case a Rejected Landing had been executed, the aircraft would have crossed over the antenna with a height separation of 439 ft.

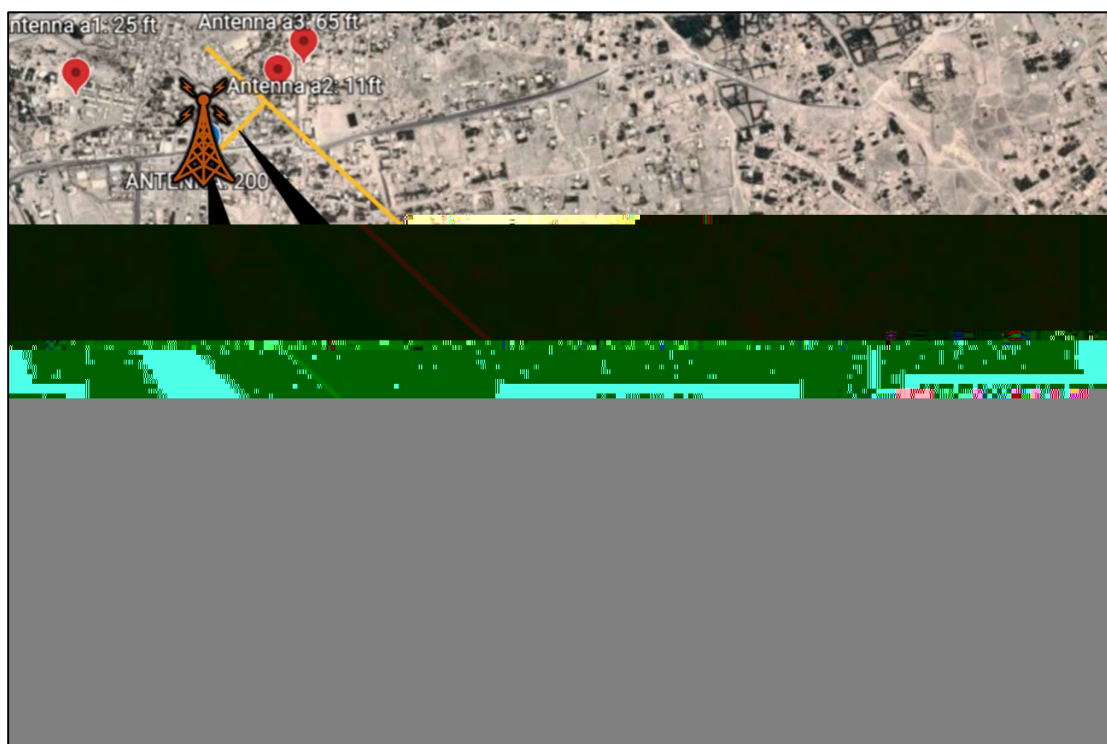


Figure 16 Antenna Position and Aircraft Take-off Path

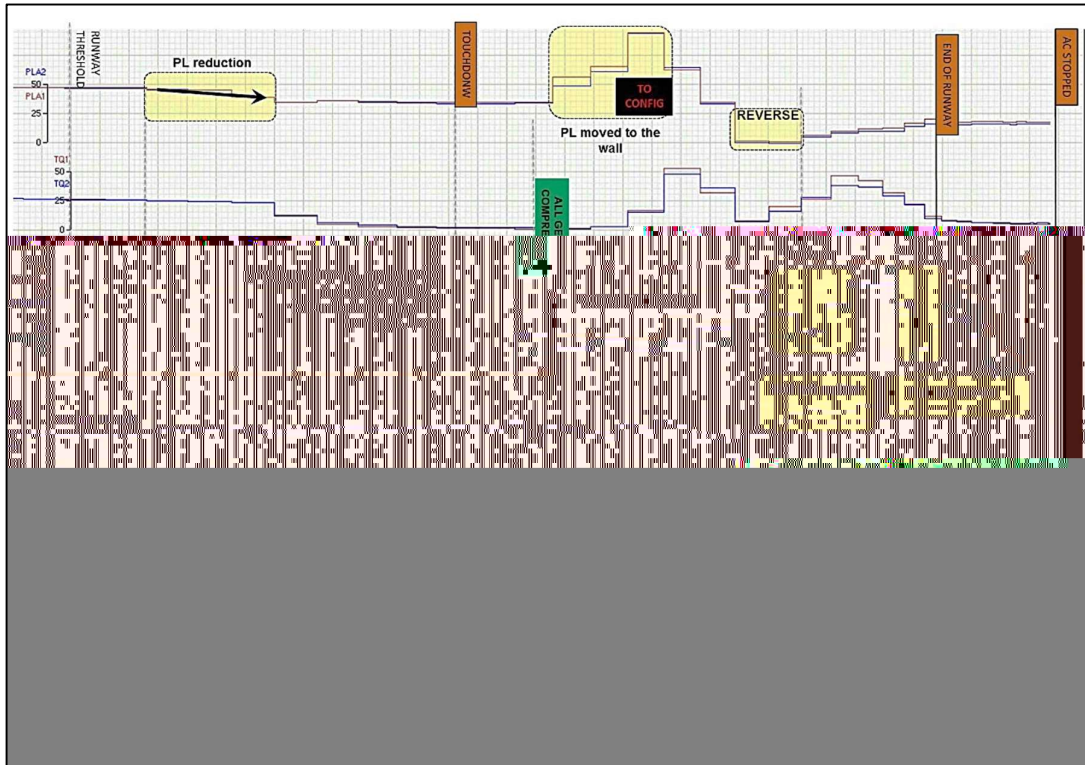


Figure 18 Aircraft Data During Landing



Figure 19 Distance Overview

SECTION 3 - CONCLUSIONS

3.1 Findings

- 3.1.1 PIA 517 was a scheduled passenger flight of ATR 72-500 aircraft from Karachi to Panjgur.
- 3.1.2 Panjgur airfield has a short and narrow R/W (5,000 x 75 ft) at a height of 3,289 ft AMSL and is deemed fit for operations under PCAA Regulations.
- 3.1.3 Although the published width is 75 ft, practically the recarpeted surface is 52 ft with the old R/W surface being 1.5 – 2 inches lower on both sides.
- 3.1.4 An unauthorized microwave antenna tower of 191 ft height was constructed in line with the R/W in the Take-off path for R/W 31 at a distance of 1.5 NM from end of R/W; however, it was documented in NOTAM (C0125/17 NOTAMR C0102/16).
- 3.1.5 The aircraft scheduled for Panjgur Airport had one brake assembly inoperative. The performance limitations were not in line with the provisions of MEL.
- 3.1.6 The particularity was pointed out by the Captain and FO; however, the aircraft was not changed despite the availability of another aircraft which was scheduled to proceed to an airport with a standard-length R/W. Initial aircraft load was not reduced.
- 3.1.7 The weight calculation for Landing with one brake inoperative was not considered resulting in aircraft subsequently being 520 kg over the weight limit on Landing in case of tail wind.
- 3.1.8 Take-off and flight enroute were uneventful.
- 3.1.9 For the flight, the Captain was PF while the FO was PM.
- 3.1.10 Approach for R/W 31 of Panjgur Airport was carried out as per published procedures.
- 3.1.11 The aircraft encountered tail wind once approaching the R/W.
- 3.1.12 The Approach speed on Final Approach was much higher (13 – 27 kt) than calculated Approach speed (107 kt).
- 3.1.13 The FO announced the speed exceedance (27 kt) only when the aircraft was just short of entering R/W at 100 ft AGL; however, the Captain elected to continue with Landing.
- 3.1.14 The combination of high Approach speed coupled with tail wind made the aircraft float for longer distance.
- 3.1.15 The Captain recognized the abnormally long float and assisted the aircraft to touch down on the R/W surface.
- 3.1.16 The aircraft touchdown was 2,200 ft from threshold of R/W 31 at a speed of 116 kt (Ground Speed 131 kt).
- 3.1.17 Upon touchdown, the Captain initially applied brakes but then decided to execute a “Rejected Landing” and Go-Around as per SOP.
- 3.1.18 The Captain advanced the throttle levers forward while simultaneously applying brakes resulting in inadequate aircraft acceleration.

3.1.19 The Captain then changed his decision and decided to continue with Landing as he was of the opinion that taking off again might jeopardize the safety of the aircraft owing to the presence of an unauthorized microwave antenna in line with Take-off path.

3.1.20 The Captain retarded the throttles and applied brakes.

3.1.21 Due to a combination of high touchdown speed, late touchdown, tail wind, indecisiveness of the Captain, one inoperative brake assembly and exceedance of weight limit for Landing with tailwind, the aircraft was unable to stop on the R/W.

3.1.22 Owing to the presence of a steep decline on the extended centreline of the R/W, the FO advised the Captain to turn to the right to avoid damage to the aircraft as much as possible.

3.1.23 The aircraft stopped 400 ft ahead of the threshold and 100 ft right of the centreline after departing the R/W.

3.1.24 The aircrew switched off the aircraft and all the passengers were safely evacuated.

3.1.25 After the incident, blood and urine samples of aircrew were collected. However, as Panjgur does not have any laboratory capable of performing specialized toxicology investigations, the samples were subsequently sent to Karachi by air.

3.2 Causes / Contributing factors

3.2.1 Cause:

3.2.1.1 Involuntary **Runway Excursion (RE)**.

3.2.2 Contributing Factors:

3.2.2.1 Disregard of Landing limitations (overweight condition upon Landing with one brake inoperative).

3.2.2.2 Disregard of operating procedures (high Approach speed).

3.2.2.3 Inadequate decision making (indecisiveness of Captain).

Note: Aviation Occurrence Category (ADREP Taxonomy)

“Runway Excursion (RE) – A veer off or overrun off the runway surface applicable during either the Take-off or Landing phase.

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SECTION 4 – SAFETY RECOMMENDATIONS

4.1 Safety recommendations

4.1.1 PCAA

4.1.1.1 PCAA may carry out survey of all airports / airfields to record unauthorized obstructions around the airfield for subsequent inclusion in AIP.

4.1.1.2 FAB may ensure mandatory NOC from PCAA prior to granting approval for microwave antennas / towers.

4.1.1.3 PCAA may carry out survey of all Runways and operating surfaces for their rehabilitation and standardization if required.

4.1.1.4 PCAA may devise and institute procedures for pathological investigation of medical samples in case of accidents / incidents at remote airfields which are not equipped to handle collection / transport / examinations of pathology samples.

4.1.1.5 PCAA may ensure that debrief of aircrew is carried out based on DFDR analysis, especially for short and / or narrow runways as well as high altitude operations.

4.1.1.6 PCAA may institute measures to ensure proper check and balance to avoid cases of fraudulent licenses.

4.1.2 PIA

4.1.2.1 PIA may ensure that MEL requirements are properly considered prior to departure.

4.1.2.2 PIA may ensure that aircraft with MEL are within the weight and load limits for optimum performance during Take-off and Landings.

4.1.2.3 Periodic refresher classes may be ensured for aircrew to keep them aware of high-altitude operating limitations and intricacies.

4.1.2.4 Random check flights may be carried out to evaluate aircrew proficiency for high altitude / short length airfields.

4.1.2.5 Adequate academic training may be ensured for under training Captains to enhance their academic knowledge at regular intervals.

4.1.2.6 Aircrew may be provided adequate specialized training for non-standard / high altitude airfields at regular intervals.

4.1.2.7 In case of non-stabilized approach, the option of Go-Around should be exercised to ensure safety of aircraft, and same may be communicated to all aircrew.

4.1.2.8 Flight crew may be inculcated with true spirit of Crew Resource Management where crew member may act decisively to ensure safety of aircraft in case of divergence in parameters from standard profile.

4.1.2.9 Captains may be preached to pay heed to their FOs instead of blindly relying on their own judgement and experience (CRM).

4.1.2.10 Flight crew may be instructed to take timely and positive decisions towards safety of the aircraft and not to be indecisive.

4.1.2.11 Simulator training for aircrew may include Go-Around as well as rejected Landing procedure.

4.1.2.12 PIA may ensure debrief of aircrew based on DFDR analysis, especially for short and / or narrow runways as well as high altitude operations.