FINAL INVESTIGATION REPORT

SERIOUS INCIDENT OF PAKISTAN INTERNATIONAL AIRLINES FLIGHT PIA 588 ATR 72-500 AIRCRAFT REG. NO. AP-BKZ AT BENAZIR BHUTTO INTERNATIONAL AIRPORT ISLAMABAD ON 25TH DECEMBER, 2017

Date: 28th March, 2023

SCOPE

Aircraft Accident Investigation Board (AAIB), Pakistan conducts investigations in accordance with Annex-13 to Convention on International Civil Aviation and Civil Aviation Rules 1994 (CARs 94).

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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

Abbreviation	Full Form
AAIB	Aircraft Accident Investigation Board
AOA	Angle of Attack
ARC	Abnormal Runway Contact
ATPL	Airline Transport Pilot License
ATS	Air Traffic Service
BBIAP	Benazir Bhutto International Airport, Islamabad
CG	Center of Gravity
CPL	Commercial Pilot License
FDM	Flight Data Monitoring
FDR	Flight Data Recorder
FO	First Officer
ft	Feet
G	Acceleration due to gravity
hrs	Hours
ILS	Instrument Landing System
kg(s)	Kilogram(s)
Km	Kilometers
kts	Knots
LT	Local Time
M	Meters
MLG	Main Landing Gear
MOC	Management of Change
MOR	Mandatory Occurrence Report
OPRN	Benazir Bhutto International Airport
PIA	Pakistan International Airlines
QA	Quality Assurance
R/W	Runway
ROD	Rate of Descent
UTC	Universal Time Coordinated

INFORMATION ON NOTIFICATION

The serious incident was reported to Aircraft Accident Investigation Board (AAIB), Pakistan, by General Manager Safety & Quality Assurance (QA) Pakistan International Airline (PIA) on 27th December, 2017. Ministry of Aviation, Government of Pakistan issued Notification on 16th January, 2018 and Corrigendum constituting an investigation team to investigate the serious incident.

SYNOPSIS

Pakistan International Airline (PIA) flight PIA 588 aircraft ATR 72-500 Reg. No. AP-BKZ was a scheduled passenger flight on 25th December, 2017 from Bahawalpur Airport to Benazir Bhutto International Airport (BBIAP), Islamabad. During landing at BBIAP, Islamabad it was reported by cabin crew seated at Aft Jump Seat that an unusual noise had been heard during landing. Subsequently, during post flight inspection, a half inch scratch mark was observed on the tail boot with no other damage to the aircraft. Based on the observation from the cabin crew and the physical evidence, it was ascertained that a tail strike had occurred during landing.

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SECTION 1 - FACTUAL INFORMATION

1.1. History of the Flight

1.1.1. PIA 588 was a scheduled passenger flight of ATR 72-500 aircraft from Bahawalpur Airport to Benazir Bhutto International Airport (BBIAP), Islamabad on 25th December, 2017. The aircraft departed from Bahawalpur Airport at 0840 hrs Universal Time Coordinated Time (UTC) and landed at BBIAP, Islamabad at 1010 hrs. Take off, departure and enroute flight remained uneventful. After landing at BBIAP Islamabad, it was reported by one of the cabin crew seated at Aft Jump Seat that an unusual noise had been heard during landing. Subsequently, during post flight inspection, maintenance personnel discovered a half inch scratch on the tail boot which, when coupled with cabin crew observation, led to the conclusion that a tail strike had been made during landing.

1.2. Injuries to Persons

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

1.3. Damage to Aircraft

1.3.1. A half inch scratch on tail boot with no other damage to the aircraft.

1.4. Other Damages

1.4.1. No other damages were reported.

1.5. Personnel Information

Captain	
Date of Birth	29th Jan, 1971
Date of Joining PIA	31st Oct, 2016
License type	Air Transport Pilot License (ATPL)
Last medical examination	08th August, 2017 valid upto 28th Feb, 2018

OPBW AD 2.18 ATS COMMUNICATION FACILITIES

Service designation	*Call sign*	*Frequency*	*Hours of operation*	*Remarks*
1	2	3	4	5
TWR	Bahawalpur Tower	129.8 MHz	NOTAM	Primary frequency

Table 6 ATS Communication Facilities – Bahawalpur International Airport

OPRN AD 2.18 ATS COMMUNICATION FACILITIES

operation	*Remarks*	*Service designation*	*Call sign*	*Frequency*	*Hours of*
4	5	1	2	3	4
4	Primary frequency,	APP	Islamabad APP	124.9 MHZ	H2
4	Primary frequency,	APP	Cherat APP	125.6 MHZ	H2
4	Primary frequency,	TWR	Chaklala Tower	123.7 MHZ	H2
4	Emergency Frequency	"	"	121.5 MHZ	H2
4	Secondary Frequency	"	"	119.7MHZ	H2
4	Secondary Frequency		Islamabad APP	125.5 MHZ	H2
4		ATIS	ATIS	129.6 MHZ	H2
(		BS	Radio Pakistan	1150 KHZ	H)
4		G/A/G	Radio	5601 KHZ	H2
4		G/A/G	Radio	2923 KHZ	H2

Table 7 ATS Communication Facilities – BBIAP, Islamabad

1.10. **Aerodrome Information**

1.10.1. Aerodrome Information of BBIAP, Islamabad and Bahawalpur International Airport are provided below in tabular form. At the time of the incident no abnormality was reported for either airfield.

OPBW AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

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*

Table 8 R/W Physical Characteristics & Declared Distances – Bahawalpur International Airport,

OPBW AD 2.14 APPROACH AND RUNWAY LIGHTS

Designations RWY NR	*APCH LGT type LEN INTST*	*THR LGT colour WBAR*	*VASIS (MEH) PAPI*	*TDZM LGT LEN*	*RWY Centre line LGT Length, spacing, colour, INTST*	*RWY EDGE line LGT Length, spacing, colour, INTST*	*RWY End LGT colour WBAR*	*SWY LGT LEN (M) colour*	*Remarks*
1	2	3	4	5	6	7	8	9	10
08	SALS 420M LIH	GREEN	PAPI Left 2.98°	Nil	2850 M , 30 M,	2850 M, 60 M,	RED	Nil	Strobe Lights Avbl
26	PALS CAT-1 923M LIH	GREEN	PAPI Left 2.98°	Nil				Nil	-

[redacted]

Table 9 Approach and R/W Lights, Other Lighting & Power Supply – Bahawalpur International Airport

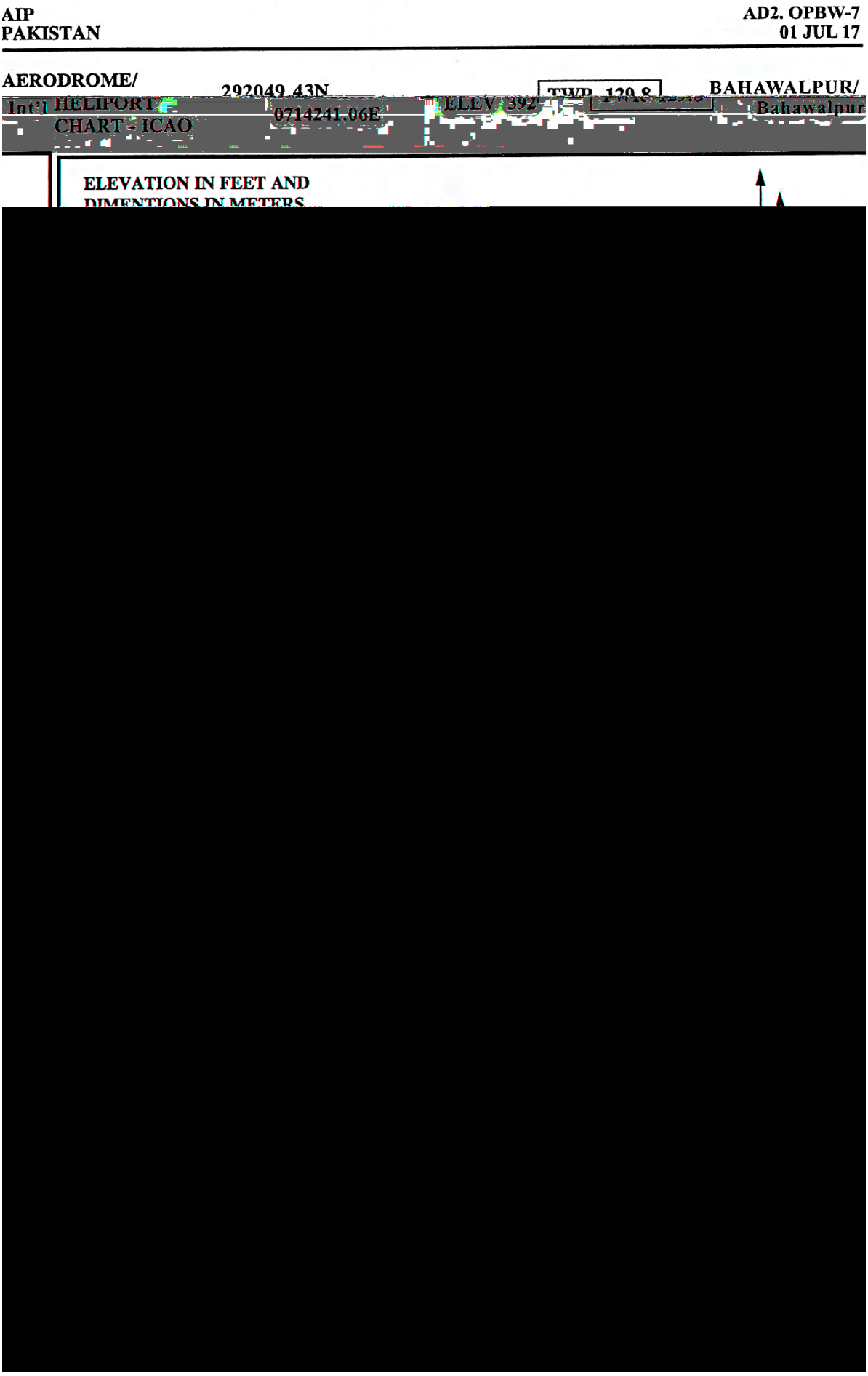

Figure 1 Aerodrome / Heliport Chart – Bahawalpur Airport, Bahawalpur

OPRN AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

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*
1	2	3	4	5	6
12	118°	3291 x 46	111/F/C/W/T Bitumen	333721.41N 0730508.49E	THR 506M / 1660 FT
30	298°			333639.32N 0730642.38E	THR 505 M / 1657 FT

Designations RWY NR	*Slope of RWY/SWY*	*SWY dimension (M)*	*CWY dimension (M)*	*Strip dimension (M)*	*Obstacle Free Zone*
[redacted]					

Table 10 R/W Physical Characteristics, Declared Distances & Approach and R/W Lights – BBIAP, Islamabad

OPRN AD 2.15 OTHER LIGHTING, SECONDARY POWER SUPPLY

1. ABN/IBN location, characteristics and hours of operation	-
2. LDI location and LGT	LDI at signal area.
Anemometer location and LGT	Anemometer on TWR.
3. TWY edge and centre line lighting	TWY edge lights
4. Secondary power supply / switch-over time	To all facilities at AD. Switch over time less than one m
5. Remarks	-

inute.

Table 11 Other Lighting & Power Supply – BBIAP, Islamabad

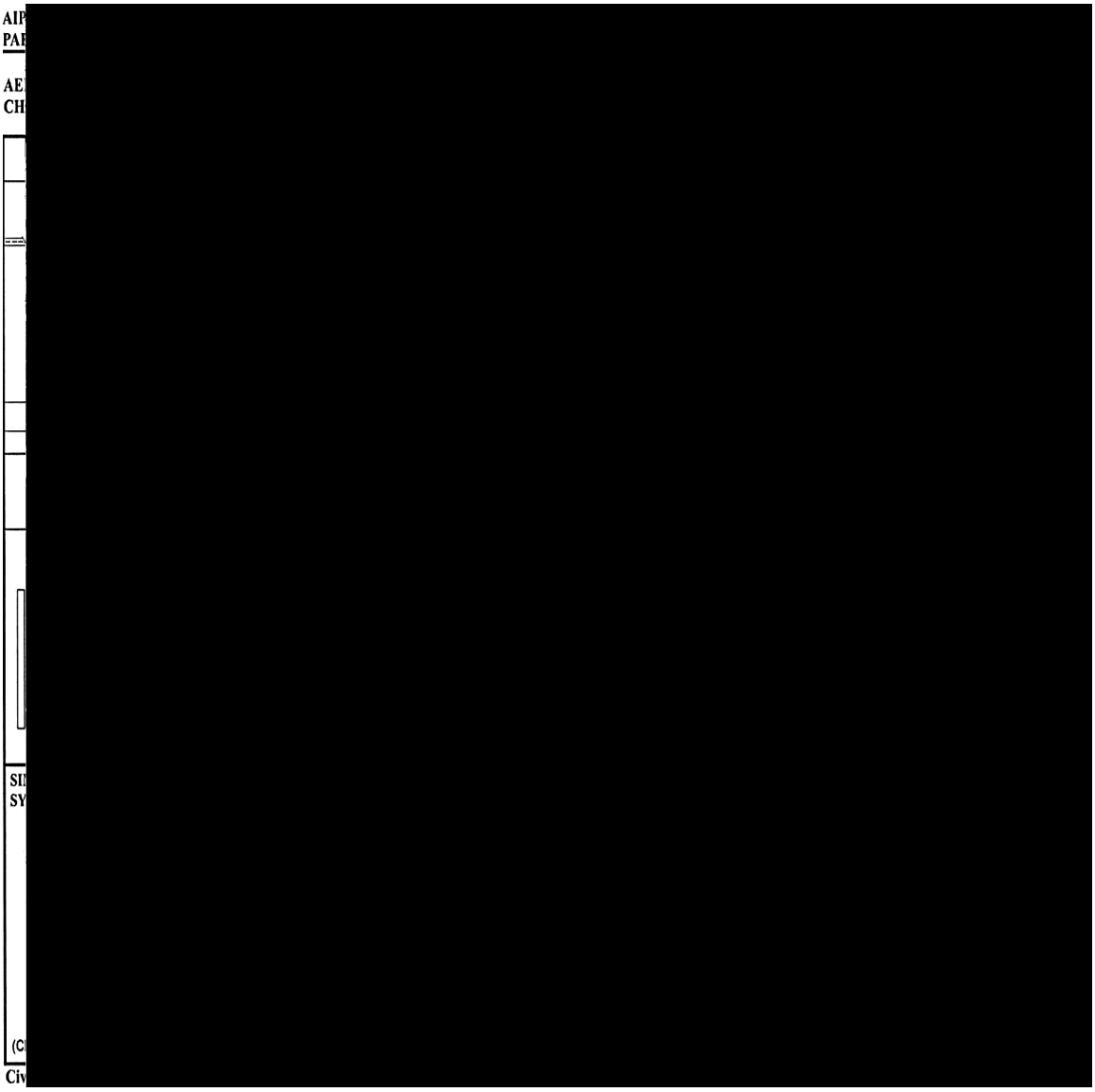

Figure 2 Aerodrome / Heliport Chart – BBIAP, Islamabad

1.11. **Flight Recorders**

1.11.1. Flight Data Recorder (FDR) was analyzed by PIA Safety & Quality Assurance to ascertain the exceedances during the event flight as shown in figure below.

Time	Barometric Altitude _ALT_BARO (ft)	Radio Height _ALT_RADIO (ft)	LH angle of attack _AOA_LH	RH angle of attack _AOA_RH	Calibrated Air Speed_CAS (kts.s)	Pitch intermediate _PITCH_I	Maximum Pitch _PITCH_MAX
1:25:46	1632	100	4.8	5	107.5	0.7	0.88
1:25:47	1628	90	3.8	4	110.5	0.79	0.79
1:25:48	1617	79	4.4	5.3	108.5	1.41	1.41
1:25:49	1606	69	5.3	5.8	108.5	1.76	1.76
1:25:50	1600	60	4.9	5.6	108.5	1.76	1.76
1:25:51	1593	52	5	5.6	107.5	1.67	1.76
1:25:52	1586	44	5.8	6.2	105.5	1.67	1.76
1:25:53	1576	36	5	5.6	106.5	2.11	2.11
1:25:54	1569	29	5.9	5.5	104.5	2.55	2.55
1:25:55	1563	21	6.8	7.1	104.5	3.6	3.6
[redacted]							

Table 12 FDA Analysis of Event Flight

1.11.2. There were two low and one medium severity exceedances observed during the event flight. The medium severity exceedances was high pitch at touchdown.

Event Number	Event Name	Severity	Phase	Snapshot	Event Value
1030	Taxi speed high in straight line	Low	TXO	Ground speed corrected	34
1705	Thrust asymmetry in flight	Low	APP	Altitude AFE	2110.3
1108	Pitch high at touchdown	Medium	LAN	Maximum pitch (1 Hz)	8.09

Table 13 Event exceedances

1.12. Wreckage and Impact Information

1.12.1. Not applicable

1.13. Medical and Pathological Information

1.13.1. Post occurrence blood and urine samples were not taken.

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. Investigation into aircrew history revealed that Captain of the flight had been inducted on a contractual basis by PIA directly as Captain without having served with PIA as First Officer (FO). Moreover, there is no record of Specific Airline Orientation Training or Management of Change (MOC) carried out for the induction.

1.18. Additional Information

1.18.1. It was highlighted that the touchdown may have been beyond the touchdown zone markings. It is appropriate to mention that R/W 30 exhibits a slight incline in the touchdown zone beyond which it converts into a downslope.

1.19. Useful or Effective Investigation Techniques

1.19.1. Not applicable

SECTION 2 – ANALYSIS

2.1. **General**

2.1.1. The aircraft had been loaded within the required Centre of Gravity (CG) limits (26.2%) with all up weight of 21.6 tons. Take off and departure from Bahawalpur airport as well as the flight enroute remained uneventful. While executing ILS Approach for R/W 30 at BBIAP, Islamabad, Captain disengaged the AUTO PILOT and flew the aircraft himself on final Approach.

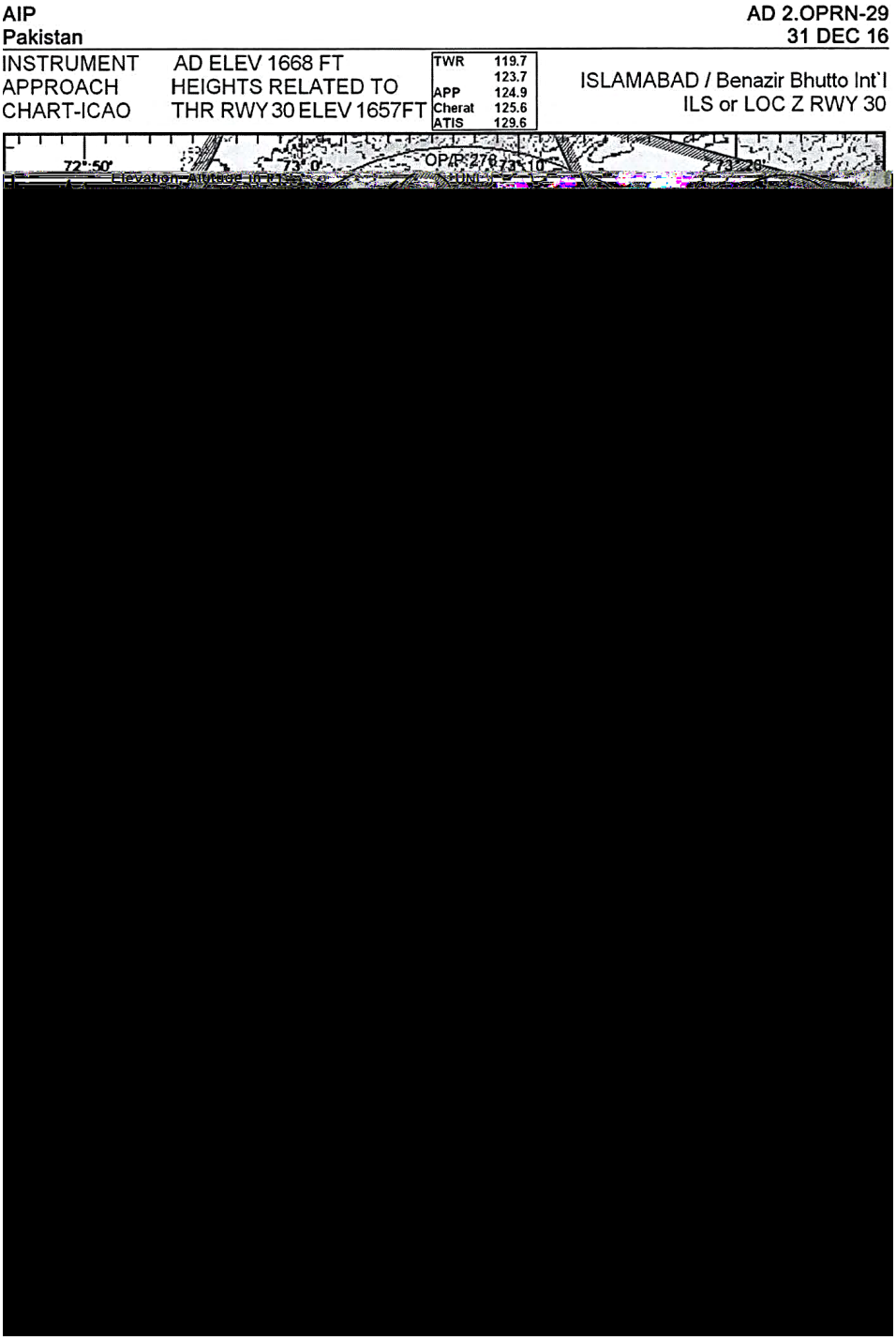

Figure 3 ILS R/W 30 Approach Chart

2.1.2. While approaching to land, some kites were observed due which the aircraft went below the glideslope to avoid them; however, Approach was continued. Subsequently, while returning to the correct glideslope, not much power was added but other parameters were within acceptable limits. The touchdown of the aircraft was at ~1.4 G with aircraft pitch angle of 8.09° and aircraft made slightly delayed

touch down. The aircraft touchdown is considered to be normal; however, the pitch angle was beyond the safe pitch limit of the aircraft.

2.2. Aircraft Loading

2.2.1. The aircraft loading was carried out within the prescribed CG limits (26.2%).

2.3. Crew Qualification

2.3.1.

2.6.2. **Runway Slope**

2.6.2.1. The gradient or slope of a R/W is **the amount of change in R/W height over the full length of the R/W**. This figure is expressed as a percentage. If the gradient is 3%, for every 100 ft of R/W length, the R/W height changes by 3 ft.

$$\text{R/W slope} = \frac{\text{Difference in R/W height between both ends}}{\text{Length of R/W}} \times 100$$

2.6.3. **Data for OPRN R/W**

Total length of runway: 3291 m

Displaced threshold R/W 12: 274 m

Displaced threshold R/W 30: 274 m

Upslope R/W 30: 0.5% up till 762 m from displaced threshold

Upslope R/W 12: 0.15% up till 1981 m from displaced threshold

Downslope start R/W 30: 762 m from displaced threshold

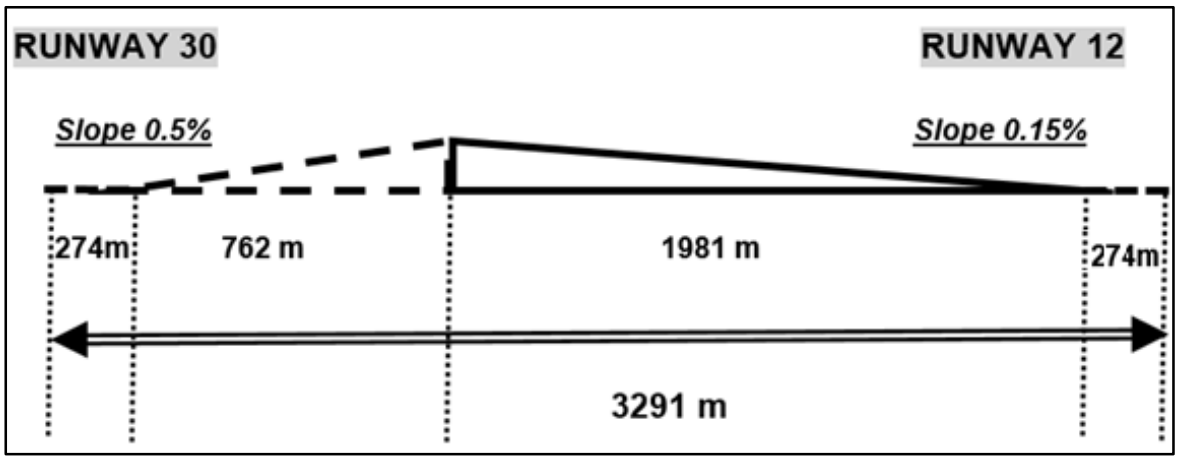

Figure 5 Calculation of R/W Downslope Angle for R/W 30 BBIAP, Islamabad

Remaining R/W length = 3,291 – 274 – 762

= 2,255 m / 7,396.4 ft

R/W downslope = 0.15%

$$\text{R/W Slope} = \frac{\text{R/W height Difference}}{\text{R/W length}} \times 100$$

$$0.15 = \frac{\text{R/W height difference}}{2{,}255} \times 100$$

$$\text{R/W height difference} = \frac{2{,}255 \times 0.15}{100}$$

R/W height difference = 3.3825 m / 11.0946 ft

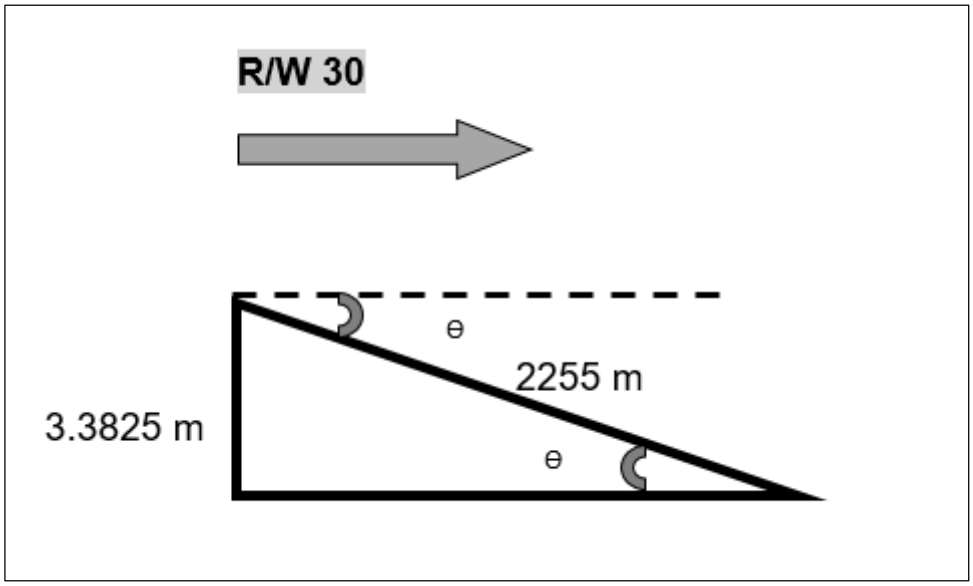

Figure 6 Calculation of R/W Downslope Angle

$$\sin \Theta = \frac{3.328}{2,255}$$

$$= 0.00147$$

Θ = 0.08° (Runway downslope angle)

2.6.4. A gradient angle of 0.08° would add to the aircraft AOA resulting in an overall increased AOA upon landing. While the gradient of the R/W at that point is not significant enough to cause a tail strike by itself, the combination with additional factors of high pitch angle, high AOA and reduced clearance upon touchdown may have caused a tail strike on landing.

SECTION 3 – CONCLUSIONS

3.1. Findings

3.1.1. The Captain of the flight had been inducted on a contractual basis by PIA directly as Captain without having served with PIA as First Officer and with no record of Specific Airline Orientation Training or Management of Change (MOC).

3.1.2. Take off, departure and flight enroute remained uneventful.

3.1.3. During ILS approach R/W 30, the aircraft momentarily went below the Glide Slope during final approach to avoid kites.

3.1.4. Upon resumption of Glide Slope, less power was added; however, other parameters were within limits.

3.1.5. The aircraft touched down beyond the landing zone markings where the R/W has a down slope angle of 0.08°.

3.1.6. The aircraft touched down at ~1.4 G and at a pitch angle of 8.09° which is beyond the aircraft safe limit.

3.1.7. Cabin crew seated on the aft jump seat reported an unusual noise during landing.

3.1.8. Post flight inspection revealed a half inch scratch on tail boot but no structural damage.

3.2. Cause of Occurrence

3.2.1. A combination of reduced power at low speeds resulting in high AOA, high aircraft pitch angle, R/W down slope and sudden transfer of weight onto MLG at touchdown resulted in **Abnormal Runway Contact (ARC)** in the form of tail strike.

SECTION 4 – SAFETY RECOMMENDATIONS

4.1. **PIA**

4.1.1 PIA may adopt a policy of periodic check flights for all aircrew with special emphasis on monitoring of parameters during critical stages of flight i.e. Take-off and Landing.

4.2. **CAA**

4.2.1. Collection of requisite medical samples from aircrew after any incident may be ensured to check the presence of any psychoactive substances / alcohol.