

ORIGINAL

HQ CAA/1901/144/AIB



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AIRCRAFT INCIDENT INVESTIGATION

B-707 AP-AZW

WHICH OCCURRED ON
7TH FEBRUARY 1992

AT

LAHORE AIRPORT

CIVIL AVIATION AUTHORITY

KARACHI, PAKISTAN

AIRCRAFT ACCIDENT INVESTIGATION REPORT

LANDING INCIDENT AT LAHORE AIRPORT ON 7TH FEB. 1992,

AT 0830 HRS PST INVOLVING PIA B-707 AIRCRAFT

REGISTRATION MARKS AP-AZW WHILE OPERATING

SCHEDULED DOMESTIC PASSENGER FLIGHT

PK-314 FROM KARACHI TO PESHAWAR

AUTHORITY Director General Civil Aviation Authority Memorandum
No.HQCAA/1901/144/AIB dated 7th Feb.,1992 (App."A").

COMPOSITION OF INVESTIGATION TEAM

- | | | |
|-----|--------------------------------|------------------------|
| (a) | Air Cdre (R) Abdul Basit | Investigator-in-Charge |
| | Chief Inspector & | |
| | President A.I.B. | |
| (b) | Gp.Capt.(R) Rashid A. Chaudhry | Investigator |
| | General Manager (Gen.Avn) | |
| | (North) CAA Lahore | |
| (c) | Mr. Afzaal Imaduddin | Investigator |
| | Sr.Airworthiness Surveyor | |
| | CAA Lahore | |
| (d) | Capt. Amjad H. Faizi | Co-Opted Member |
| | Chief Pilot Corporate Safety | |
| | PIAC QIAP, Karachi | |

1. AIRCRAFT INFORMATION

1.1. Registraion Marking	:	AP-AZW
1.2. Aircraft type and maker's S.No.	:	Boeing 707 - 3311B 19636
1.3. Engine types, airframe position and maker's serial No.	:	P&WJT3D-3B P.N.1:667657 P.N.2:645655 P.N.3:643524 P.N.4:644863
1.4. Certificate of Registration No.and validity	:	520/1 N/A
1.5. Certificate of Airworthiness No. and date of expiry, and Flt. Manual No.	:	472 050591-040592
1.6. Certificate of safety date and time (GMT) of issue and period of validity	:	C of M 17.11.91 at TSN 59874.53 112 days/750 hrs whichever occurs earlier from date of certificate.
1.7. Date of Construction of airframe	:	22 July,1968
1.8. Name and address of owner	:	PIAC KHI PAK

- 1.9. Gross Weights. Maximum permitted : 331600 Lbs
by C. of A. for this flight, at 150411.40 Kgs.
the time of accident.
- 1.10. Loading. Centre of gravity limits : C of G location
in C.of A. and centre of gravity 32.79% MAC aft
position at the time of accident DATUM
and commencement of flight. (INDEX 5529)
- 1.11. Airframe history.(Give flying : TSN 60423
time since manufacture, last TSO 1813
overhaul and last periodic check. LAST CHECKS:-
List also essential modifications C-6(121190-
completed). 280191) (+SC-21)
SC-22(280.791-
030591) SC-23
(160891-171191)
- 1.12. Engine history.(Give flying time : ENGINE #1 TSN
since manufacture, last overhaul 47555 ENGINE
and last periodic check. List also #2 TSN 91955
essential modifications completed) TSO 2255
ENGINE #3
TSN 59704
TSO 17316
ENGINE #4
TSN 53743
TSO 16487

2. CREW INFORMATION

2.1. Pilot-in-Command

2.1.1.Name : CAPT.SIRAJ-UL-MULK

2.1.2.Position in the cockpit : Captain

2.1.3.Date of birth : 10.3.1945

2.1.4.Type of licence and No. : ALTP No. 533

2.1.5.Medical date with status : 14.11.1991 Fit
for renewal of
ALTP

2.1.6. RATING

2.1.6.1. Type(s) held : F-27, B-707/
720B, DC-10, B-
747, B-737

2.1.6.2. Type current : B-707

2.1.6.3. Assist/Flight : -
Instructor Rating

2.1.6.4. Check Rating : -

2.1.7. FLYING EXPERIENCE

2.1.7.1. Grand total : 8671:21

2.1.7.2. Total in command : 2437:51

2.1.7.3. Total in command/
occurred : 159:43

2.1.8. Where trained : -

2.1.9. Date of joining the
organization : -

2.2. CO-PILOT

2.2.1. Name : NIAZ NABI

2.2.2. Position in the Cockpit : F/O

2.2.3. Date of Birth : 31st Dec. 1947

2.2.4. Type of Licence and No. : ALTP No. 756

2.2.5. Medical date with status : Fit for renewal
of ALTP Lic.
subject to use
of corrective
glasses.

2.2.6. RATING

2.2.6.1. Type(s) held : C-150/152, 172,
F-27, B-707

2.2.6.2. Type current : B-707

2.2.6.3. Assist/Flight : -
Instructor Rating

2.2.6.4. Flight Engineer : -
Instructor Rating

2.2.6.5. Check Rating : -

2.2.7.FLYING EXPERIENCE

2.2.7.1 Grand Total : 3498.00

2.2.7.2. Total in command : 2443.50

2.2.7.3. Total in command/ : 27.36 (P-2 U/S)
Co-Pilot/Flt.Engr
on the type of
accident/incident
occurred

2.2.8.Where trained : PIAC

2.2.9.Date of joining the : 1989
organization

2.3. FLIGHT ENGINEER

2.3.1.Name : Mohammad Qasim

2.3.2.Position in the Cockpit : Flight Engineer

2.3.3.Date of Birth : 16th Sept., 1954

2.3.4.Type of Licence and No. : F/E Lic.No. 250

2.3.5.Medical date with status : 12th Nov.91(Fit)

2.3.6.RATING

2.3.6.1. Type(s) held : B-707/720-B

2.3.6.2. Type current : -

2.3.6.3. Assist/Flight
Instructor Rating : -

2.3.6.4. Flight Engineer
Instructor Rating : -

2.3.6.5. Check Rating : -

2.3.7.FLYING EXPERIENCE

2.3.7.1. Grand total : -

2.3.7.2. Total in command : -

2.3.7.4. Total in command/
Flight Engineer
on the type
accident/incident
occurred : B-707 496.00

2.3.8.Where trained : PIA

2.3.9.Date of joining the
organization : -

3. SYNOPSIS

- 3.1. Aircraft B-707 AP-AZW was on a scheduled domestic passenger flight PK-314 from Karachi to Lahore and onward journey to Peshawar. The departure from Karachi was almost on time. The weather enroute was fair and the flight, was uneventful. Lahore weather was cloudy with some cumulonimbus clouds towards southern side with heavy rain all over the airfield and the visibility was 1 to 1.2 K.M. The aircraft followed approach procedure "ALPHA" and reported over head at 7000 ft. Captain Siraj-ul-Mulk the Captain of the aircraft was on the controls and made an I.L.S. approach and landing. On finals the aircraft broke clouds at 500 feet A.G.L. when the F/O reported "field in sight". After extended flare a positive touchdown, spoilers, thrust reversers and full brakes were applied but the aircraft did not seem to decelerate and continued to roll. The Pilot increased the brake pressure but to no avail.
- 3.2. The pilot after observing the approach lights and the chequered hut at the end of the R/W approaching fast, on the left and ahead, steered the aircraft to further right with an intent to avoid collision with the approach lights and the localizer antenna. The aircraft crossed the stop way portion and traversed another 1035 feet beyond the over run and then came to a stop in the Katcha. (Appendix B4). This Katcha area happened to be in a fairly compacted state as such the aircraft did not sink. Only the right wheel had sunk down by about four inches. (See Appendix B6).

- 3.3. None of the passengers or the crew was injured and there was no sign of any smoke or fire in cockpit or the cabin, as such the Captain had decided not to resort to deployment of emergency escape chutes.
- 3.4. The disembarkation of passengers was done after about an hour once the normal stairs arrived; and the passengers were transported to arrival lounges. The crash fire facilities reached the scene of the accident immediately but were not used as the conditions did not warrant their use.
- 3.5. The runway was cleared for operation at about 0950 Hrs PST. But with restriction due to the aircraft standing in the approach limits of R/W 18. The aircraft removal had to be delayed until 1430 Hrs on 9th Feb when the area dried up.

4. INJURY TO PERSONS

- 4.1. No injury was caused to any person on board the aircraft or outside as a result of the incident.

5. DAMAGE TO RUNWAY FACILITIES/APPROACH LIGHTS

- 5.1. Two of the collapsable approach lights were broken down apparently due to thrust reversers blast from the No. 1 engine.

6. DAMAGE TO AIRCRAFT

6.1. The aircraft sustained no structural or other damage and was cleared for ferry flight after a taxi run check.

7. METEOROLOGICAL CONDITIONS

7.1. It was raining heavily when the aircraft landed.

7.2. Met. reports are at appendices "K-1 to K-14".

8. NAVIGATION AND LANDING AID (VISUAL/PRECISION)

8.1. Aircraft navigational and Landing Aids were available and serviceable at the time of the accident. These were not a cause factor in the accident. Landing Aids were tested/calibrated by the CAA calibration aircraft in December 1991.

8.2. Calibration report of the Radio Aids is at Appendix "O-1 to O-3."

9. COMMUNICATION (INCLUDING RAD/COMMUNICATION)

9.1. All the communication were available and serviceable at the time of accident.

9.2. These were not a contributory factor in the accident.

10. AERODROME AND GROUND FACILITIES

10.1. All the Aerodrome and Ground Facilities were available. Crash fire tenders and rescue facilities immediately reached the scene of accident but as there was no fire etc no fire fighting facility was used.

11. FLIGHT RECORDERS

11.1. Flight Data Recorder and the Cockpit Voice Recorder were removed from the aircraft. The read out of the F.D.R. was prepared by the PIAC. CVR recording was highly distorted and almost half of it pertained to this incident. The readout of the FDR foil tracing has also been sent to Boeing Company for more accurate interpretation.

11.2. As mentioned in previous accident reports, the recording on C.V.R. was unsatisfactory because the PIA Pilot's are not using boom microphones below 18000 ft. The input from the area microphones is attenuated due to engine and other noises which mars the quality of recording of conversation which transpires between crews. In this particular case since the pilot failed to pullout the C.B. of the C.V.R. which is a mandatory requirement to help preserve the last 30 minutes recording (F.O.M. Page 527refers). Thus a some of the information was not available to the Investigation Team.

- 11.3. Flight Data Recorders on B-707 are of 1970 vintage and record only the time elapsed, height, speed and vertical acceleration that too in a graphic scale form which can not depict very precise figures.

12. **SURVIVAL ASPECTS**

- 12.1. Though it culminated into a survivable incident, the conditions were all set for a disastrous situation; because aircraft came to a stop only about 500 to 600 ft short of the built up area ahead. Also had the Katcha area, where the aircraft over ran and stopped, not been a compacted one the aircraft could have sustained damaged and resulted in fire/injury to PXs etc. Also had the aircraft not been steered to the right it would have collided with approach lights and localizer antenna which may have resulted in a catastrophe.

13. **OBSERVATIONS**

- 13.1. The Aircrew left Lahore and did not wait for the investigation team to arrive and interview/record certain pertinent information when the things were fresh in their minds.
- 13.2. The Mu meter at Lahore Airport was unserviceable as such under the prevailing conditions the R/W braking action could not be measured. However, as per APM/

SATO Lahore a day prior to this accident the braking action of the runway was reported (by two different Captains of PIAC) to be medium to good under almost similar conditions.

- 13.3. The Captain did not have his breakfast that morning however he did have about 6 hours of sleep and felt normal.

14. MEDICAL REPORTS (COCKPIT CREW)

- 14.1. Blood and urine samples of the Captain, F/O and F/E were taken immediately after the evacuation and sent for laboratory analysis. The results indicated no abnormality. (See Appendix L-1 to L-6.

15. INSPECTION OF WHEELS TYRES AND FUSELAGE OF THE AIRCRAFT

- 15.1. After the aircraft was retrieved from the Katcha on 9th February, the wheels, tyres and under surfaces were washed and inspected for any possible damage. All the surfaces and tyres etc were found to be in fully serviceable states. However one of the tyres on the right hand wheel (front inner) had scratching marks, over about 10 inch area. It indicated that this tyre had passed over a sharp and hard object in the Katcha area.

- 15.2. The aircraft was given ground run and all the systems functioned as normal.

16. TAXI TEST RESULTS

16.1. The aircraft was taxi tested by the Chief Pilot B-707 at Lahore in the presence of the investigators. Spoilers, thrust reversers brakes and the anti-skid systems operated/functioned normally. (See APP. Q-10)

17. AIRPORT INFORMATION

17.1. NAME	:	LAHORE INT'L AIRPORT
17.2. FIELD ELEVATION	:	712 FEET
17.3. LENGTH OF RUNWAY	:	11020FT
17.4. INSTRUMENT R/W	:	36
17.5. RADIO/NAV.AIDS	:	DVOR/ILS - TDME & DME
17.6. AIRFIELD LIGHTNING SYSTEM	:	CAT-II APPROACH LANDING SYSTEM
17.7. VISUAL LANDING AIDS	:	VASI

18. ACTUAL WEATHER AT THE TIME OF INCIDENT

18.1. CLOUDY WITH CB AROUND AIRFIELD.

18.2. HEAVY RAIN

18.3. VISIBILITY - 1.2 KM

18.4. WIND - CALM

18.5. TEMPERATURE - 12 degree C.

19. ANALYSIS

19.1. The evidence adduced ascertains beyond doubt that the aircraft was fully serviceable. Particularly the decelerating/stopping services viz-a-viz spoilers, reversers, brakes and the anti-skid system operation remained normal prior to and even after the incident had occurred. Also the aircraft history does not indicate any malfunction of these devices in the recent past. But the fact is that the aircraft could not be stopped on a 11020 feet long runway and came to a halt at a point 1435ft beyond the end of the runway on Katcha area. thus some factors other than malfunction of spoilers, reversers, brakes or antiskid system had contributed to this incident. Since the decelerating/stopping devices of the aircraft were fully serviceable, it is reasonable to assume and investigate on the following hypothesis:-

19.1.1. The aircraft touch down at the planned point (1000 - 1500 ft from the threshold) at the computed speed but certain factors e.g. rain water etc rendered all the decelerating/stopping devices ineffective which caused the aircraft to consume the remaining length

of the runway (9500 to 10,000ft) without having decelerated except after having entered the Katcha portion beyond the stop way/over run part and then came to a stop.

19.1.2. The aircraft touched down at 1000-1500ft point but the speed was higher than the computed one for the landing weight which caused the aircraft to traverse extra distance than the required landing roll for the prevailing conditions, before it came to a stop.

19.1.3. The aircraft landed/touched down some where beyond the planned point (1000-1500ft) and the remaining length of runway was not sufficient for the aircraft to slow down and stop with out having gone beyond the runway.

19.1.4. The aircraft touch down was long and hot owing to which this incident became inevitable. This could result from an excess speed and height over the threshold, as a sequel to which an extended flare coupled with very slippery R/W would culminate into excessive landing roll.

19.2. Not withstanding the fact that at the time of this incident it was raining and there was water on the runway which would have obviously reduced the braking action of the runway, landing data charts/graphs for B-707 aircraft show that even without the use of the

reversers, the aircraft would have required no more than 7100 ft to stop. Thus if the aircraft touched down at the planned point (1000-1500ft) at the correct speed, use of thrust reversers (which the pilot & F/E contend to have applied to their max limits) should have enabled the aircraft to take far less landing roll than 7100 ft. Even if considerable reduction in runway braking action is accepted, 11000 ft of runway plus 1500 feet additional distance to have been consumed to come to a stop this aircraft (which had all the decelerating devices functioning) is considered to be an abnormal phenomenon; and can easily be ruled out.

- 19.3. It is quite possible, that the approach speed was much higher than the V/ref.(133Kts) and did not bleed off as early as had been planned by the Pilot executing ILS approach and he could not monitor it closely because he later concentrated more in maintaining visual contact with the runway.(Which was necessitated by the fact that the visibility was marginal due to rain) It eventually resulted in a late touch down. But it does not seem convincing that 10-15 Kts could not have been bled off and achieve the correct V/ref over the threshold unless the approach was high too. A combined effect would then result in a long touch down, particularly under the prevailing conditions. In other words an extended flare condition could have occurred in which the aircraft ended up higher over the threshold with excessive speed, yet to be bled off.

- 19.4. The wheel tracks left by the aircraft on Katcha were very prominent (See App.B-4) and can be traced back on to the main runway. These were very clear and identifiable.
- 19.5. The main wheel tracks begin from about 4000 ft distance to go, (See App.B-1/B-2) and on the right half of the runway and then gradually further veering off to the right. This was done to stay clear of the approach lights etc by the Pilot intentionally (as stated by the Pilot).
- 19.6. The nose wheel track starts to appear after about 500 ft from the point where the main wheel tracks begin. It goes to indicate that the aircraft initially touch down some where half way down the runway. This also corroborates with the eye witnesses view-point.
- 19.7. The duty A.T.C.O was interviewed and asked to indicate exactly where the aircraft seemed to have touched down as observed by him while standing in the control tower. This was done with the help of a jeep fitted with R/T. The S.A.T.O. Lahore Airport was asked to slowly drive on the runway and was then guided by the eye witness to the exact place on the runway. The jeep was parked there and then photographed. (See. Appendix B-7).
- 19.8. The second eye witness. (See Appendix B-8) also observed the aircraft almost in the same area as stated by the No. 1 eye witness.

- 19.9. The extended flare on landing (as seen by the eye witness See APP-Q.16) resulted in a touch down at about 5500 ft. PIA SOP for the wet runway landing and stopping (FOM page 669 para-11 (m) "states that the pilot must aim for firm touch down at 1000 ft down the R/W. However if for some reason, the touch down is not possible at 1000 ft, the Captain should go around and another approach be performed".
- 19.10. A well planned and properly executed approach, flare and touchdown affords maximum runway length for stopping the aircraft and caters for any weakness, if at all, in decelerating devices. Errors or deviations that accumulate in the approach or touch down may be difficult or impossible to correct in the subsequent roll without paying the penalty for it. This over run incident was thus probably the result of an extended flare, and some what higher speed touch down but got saved from an almost disastrous out-come because of and full employment of all the decelerating devices which remained serviceable/operable and effective through out. And also the wise decision of the Pilot to have steered to avoid collision with the approach lights and localizer antenna.
- 19.11. The entire length of runway (starting from threshold of R/W 36) was examined and no fresh touchdown marks of rubber or wheels tracks could be traced, except the one stated at para 19.5. The Captain of the aircraft, Chief Pilot standards of PIAC and the SATO Lahore Airport were also present.

19.12. The scrubbed whitish appearance of wheel tracks indicates a certain amount of cleaning action of the wheels tyres, which is inevitable when a heavy aircraft is decelerating where maximum decelerating devices have been applied to their full extent e.g. spoilers, reversers and wheel brakes all at the same time, which was exactly the case in this instance. This further proves that the aircraft touched down late and the pilot used the decelerating devices effectively, to their maximum continuous extent till the aircraft stopped (See App B).

19.13. Detailed analysis of other factors & variables that could have been the contributory factors in this incident is as follows:-

19.13.1. The area where the scrubbed wheel tracks appeared is absolutely clear of any rubber marks and so is the gap up to the midway point, as such it is evident that aircraft must have touch down some where halfway down the runway and then it took about 1500 ft of initial roll before the spoilers, reversers and brake became effective and exerted full decelerating forces and caused the wheels to leave the scrubbed wheel track. Untill then, probably, enough decelerating loads on the nose wheel had not come. Once the aircraft load was transferred the scrubbed wheel track mark of the nose wheel also started to leave its evidence.

19.14. And the fact that the aircraft from then on stopped in about 5500 ft, further substantiates the probability that it touched down some where in the vicinity of the VOR hut which is exactly mid way point of the runway. Had the aircraft touched some where before this point the chances were that it would have stopped on the runway or at the most on stopway/over run area.

19.15. Neither there was any evidence of aquaplaning of any type what so ever on the runway. Positive indication of occurrence of such phenomenon is the effect on aircraft wheels. In case hydroplaning has occurred very prominent indications would appear on the tyre in the form of flat spots, blisters or reverted rubber.

19.16. Referring to photographs (APP. B1-10) no damage to aircraft wheel is noticed. During post incident inspection no abnormality with aircraft tyres was observed, thereby indicating that no such phenomenon was experienced by the aircraft during landing on wet runway. Thus possibility of any aquaplaning is ruled out.

20. DISCUSSION OF EVIDENCE

20.1. FLARE ON LANDING A well planned and properly executed approach, flare and touch down as per applicable conditions ensures uneventful landing. PIA SOP for wet runway techniques states that the Pilot must aim to touch down at 1000ft. Another requirement

for wet runway landing is a firm and positive touch down. As per the statement of the Captain the touch down was positive & was made within 1000 to 1500 feet of runway. The Flight Data Recorder indicates vertical acceleration of 1.8g apparently indicating hard landing.

- 20.2. Understanding the capabilities and limitations of the stopping systems and the tyre/ground interface provides basis for landing distance. Errors or deviations that accumulate in the approach or touch down may be difficult to correct in the subsequent roll out; without having paid the penalty.
- 20.3. Excess approach speed is a contributing cause in almost every over run. Excess speed increases the tendency of the airplane to float during the flare and to rebound at touch down, increases the stopping distance required once on the runway. Therefore, the approach speed should be as low as possible commensurate with landing conditions.
- 20.4. As per the Flight Data Recorder (APP. R) a continuous positive contact between the tyre & ground was not established. The aircraft apparently ballooned up and made two subsequent touch downs in a span of 20 seconds. Beyond 20 seconds data recorded is not reliable due reduction in speed. However, in the process sufficient runway was consumed which could have been used in stopping the aircraft thus increasing the overall stopping distance for aircraft at high speeds.

20.5. As per the Flight Data Recorder 60 seconds before the touch down the aircraft speed was 150 kts (140 kts as per statement of the captain). Also during the course of discussion the Captain stated that he bled off the excess speed prior to touch down. During the process 50 knots was bled off till touch down which was made at 100 kts as per the flight data recorder. The reduction achieved in speed was more than required resulting in a thick touch down with vertical acceleration of 1.8 g recorded by the FDR. This fact is further confirmed from the statements of the Cabin Crew (refer Appendix Q4-Q9).

20.6. ROLL OUT The stopping forces available are aerodynamic drag, reverse thrust and wheel brakes. The total force that can be generated is the sum of these three components and depends upon the aircraft speed, the prevailing runway conditions and the Pilot technique. Aerodynamic drag & reverse thrust forces are most effective at high speeds. The brake force varies inversely with aircraft speed and depends upon the runway conditions the load on the tyres (weight minus lift) and Pilot technique.

20.7. On wet runway the total stopping force available is less than on dry runways due to the reduced braking effectiveness. The reversers and the spoilers become more important since they now present a large proportion of the total force capability. Wet runway braking capability is smallest at high speeds and increases as the speed decreases. As per the wind tunnel tests of various aircraft, it has been

established that the spoilers furnish 50% of the high speed stopping force, whereas all the stopping force at low speeds is further supplemented by the deployment of reverse thrust.

20.8. The Captain, as per his statement states that no deceleration of the aircraft was felt after deployment of speed brakes & thrust reversers immediately after touch down. Further more wheels brakes seemed to be not effective at all, as stated by the Captain.

20.9. Review of the data retrieved from the FDR confirms reduction of speed from 100 kts at touch down to below 100 kts. The initial reduction was achieved after the airplane had finally settled on to the runway primarily through speed brakes and thrust reversers. The fact is further confirmed from the cockpit voice recorder wherein noise generated due activation of thrust reverse is clearly recorded. However, for understanding the ineffectiveness of brakes, as stated by the Captain, we may look into the anti-skid system.

20.10. BRAKES & ANTI-SKID The brakes are the primary means for stopping the aircraft and are applied separately on each side of the aircraft by pressing the respective brake pedal. The pedal force applied is transmitted through cables to valves in the wheel well which converts the force to a hydraulic fluid pressure. This pressure is then routed to the brakes.

- 20.11. Anti-skid system minimize tyres skidding and prevents wheel lock-ups during braking. This system prevents tyre blow out, and optimizes braking effectiveness under all runway conditions.
- 20.12. In the anti-skid system, the actual speed of the wheel is measured by a transducer in the axle and is compared to a "reference" wheel speed. If the actual wheel speed drops below the reference then a "skid" is detected and the anti-skid system releases the brake pressure to allow the tyre/ground friction to increase the wheel speed. When the anti-skid system detects that the skid has been corrected, it allows re-application of the brake pressure.
- 20.13. An essential elements in the skid control circuit is the reference wheel speed signal. Without this signal, skidding or locked wheels cannot be detected. The reference signal is initially generated by the wheel itself spinning up after touch down. On dry runways this occurs almost instantaneously. However, wheel spin is slower on slippery runways. If brake pressure is applied prior to wheel spin up, locked wheels can result. However, most anti-skid systems also employ touch down protection and locked wheel protection.
- 20.14. Referring to the data from the FDR the touch down was hard and the aircraft apparently bounced up. two additional touch downs in a span of 20 seconds have been recorded. However, due consideration was given to the fact that the additional peaks on the curve

retrieved from FDR could have been due to the bumpy Lahore runway. subsequently additional data from other landings by different aircraft and also from previous landing made at Lahore by the same aircraft on 5.2.92 was studied. No bumps/peaks were noticed which could prove the fact that aircraft accelerometer can not register any uneven runway surface.

20.15. Therefore, it could be easily deduced that bumps registered by FDR could have been due to aircraft bouncing off the runway only.

20.16. As per the statement of the Captain of the aircraft, no slowing down effect due wheel brakes was felt. However, from the study of anti-skid system, it is very evident that the brakes would not be effective unless the wheels have spun up to the reference speed. In the event of aircraft bouncing off, coupled with heavy down pour/wet runway conditions, it may have been possible that the wheels could not spin up to the required reference speed. Therefore, the delayed action of the brakes contributed to the aircraft over run on to the unprepared surface.

20.17. A study was conducted from the information recorded from the cockpit voice recorder. The operation of the thrust reverser from initial deployment to the aircraft finally stopping after over-run consuming 9000

ft of runway plus 1435 ft of Katcha area would have been more than 35 seconds. As such it could be easily inferred that the final touch down and activation of thrust reversers was done somewhere in the middle of runway.

21. FINDINGS

21.1. The following findings have emerged after examination of the scene of incident, the aircraft decelerating devices, recordings of statements of the witnesses, study of ATC tape extracts/listening to ATC tape, study of aircraft and crew records and analysis of information Data from the FDR and CVR:-

21.1.1. The aircraft Boeing 707 AP-AZW was certificated, equipped and maintained in accordance with CAA requirements. The aircraft was correctly refueled and properly loaded for the flight. The CG position and landing weight were within limits.

21.1.2. The aircraft landed through approach procedure 'ALPHA' instead of a straight in approach which was a correct decision on the part of the Captain because there was an active CB cell south of the airfield

21.1.3. The cockpit crew were properly licenced and held valid rating for Boeing 707 type of aircraft.

- 21.1.4. Non of the cockpit crew remembers the height and speed of the aircraft while crossing over the threshold. Inadequate communication on part of the crew members, lack of situational awareness on part of the Captain also contributed to this accident.
- 21.1.5. Captain of the aircraft exercised poor judgement and violated the SOP by having flown the aircraft in a manner that it touched down at almost half way down the runway, under the existing adverse conditions (Heavy rain & wet runway).
- 21.1.6. The blood/urine sample analysis of the cockpit crew was carried out immediately after the accident and was found within normal limits.
- 21.1.7. Cockpit Voice Recorder C.B was not pulled out by the crew, a violation of SOP. Thus some of the valuable evidence was lost.
- 21.1.8. The eye witnesses (duty ATCO) saw the aircraft touch down almost half way down the runway.
- 21.1.9. The aircraft was in a fully serviceable state before and even after the incident took place and no technical fault was found with the aircraft.

- 21.1.10. Cockpit crew are not being detailed/scheduled for the Emergency Refresher Courses for the past few years. It is a violation of recommended procedures.
- 21.1.11. There was a lack of optimum use of human Skill/Resources available in the cockpit.
- 21.1.12. The crew were not well versed with the SOPs.
- 21.1.13. Two of the cabin crew were not manning their allocated positions due to additional sub-lo-passengers.
- 21.1.14. Crash fire and rescue personnel responded promptly and reached the scene of incident without delay.
- 21.1.15. FDRs on Boeing 707 aircraft are of old vintage and do not record sufficient parameters which could be useful to the management as well as to the investigators for purposes of monitoring and analysis.
- 21.1.16. Large sized hand baggage of passengers was allowed on board the aircraft. This is not a safe practice.
- 21.1.17. The Pilot was forewarned about the wet runway.

21.1.18. PIA Pilots are not using boom microphones which is a mandatory requirement for all air carrier operators. As a result of this CVR recording was highly distorted and unreadable.

21.1.19. During last one and half years there have been atleast 6 cases of PIA aircraft going beyond the full length of runway on different airfields due to late touch down and higher speeds; while landing.

21.1.20. The Captain, though had adequate rest prior to reporting for duty, did not have his breakfast that morning.

21.1.21. PIA is detailing cabin crew on various types of aircraft on adhocism; which is against the norms of flight safety.

21.1.22. PIA is generally operating flights with minimum compliments of cabin crew. This situation is fraught with safety hazard.

21.1.23. Emergency escape chutes were not deployed for evacuation of passengers and the passengers remained on board for about one hour till the stairs arrived.

21.1.24.No.3 engine was kept running for quite some time after the aircraft had come to a stop, which is contrary to standard operating procedures.

21.1.15.The aircraft was subjected to uneven loads over the Katcha area during landing and reverse loads when it was retrieved.

NOTE The Captain declined to avail the privileges under rule 331 of CAR 1978 and produce any witnesses, make additional statement or produce any evidence in his defence.

22. **CAUSES**

22.1. Human Error - Pilot Factor - Avoidable.

PRIMARY

22.1.1. In that the Pilot-in-Command flew the aircraft in a manner that it touched down well beyond the specified point on a wet runway, which is contrary to the standard operating procedures and caused the accident by having failed to control and stop the aircraft on the runway.

SECONDARY

22.1.2. Adverse weather condition - Heavy rain.

23. RECOMMENDATIONS

- 23.1. Disciplinary action under Civil Aviation Rules 1978 be instituted against Capt. Siraj-ul-Mulk ALTP No.533 for operating the aircraft negligently by failing to adhere to the standard operating procedures thereby violating rule 251(9) and rule 155(1) of CAR 1978.
- 23.2. PIA should review and institute a system through which it can be ensured that each cockpit crew and cabin crew remains well versed/up dated with the standard operating procedures and other related contents of the crew mandatory manuals e.g. FOM and cabin crew operating manuals.
- 23.3. PIA should review its aircrew training concepts to cater for technological and conceptual advancements such as Cockpit Resource Management and Line Oriented Flying Training etc.
- 23.4. PIA management should ensure that cabin crew's allocated seats are not occupied by anyone other than the cabin crew on duty.
- 23.5. PIA should replace FDRs of B-707 aircraft with DFDRs which are more advanced and record comprehensive information data for the purposes of investigations, monitoring and analysis if these aircraft are to be continued in service.
- 23.6. Cockpit crew must undergo emergency approved refresher courses at least once a year.

- 23.7. PIA must enforce aggressive flight safety programme and conduct spot checks of aircrew as well as cabin crew. The ultimate responsibility for safety lies with the operator.
- 23.8. PIA must ensure that all Pilots are provided with headsets having boom microphones and their use below 18000 ft is made mandatory.
- 23.9. PIA must re-emphasise the necessity of pulling-out the C.B of CVR by the Captain in the event of incidents/accident to ensure preservation of the tape.
- 23.10. PIA must review the policy of allowing the passengers to carry bulky/over size baggage in to the cabin for safety reasons.
- 23.11. Cabin Crew deployment Policy must be reviewed by PIA. Adhoc detailing and on any of the six types of aircraft is against all the safety rules.
- 23.12. All engines must be switched off under abnormal conditions, as any prolonged engine operation under such like circumstances may end up causing more penalty than the gain.

23.13. Additional Non destructional test of the landing assembly, as per details in (APP. S) be instituted after complete removal of both landing gears.

APP. "B₁"



WHEEL TRACK PRIOR TO GOING OFF THE RUNWAY

APP. "B₂"



POINT FROM WHERE THE WHEEL TRACK COMMENCE

APP B₃"



PROBABLE AREA OF TOUCH DOWN

APP B₄"



LEFT WHEEL TRACK ON KATCHA

APP. "B5"



TWO APPROACH LIGHTS MISSING AND DEPICTION OF CLOSENESS OF THE AIRCRAFT TO THE BUILTUP AREA AHEAD (ONLY 500' TO 600' AWAY).

APP. "B6"



RIGHT WHEEL SUNK IN THE SOGGY/KATCHA AREA - LEFT MAIN WHEEL AND NOSE WHEEL ON A COMPACTED KATCHA GROUND



APP. B₇"

TOUCH DOWN POINT - 5300 FEET FROM THE BEGINING
OF RUNWAY -36 WAS OBSERVED BY THE DUTY ATCO FROM
THE CONTROL TOWER (NO.1 EYE WITNESS)



APP. B₈"

NO.2 EYE WITNESS - STANDING AT THE LOCATION FROM
WHERE HE OBSERVED THE AIRCRAFT ABOUT TO TOUCHDOWN



APP. "B9"

TYRE CREEP MARKS STILL IN PLACE



APP. "B10"

VOR HUT - MID WAY POINT OF TOUCH DOWN

APP. B₁₁



WHEEL TYRES



APP. B₁₂

WHEEL TYRES