

NO HQCAA/1901/264/SIB



**CIVIL AVIATION AUTHORITY
KARACHI PAKISTAN**

**INCIDENT INVESTIGATION IN RESPECT TO
M/S PIAC BOEING 737 REG NO AP-BCB
OCCURRED ON 31ST DECEMBER 2000**

AT

FAISALABAD AIRPORT

FINAL REPORT

INCIDENT RELATING TO PIAC BOEING 737 PAKISTAN AP-BCB AT FAISALABAD AIRPORT ON 31ST DECEMBER 2000

SYNOPSIS

On being notified of the incident to PIA B-737 AP-BCB at Faisalabad on 31st December 2000, SIB was tasked to carry out the investigation vide Director General Civil Aviation Authority Memorandum No.HQCAA/1901/264/SIB dated 6th January 2001 (Appendix 'A1'). The investigation team was composed of Air Commodore Hashim Yamin, President SIB (Investigator In-charge), Engr Afzaal Imaduddin, Controller of Airworthiness (AE) (Tech. Investigator). This report is being released under authority of DG CAA.

Brief Resume. PK-340 was on a routine flight from Karachi to Faisalabad. The Captain of the aircraft was the Pilot Flying (PF) for this sector. The flight was uneventful until final approach for Runway-03 at Faisalabad Airport. The weather at Faisalabad was reported overcast / raining with visibility 1 Km. Aircraft touched down the runway late and at faster speed. Consequently, it could not be stopped on the runway or the stopway. It went into Kutcha area and came to a stop after covering a distance of 350 feet. All passengers were disembarked safely by using passenger steps. There was no reported injury. The aircraft sustained minor damage.

1. FACTUAL INFORMATION

1.1. History of the Flight

- 1.1.1 PK-340 passenger flight from Karachi to Faisalabad, take off time 0830 PST.
- 1.1.2 Incident took place at Faisalabad Airport during daytime at 0955PST.
- 1.1.3 Flight preparation is a non-factor in the incident.
- 1.1.4 PK-340 was on a routine flight from Karachi to Faisalabad. The Captain of the aircraft was Pilot Flying for this sector. The flight was uneventful until final approach for Runway 03 at Faisalabad Airport. Visibility reported by Met was 2 Kms while ATC Tower observation was 1 Km. Wind was calm. The Captain attempted to carry out an ILS approach. However, ILS could not be successfully selected on either of the two aircraft systems. The Captain thus decided to carry out a visual approach. Meanwhile, he picked up the runway at minimum altitude. At that stage he was higher and slightly faster. He decided to land and hence continued approach. The aircraft finally touched down about 6200 feet down the runway and could not be stopped on the runway or the stopway. It came to a stop after travelling 350 feet into the Kutcha. No one was injured as a result of this incident. However, aircraft's both main inner wheel tyres were found to have a flat spot each and its left inner tyre was found deflated also. Its engines' fan blades were also damaged.

1.2. Injuries to Persons Nil.

1.3 Damage to Aircraft No 2 and No 3 main wheel tyres burst. No 4 tyre had a deep cut. No 1 engine inlet cowl inner skin perforated (approximately ½") at three places. Twenty fan blades of No 1 engine and thirteen fan blades of No 2 engine damaged.

1.4 **Other Damage** Nil.

1.5 **Personnel Information**

1.5.1. **Pilot-in-command**

1.5.1.1 Farrukh Shafiq P-43279 Captain, Pilot Flying (PF), 48 Years, Employed in PIA since 1980.

1.5.1.2 Type of licence & No ATPL # 788.

1.5.1.3 Flying Experience:

1.5.1.3.1 Total in command (P-1) on the type (B-737) on which incident occurred 1566 hrs.

1.5.1.3.2 Total in Command (P-1) 4159 hrs.

1.5.1.3.3 Grand total 10879 hrs.

1.5.2. **Co-Pilot**

1.5.2.1 Obaid Jatoi P-54928, First Officer (PNF), 44 Years, Employed in PIA since 1996.

1.5.2.2 Type of licence No CPL # 1771.

1.5.2.3 Flying Experience:

1.5.2.3.1 Total in Command (P-1) 1655 hrs.

1.5.2.3.2 Total Co-Pilot (P-2) on the type (B-737) on which incident occurred 369 hrs.

1.5.2.3.3 Total P-2 2808 hrs.

1.5.2.3.4 Grand Total 4463 hrs.

1.5.3 The recent rest schedule versus flight duty time was satisfactory for both Captain Farrukh and Co-Pilot Obaid (Appendix 'B1' & 'B2').

1.6. **Aircraft information.**

1.6.1 The aircraft had a valid Certificate of Airworthiness.

1.6.2 Aircraft ILS un-serviceability had been reported at several occasions- in the technical log book in the recent past (refer Technical Analysis, para 2.1.1.1.)

1.6.3 Aircraft Centre of gravity was within limits (for weight report and loading advise refer Appendix 'C1' to 'C3').

1.6.4 Fuel used Jet A-1.

1.7. **Meteorological Information**

1.7.1 The actual weather at the time of landing i.e 0955 PST on 31st December 2000 at Faisalabad Airport was light rain, surface wind calm. Tower observation of visibility was 1 Km (Appendix 'D1' & 'D4').

1.7.2 There was no weather warning.

1.7.3 METAR OPFA

0400 UTC Calm, 2Km, Drizzle, 3SC040 7AC AS 100 1016/12

0500 UTC Calm, 1 Km, Light rain/overcast, 2ST020 3SC040
7AC AS 100 1017/12

1.8. **Aids to Navigation**

1.8.1 ILS – Ground Equipment Serviceable. For on-board ILS, refer para 1.6.2 and 2.1.1.1.)

1.8.2 NDB – Equipment on Ground Serviceable

1.9. Communication

1.9.1 Satisfactory.

1.9.2 UHF & VHF – Serviceable. R/T Tape Extract placed as Appendix ‘E1’.

1.10. Aerodrome Information

1.10.1 Faisalabad Airport has one runway. Runway 03 was in use at the time of the incident. The runway is about 9270 feet long and 150 feet wide. At the end of Runway 03, there is a stopway about 500 feet long (AIP Chart at Appendix ‘E2’). At the time of landing the runway surface was wet due to rain.

1.10.2 Braking action appeared to be satisfactory despite the wet runway condition.

1.10.3 PAPI – Serviceable.

1.10.4 Runway Approach Lights – Serviceable. As per available evidence, these were at 100% intensity.

1.10.5 Strobe Light – Serviceable and ON

1.11. Flight Recorders

1.11.1 Flight Recorder S No 2388, installed on the aircraft, is compatible but not original for B-737. Total Data was not available due to insufficient or incorrect integration of the system. The available Flight Recorder Data shows (details at Appendix ‘F’) that on final approach, the aircraft was high and also faster on speed. It made a destabilized approach with a high sink rate. The flaps selected were 30 degrees. Aircraft touched down at 150 KTS. The Pilot immediately selected reverse thrust and applied maximum brakes. The aircraft came to a stop about 3650 feet after touchdown.

1.11.2 Cockpit Voice Recorder (S No 50276) data erased as Co-Pilot forgot to take out the relevant circuit breaker on completion of landing.

1.12. **Wreckage and Impact Information**

1.12.1 For Final Flight Path details refer Appendix 'G1 to G3'. For Ground Path refer Appendix 'H'. After landing, aircraft came to a stop in 'Kutchra' about 350 feet ahead of the stopway and about 22 feet left of the extended centre line.

1.13. **Medical and Pathological Information**

1.13.1 Work-rest schedule and nourishment level of both cockpit crew were satisfactory.

1.13.2 Drug intake – Nil. Refer Medical Report at Appendix 'J1' & 'J2'.

1.14. **Fire**

1.14.1 No smoke or fire was caused due to this incident.

1.14.2 Precautionary actions taken as per SOP. Fire / Rapid Intervention Vehicle (RIV), foam type, sent to the scene of the incident.

1.15. **Survival Aspects**

1.15.1 Nil.

1.16. **Test and Research**

1.16.1 Nil.

1.17. **Organizational and Management Information**

1.17.1 Aircraft Retrieval details at Appendix 'K'.

1.18. Additional Information

1.18.1 Nil.

1.19. Useful or Effective Investigation Techniques

1.19.1 Nil.

2. ANALYSIS

2.1 Technical Analysis

2.1.1 ILS Malfunction

2.1.1.1 As per the aircraft technical log book, there were persistent snags of ILS and auto-pilot on the aircraft AP-BCB. Technical Log revealed that on following flights the snag reported were "No 1 ILS does not capture localizer on captain side and F/D bar retracts" and "Auto-pilot does not capture ILS LOC / GS with auto-pilot B in CMD...". PK-271/0412, PK-343/1012, PK-327/1212, PK-414/1312, PK-230/1312, PK-385/1712, PK-317/2212, PK-388/2212, PK-251/2312, PK-413/2512, and PK-387/3012

2.1.1.2 Even though ILS snag is covered under MEL 34-3, item 17, it appears that serious and dedicated effort has not been made for its rectification (Appendix 'L').

2.1.1.3 The aircrew reported that the ILS localizer overshoot twice before locking. The matter was investigated. Faisalabad localizer had been reported to hunt before locking. However, the problem was rectified and cleared by the check aircraft. Subsequently, it was confirmed to be serviceable (Appendix 'M').

2.1.2 No 2 & 3 Wheel Tyres Burst.

2.1.2.1 In order to analyze both the No. 2 & No. 3 wheel burst we may look at the function of the anti-skid system briefly. The anti-skid system is an electro-hydraulic subsystem placed in the hydraulic brake system to prevent skidding. Following protective modes are available in the anti-skid system: touchdown protection; and locked wheel protection.

2.1.2.1.1 Touchdown protection prevents brake applications prior to wheel spin up or with light vertical loading. A brake release signal is sent to the in board wheel pair from the right main gear air-ground sensor and to the outboard brakes from the nose gear ground sensing switch.

2.1.2.1.2 Locked wheel protection is provided by the anti-skid control unit from a comparison of left and right inboard, left and right outboard wheel speed signals respectively. The locked wheel error signal will release the brake on the slower wheel when its speed drops to less than 40 percent of the faster wheel. Locked wheel drop out will occur at approximately 20 knots.

2.1.2.2 Each main wheel card contains monitor circuit which is not part of the active control loop. The anti-skid system is continuously monitored and failure detection causes immediate illumination of the ANTI-SKID INOP light.

2.1.2.3 According to the aircrew this light did not illuminate. DFDR and other evidence show that the aircrew applied brakes after touchdown (all gears down). Yet anti skid system should have prevented wheel locking or skidding

even on a wet runway. Post incident inspection of the anti-skid system at Karachi revealed no defect with the anti skid system (Appendix 'N'). The case is being referred to Boeing for comments.

2.1.3 No 1 Bald tyre

2.1.3.1 No 1 tyre was observed to be bald.

2.1.3.2 The tyres may remain in service if the tread reinforcement ply shows. As per Boeing maintenance manual chapter 32-45 (Appendix 'O') if the tread reinforcement ply does not show the tyre may be used without safety concerns. In this particular case, the tyre was not showing tread reinforcement ply. As such it was safe to use. It may, however, be noted that bald tyres may cause reduced wheel traction special due to aqua planing on wet runways which may contribute to jamming of the wheels.

2.2. Operational Analysis

2.2.1 Role of the Captain (For relevant extracts of B-737 SOPs, Ops Manual, Training Manual, Stopway Runway Supplement and Quick Reference Handbook respectively, refer Appendices 'P', 'Q', 'R', 'S' & 'T')

2.2.1.1 Awareness When the Captain picked up the runway, he was aware that he was high on approach and also faster on speed. He was also aware of the low visibility and the wet runway condition. He had also had problems with the ILS. Being fairly experienced he should have been mindful of the fact that landing from that approach could be hazardous. He should have realized during the final approach and pre touch down (phase) that the actual visibility was below

minima (900 m) as the marker boards and the end of runway were not visible. However, he ignored this important point. He also showed inadequate situational awareness when he claimed to have touched down 3000 feet to 4000 feet down the runway instead of the actual 6200 feet.

2.2.1.2 Decision His decision to land instead of carrying out a missed approach was incorrect.

2.2.1.3 Performance By nature, he is less assertive. Owing to this, he was not cleared as a supervisory Captain. He should have checked his Co-Pilot for not giving him mandatory calls during the final approach. He permitted the aircraft to float for a long distance from 50 feet height to touch down, the aircraft floated for about 3500 feet instead of the normal 1000 feet. His aircraft handling after touch down was good. He stopped the aircraft within the minimum possible distance. He remained composed and took correct actions as regards communicating with the ATC and passengers during the incident. He should have ensured that his Co-Pilot took out the CVR Circuit Breaker on completion of landing.

2.2.2 Role of the Co-Pilot

2.2.2.1 Awareness He was aware of the high approach and greater speed on final approach. He should have been more concerned about the grave consequences of this.

2.2.2.2 Decision While as a Co-Pilot and Pilot Not Flying (PNF), the final decision is that of the Captain, being fairly experienced, he should have advised the Captain to carry out a missed approach. This is specially so because the trans-pilot authority gradient maintained by the Captain was quite gentle. His stance that he had full confidence in the ability of the Captain is not justified and undermines the responsibility assigned to a Co-Pilot in such cases.

2.2.2.3 Performance He did not give the mandatory calls, which is part of his responsibility as PNF. He also did not take out the circuit breaker of the CVR on completion of landing. This is in addition to the fact mentioned in para 2.2.2.2.

2.2.3 Training Factor

2.2.3.1 In case of the Captain, his training record shows that he did face difficulty in transferring from IMC to VMC. He was also found to be less assertive.

2.2.3.2 In case of the Co-Pilot, his training record shows that he was found lagging behind during call-outs.

2.2.3.3 It is important that all weak areas detected amongst aircrew are aggressively addressed during training and recurrent checks by the Airline and the Flight Inspectors.

2.2.4. Miscellaneous Factors

2.2.4.1 The importance of adherence to laid down procedures (irrespective of experience / proficiency), knowledge of common weather phenomena, etc. needs to be re(emphasized) on aircrew.

3. CONCLUSION

3.1 Findings

- 3.1.1 On 31st December 2000, PIA's Boeing 737 aircraft AP-BCB was on a scheduled passenger flight PK-340 from Karachi to Faisalabad.
- 3.1.2 Captain Farrukh Shafiq was Pilot-in-Command and Pilot Flying (PF), while First Officer Obaid Jatoi was the Co-Pilot and Pilot Not Flying (PNF). The Pilots were properly certified and fit for the flight.
- 3.1.3 The aircraft was declared airworthy for the flight. However, aircraft technical log revealed that there were many entries of defects on No 1 ILS and auto-pilot in the recent past.
- 3.1.4 The flight was carrying 103 passengers and eight crewmembers (two cockpit crew and six cabin crew).
- 3.1.5 At 0830 PST, the aircraft departed Karachi, as per schedule.
- 3.1.6 During cruise, near Rahim Yar Khan, the Captain came to know that it was raining at Faisalabad with tower observation of visibility 1 Km.
- 3.1.7 At 0929 PST, PIA 340 established contact with Faisalabad and requested for the latest weather. Faisalabad passed on the weather as "Wind calm, 2 Km, Tower observation 1 Km, Light rain, Cloud 3 Sc 4000, 7 As 10000----, Runway condition is wet and some water patches observed on the runway".
- 3.1.8 At 0946 PST, PIA 340 reestablished contact with Faisalabad, "Released by Lahore, Out of 130 for 60".

- 3.1.9 The Captain did not choose to carry out a NDB let down. Instead, he decided to go directly for an ILS approach.
- 3.1.10 Faisalabad cleared PIA 340 to descend to 3500 feet and establish on ILS.
- 3.1.11 At 0950 PST, when 20NM out, PIA 340 started to turn left to establish on ILS. Faisalabad cleared the aircraft to descent to 2600 feet.
- 3.1.12 The Captain intercepted the localizer at 10NM. The localizer overshot twice before aligning itself.
- 3.1.13 ILS glide slope did not lock on both, No 1 & No 2 auto-pilots. The Captain engaged No 1 auto-pilot at 0951:34 and disengaged it at 0952:17. He then engaged No 2 auto-pilot at 0952:18 and disengaged it at 0952:25. Again he engaged No 2 auto-pilot at 0953:55 and disengaged it at 0954:02.
- 3.1.14 The Captain, therefore, decided to fly the aircraft manually. At that time, the aircraft was two dots above the glide slope.
- 3.1.15 At 0955:04 PST, the aircrew established contact with the approach lights and PAPI. The PAPI was indicating high approach. At that stage, the aircraft was on final approach at 395 feet (Faisalabad minima in 393 feet AGL) and at about 159 KTS. The Captain started to line up with the runway and descend steeply. Simultaneously, Faisalabad cleared PIA 340 to land.
- 3.1.16 Between 0955:15 and 0955:22 PST, while the aircraft was descending from 150 feet AGL to 50 feet AGL, Audio terrain warning got activated due to excessive rate of descend.
- 3.1.17 At 0955:12 PST, the aircraft was in line with the runway and over the threshold. At that stage it was at 230 feet AGL and at 167 KTS. As per calculations, based on landing weight 509122 Kg and flaps 30 degree, the Vref speed figures out to

be about 135 KTS. As such he was 32 KTS faster on speed. The Captain reduced the Thrust.

- 3.1.18 At 0955:22 PST, the aircraft was descending through 50 feet. At that stage it was 2700 feet down the runway i.e. $6300 + 500 = 6800$ feet of prepared surface was available to it. The speed of the aircraft was about 167 KTS. Procedurally, at 50 feet AGL, the aircraft should have been over the beginning of runway at 135 KTS. The landing distance with 167 KTS Vref figures out (based on slippery runway, maximum manual brakes, medium braking action, aircraft weight 51000 Kg, runway elevation 607 feet, flaps 40, Vref 40 approach speed) as 6415 feet i.e. 1000 feet from 50 feet to touchdown and 5415 feet thereafter.
- 3.1.19 Hence, technically, it should have been possible to stop the aircraft on the prepared surface had the touchdown not been delayed and the aircraft not permitted to float for a long distance (3500 feet).
- 3.1.20 Co-Pilot vaguely remembers that he gave a call to the Captain that 4000 feet of the runway was left.
- 3.1.21 At 0955:35 PST, the aircraft touched down (main wheels) at about 148 KTS, about 6200 feet down the runway (refer 3.19 for landing distance calculations).
- 3.1.22 Two-three seconds later, at 0955:37 PST, the Captain lowered the aircraft nose, selected reversers and applied brakes.
- 3.1.23 At 0955:43 PST, the Captain went on maximum brakes.
- 3.1.24 At 0956:03 PST, the aircraft, after covering 500 feet of over-run area, entered Kutcha at an estimated speed of about 40 KTS.

- 3.1.25 At 0956:08 PST, the aircraft came to a stop. The Captain gave a call to ATC "Overshot the runway, Sir" and selected the reversers off.
- 3.1.26 All 103 passengers and eight crewmembers on board the aircraft remained safe.
- 3.1.27 There was also no injury on the ground.
- 3.1.28 The Captain took correct actions as regards passing of information to passengers after the incident.
- 3.1.29 The passengers were disembarked safely with the help of the passengers steps.
- 3.1.30 B-737 tow bar was not available with PIA at Faisalabad airport. Hence Engineering personnel at Faisalabad could not make an attempt to tow the aircraft.
- 3.1.31 The runway remained closed for about 21 hours after the incident. Only one other PIA Flight to Faisalabad was affected during this period.
- 3.1.32 Both main inboard tyres (No 2 & 3) skidded on the runway surface, resulting in flat spots in tyres No 2 & 3 and deflation of left inboard (No 2) tyre. On shop inspection at Karachi the anti-skid system was found serviceable. The matter is being referred to Boeing Company for their opinion on the possible cause(s) of tyres failure.
- 3.1.33 Tyre No 1 was found bald, though within satisfactory limits for flight. Bald tyres have reduced traction which can adversely affect landing distance especially on a wet runway.
- 3.1.34 There were many snag reports of ILS and auto-pilot in the recent past. Even though these snags can be covered under aircraft's MEL; yet their frequent reappearance reflects adversely on the standard of maintenance work / supervision.

3.1.35 Fan blades of both engines were damaged. This can be best attributed to debris lifted up from the ground and ingested in the engines as a result of high power on engines plus reverse thrust when the aircraft went on to Kutcha.

3.1.36 During the incident the Captain made the following mistakes:

3.1.36.1 Despite known low visibility condition at Faisalabad, did not carry out a NDB ILS let down.

3.1.36.2 On picking up the runway, found himself very high on final approach yet decided to continue with the approach.

3.1.36.3 Continued on a destabilized approach and even ignored the terrain warning.

3.1.36.4 Landed very long (due to long float) and at higher speed in wet / slippery runway condition, disregarding clear laid down instructions. Did not carry out a missed approach instead.

3.1.37 During the incident, the Co-Pilot made the following mistakes:

3.1.37.1 Did not give vital calls (50 feet), speed variation in excess of 10 KTS, glide slope variation in excess of one dot and rate of descent in excess of 1000 feet per minute, contrary to laid down instructions.

3.1.37.2 Did not advise the Captain to execute a missed approach despite the fact that the approach was grossly destabilized and the fact that the trans-pilot authority gradient was not steep.

3.1.37.3 Did not take out the Cockpit Voice Recorder circuit breaker on completion of landing.

3.1.38 There was weak coordination between the Captain and the Co-Pilot despite the fact that both have undergone CRM.

3.1.39 The Flight Data Recorder on AP-BCB was not original but compatible, and not totally integrated with the equipment. As such some of the data was not accurately accessible (Appendix 'F').

3.2. Causes

3.2.1. Violation of laid down procedures during landing on a wet runway by the Captain of the aircraft, leading to overshooting of the aircraft beyond the prepared surface.

3.2.2. Weak performance of specified duties by the Co-Pilot of the aircraft.

4 SAFETY RECOMMENDATIONS

4.1. Appropriate corrective action be taken in respect of Captain Farrukh Shafiq, P-43279 and First Officer Obaid Jatoi, P-54928.

4.2. All Aircrew be (re)briefed on the following:

- a) To strictly follow the instructions laid down in training manual, SOPs, etc., irrespective of experience / proficiency.
- b) Not to hesitate to carry out a missed approach, whenever required.
- c) To make self-assessment of visibility instead of relying completely on the reported visibility, not to take chances with weather and to take a safer course of action, whenever in doubt.
- d) To carry out a proper let down procedure during low visibility conditions.

- e) To take out the CVR circuit breaker on completion of emergency.
- f) To carefully read through recent past record in technical log.
- g) To attach special importance to missed approach and diversion procedure during pre flight briefings.

4.3. PIA to ensure that:

- a) Poor weather procedures are emphasized on aircrew.
- b) CRM is made more effective.
- c) Weaknesses pointed out during training and check flights are appropriately addressed.
- d) More attention is given to recurring snags.
- e) Compatible but not original Flight Data Recorders for any equipment are fully mated such that their complete and accurate data is accessible.

4.4. PIA to consider:

- a) Not using bald tyres during general inclement weather conditions.
- b) Positioning a universal tow bar at its airports.
- f) Carrying out annual route check flights for first officers.

4.5. Boeing Company be approached to comment on:

- a) The possible cause(s) of tyre failure while the anti-skid system is serviceable.
- b) The pros and cons of switching off engines if the aircraft enters unprepared surface.

- 4.6. Flight Standards to ensure that weaknesses of aircrew, pointed out during training and previous check flights, are specially checked during subsequent check flights.
- 4.7. ATS to ensure that the system of visual observation of visibility at our airports is refined.
- a) In coordination with the Met Department, efforts are made to make all available RVRs serviceable.
 - b) At our international airports, a list of essential runway maintenance equipment is defined, procured (if need be) and maintained in a serviceable state.
- 4.8. APM Faisalabad to ensure that ILS localizer is periodically checked and its serviceability ensured.
- 4.9. Met Department to ensure that the system of visibility measurement at the airports is refined.

APP. 'A2'

013



VIEW OF AIRCRAFT ON KUTCHA



Signature:



VIEW OF AIRCRAFT TYRES



RIGHT MAIN GEAR TYRES VIEWED FROM REAR OF AIRCRAFT
(NO.3 TYRE HAS A FLAT SPOT)



LEFT MAIN GEAR TYRES VIEWED FROM REAR OF AIRCRAFT
(NO.2 TYRE WITH A FLAT SPOT BURST & NO.1 TYRE BALD)

24



FLAT SPOT - NO. 2 TYRE



BALD NO. 1 TYRE

25



ENGINE DAMAGE