

VOLUME I



سول ایوی ایشن اتھارٹی

AIRCRAFT ACCIDENT INVESTIGATION REPORT

PIA BOEING 747 AP - AYW
AT
ISLAMABAD INTERNATIONAL
AIRPORT
ON
4th FEBRUARY 1986

CIVIL AVIATION AUTHORITY
KARACHI, PAKISTAN

AIRCRAFT ACCIDENT INVESTIGATION REPORT

LANDING ACCIDENT AT ISLAMABAD INTERNATIONAL AIRPORT
ON 4TH FEBRUARY, 1986 AT 0840 HRS P.S.T. INVOLVING
PAKISTAN INTERNATIONAL AIRLINES BOEING - 747 AIRCRAFT
REGISTRATION AP-AYW WHILST OPERATING SCHEDULED DOMESTIC
PASSENGER FLIGHT PK-300 FROM KARACHI TO ISLAMABAD

Authority: - Director General, Civil Aviation Authority, Memorandum
No.HQ.CAA/1002/DGS dated Islamabad 4th February, 1986
(Appendix "A").

COMPOSITION OF INVESTIGATION TEAM

- | | | |
|----|---|------------------------|
| 1. | Air Cdre. (Retd) Patrick D. Callaghan,
Chief Inspector & President Accident
Investigation Board, C.A.A. | Investigator-in-Charge |
| 2. | Mr. Arif Mir
Chief of Airworthiness C.A.A. | Investigator |
| 3. | Capt. Shaukat Khan
Chief Flight Inspector C.A.A. | Investigator |
| 4. | Wg. Cdr. Zaheer H. Zaidi,
President Accident Investigation
Board, Pakistan Air Force. | Investigator |

SYNOPSIS

Pakistan International Airlines Boeing 747 aircraft Registration AP-AYW operating scheduled domestic passenger flight PK-300 from Karachi to Islamabad, departed Karachi International Airport at 0715 hrs Pakistan Standard Time (P.S.T) on 4th February, 1986. There were 248 passengers, 14 Cabin Crew and 3 Flight Crew aboard the aircraft. The flight proceeded normally and the flight crew contacted Islamabad Radar at 0830.57 hrs P.S.T on V.H.F frequency 125.5 Mhs. At this time the aircraft reported descending to 11,500 feet, passing through 14,000 feet at a D.M.E (Distance Measuring Equipment) distance of 21 nautical miles (n.m) from Islamabad Airport.

The/....

The aircraft was radar vectored for an Instrument Landing System (I.L.S) Runway 30 final approach course. When the aircraft was approaching the Outer Marker it was handed over to Chaklala Tower on VHF frequency 123.7 Mhz. The aircraft subsequently continued its approach to land, and touched down in the touch down zone at about 0841 hrs(P.S.T) with all its landing gears fully retracted. The aircraft after skidding down the runway on its belly and No.2 and No.3 engines came to a stop, 7,000 feet from runway 30 threshold whilst still on the runway. The Customer Service Officer (C.S.O) used his initiative and initiated the evacuation. All slides except the overwing slides and the upper deck slide were deployed and the occupants of the aircraft were evacuated in a short time estimated between 1½ to 10 minutes. One passenger sustained serious injury during the evacuation. The cockpit crew were the last persons to leave the aircraft and as far as can be ascertained this was at least ten minutes after the passengers and cabin crew had left the aircraft. The Airport Crash Rescue Services reacted immediately on observing the aircraft touch down, and the Crash Fire Rescue (C.F.R) vehicles reached the aircraft almost immediately as it came to a stop, and controlled the minor engine fires that occurred on the inboard engines.

The Civil Aviation Authority, Pakistan investigation determines that the probable cause of this accident was a break down of cockpit management and discipline, resulting in failure of the crew to follow the Standard Operating Procedures, the employment of non-standard procedures, which deactivated the landing gear warning systems, and which collectively resulted in the failure by the Flight Crew to lower the landing gear and ensure that it was down before landing.

1. AIRCRAFT INFORMATION

- | | |
|--------------------------------------|--------------------------|
| 1.1. Aircraft type and serial number | Boeing 747-200 S.No. |
| 1.2. Classification of Aircraft | Regular public transport |
| 1.3. Weight Category | "D" |
| 1.4. Registration Marking | AP-AYW |

1.5. Engine/.....

1.5. Engine type, installation and serial numbers.	Pratt and whitney JT-9D-7. Four installed in pods under wings.
	No.1 685962
	No.2 695733
	No.3 685744
	No.4 686029
1.6. Certificate of Airworthiness	No.448 (Revision-1) Valid
1.7. Certificate of Registration	No.495 (Revision-1) Valid
1.8. Certificate of Maintenance	Valid upto 31535-01 hrs
1.9. Owner	P.I.A.C
1.10. Weight at time of Accident	244,000 Kgs.
1.11. C of G	Within Limits
1.12. Fuel remaining on Landing	42,600 Kgs.
1.13. Configuration for this flight	First Class-20 Economy-384
1.14. Date & Time of last inspection	Check "A" plus certain items of check "C" completed on 2nd February 1986 at 31,135.01 total aircraft hours.
1.15. Next check was due at	31,535 aircraft hours
1.16. Unserviceabilities	No.1 Pack-inoperative. Auto throttle system inoperative. These discrepancies are covered by the Minimum Equipment List (M.E.L)
1.17. Airframe History	
1.17.1. Hours since new	31155 Hours 9718 Landing
1.17.2. Modification state	No outstanding mandatory modification
1.18. Engines History	
1.18.1. Hours since	No.1 16183.05
	No.2 22598.53
	No.3 23272.07
	No.4 18228.50
1.18.2. Hours due overhaul	No.1 20275
	No.2 23872
	No.3 26350
	No.4 4976
1.18.3. Modification state	No mandatory modifications outstanding.

1.19./Defects.....

1.19. Defects having a bearing on the accident None

2. CREW INFORMATION

2.1. There were three cockpit crew on board to operate the flight. Details are as follows: -

- | | |
|-------------------------|---|
| 2.1.1. Pilot flying | Captain Siraj Ali |
| 2.1.2. Pilot in Command | 1. Captain Siraj Ali |
| | 2. ALTP NO.33/1958 |
| | 3. Medical Status-Fit (Examined on 19.12.85) |
| | 4. Date of Birth - 09.07.1930 |
| | 5. Total Flying Experience 18,215.27 Hrs |
| | 6. Total in Command 16,204.50 Hrs |
| | 7. Total Experience on Boeing 747 4,017.00 Hrs |
| | 8. Total in Command 4,017.00 Hrs |
| | 9. Total flying in 90 days preceding the accident. 118.17 Hrs |
| | 10. Last Simulator Command Check 1.1.1986 |
| 2.1.3. Co-pilot | 1. First Officer Ahsan A.Bilgrami |
| | 2. ALTP NO.647/1984 |
| | 3. medical Status- Fit (Examined on 22.10.1985) |
| | 4. Date of Birth 30.08.1949 |
| | 5. Total Flying Experience 4,273.14 Hrs |
| | 6. Total in Command 903.45 Hrs (on non-commercial aircraft). |
| | 7. Total experience on Boeing 747 Under Supervision. 25.00 Hrs First Officer 23.00 Hrs <u>48.00 Hrs</u> |
| | 8. Total flying in 90 days preceding the accident. 48.20 Hrs |

9. Total/.....

- 9. Total Airline flying experience 3,071.00 Hrs
- 10. Last Route Check on Boeing 747 14.01.1986

2.1.4. Flight Engineer

- 1. Mr. Arif Rabbani
- 2. Flight Engineer licence number 53/1961
- 3. Medical Status - Fit (Examined on 19.08.1985)
- 4. Date of Birth 15.08.1933
- 5. Total Flying Experience 12,862.57 Hrs
- 6. Total experience on Boeing 747 2,854.58 Hrs
- 7. Total flying in 90 days preceding the accident. 136.19 Hrs
- 8. Date of last proficiency check 03.07.1985

2.2. There were a total of 14 Cabin Crew on board the aircraft.

3. PASSENGERS AND LOAD INFORMATION

3.1. Total number of passengers on board were 248. Their breakdown is as follows:-

- 3.1.1. First Class - 16 passengers
- 3.1.2. Economy Class 232 passengers (213 Adults, 10 Children and 9 infants).

3.2. Aircraft load information is as follows:-

- 3.2.1. Weight of passengers 17,550 Kgs.
- 3.2.2. Weight of passengers baggage and Cargo 13,981 Kgs.

4. HISTORY OF THE FLIGHT

4.1. Pakistan International Airlines Boeing 747, AP-AYW operating scheduled domestic passenger flight PK-300, departed Karachi for Islamabad at 0715 hrs P.S.T, on 4th February, 1986 with 248 passengers including 10 children 9 infants, plus 14 cabin crew and 3 flight crew on board. Start up, taxi, take off, climb and cruise were normal. At 0830.57 hrs

the/.....

the aircraft made contact with Islamabad Radar on V.H.F frequency 125.5 Mhz, and reported descending, passing through 14,000 feet for 11,500 feet at D.M.E. distance 21 n.ms from Islamabad Airport. Radar identified the aircraft and vectored it for an I.L.S final approach course for runway 30. The Flight Engineer stated that around 6,000 feet, final landing checks down to item gear, were initiated by him. The Captain did not ask for the final landing check list, however, he recalls the Flight Engineer calling "Auto Brakes" at which he selected "MIN", then "Speed Brakes" at which he selected "ARMED". This is confirmed by the read out from the Cockpit Voice Recorder. Just prior to Glide Slope(G/S) intercept the Captain selected "Land Mode" and engaged all three auto pilots. The Flight Engineer set the electrical panel on observing "Land Mode" being selected by the Captain. At G/S intercept auto pilot "C" disengaged and its lever dropped to "OFF." Soon after this, auto pilot "B" red light illuminated accompanied by the auto pilot wailer. The Captain called for the circuit breaker to be pulled. The Flight Engineer stated that he recycled the Aural Warn C/B and this action silenced the wailer. The C.V.R read out indicates that the C/B was pulled, and not cycled, resulting in disabling the landing gear warning horn. The approach was continued and landing flaps were called for by the captain and lowered by the Co-pilot. At this stage the landing gear warning horn did not activate as designed confirming that the Aural Warn C/B had been pulled. At 1000 feet, the Captain called "1000 feet" and the Co-pilot responded with a call of "1000 feet." Landing gear position was not checked at this time. At 500 feet height the G.P.W.S warning sounded "PULL UP" "PULL UP." Since the landing gear was fully up and the flaps were down, this warning was normal for the G.P.W.S. The Captain called for the circuit breaker to be pulled and the Flight Engineer deactivated the G.P.W.S by pulling the GPWS circuit breaker on the overhead panel. The landing gear position was not checked by any of the crew at this time. The aircraft continued the approach for landing, and the A.T.C. whilst giving landing clearance called "300, RECHECK GEARS. CLEAR TO LAND RUNWAY 30". The Co-pilot replied "CLEARED TO LAND. PAKISTAN 300" but failed to check the landing gear position at this time. A.T.C. failed to insist on confirmation of landing gear position. The aircraft continued the approach to land. The Flight Engineer called the radio altimeter heights down to ten feet, and it was moments after this

that/....

that the landing gear warning horn sounded as the aircraft touched down with the landing gear fully retracted. As the aircraft touched down the F/E said "GEARS ARE STILL - UP." Touch down was made with the under belly first, at a point 1,160 feet beyond the threshold and on the centre line of runway 30. After skidding on the belly, the two inboard flaps and the two inboard engines, the aircraft finally came to rest on the runway with its nose 7000 feet down the runway from the threshold of runway 30. Just before the aircraft came to a stop, on noticing that the landing gear selector lever was in the "OFF" position, the Captain asked the Co-pilot to lower it. This action resulted in the nose gear doors opening and the nose gear unlocking and dropping down partially.

- 4.2. After the aircraft had touched down, the C.S.O on observing sparks and smoke through the L5 and R5 windows, alerted the cabin crew whilst the aircraft was skidding down the runway. When the aircraft came to a stop, after attempting to contact the cockpit and failing, the C.S.O initiated the evacuation. The evacuation slides at L1,2,4,5 and R1,2, 4,5 were deployed. The overwing slides L3 and R3 were not activated because of the fire and smoke on the inboard engines. The slide at L5 failed to deploy properly adopting an "L" shape. This slide was therefore not used for evacuation and passengers were directed by the C.S.O to other slides. Despite attempts by the cabin crew to stop them, the majority of passengers carried their carry on luggage with them, throwing them on the slides and then following. In this process the slide at R-5 was punctured after 25 passengers had used it for evacuation. The three or four passengers remaining in this section were redirected to door R-4 by the Flight Steward manning door R-5. During the evacuation one passenger sustained serious injury, specifically a fracture of the right radius and dislocation of the right wrist joint. Two passengers suffered contusions of the right ankle with no bone injuries. No other serious injuries were sustained by any of the occupants of the aircraft. The evacuation was accomplished in a short time, and is variously estimated as having taken 1½ to 10 minutes. The cockpit crew were the last persons to leave the aircraft, and as far as could be ascertained they left the aircraft at least ten minutes after everyone else had evacuated the aircraft. The upper deck slide was not deployed and all persons on board the aircraft evacuated via the slides on the lower deck. (Main Cabin).

- 4.3. The Airport Crash Fire Rescue personnel on observing the aircraft touch down reacted immediately, and the Crash Fire Rescue Vehicles reached the aircraft almost immediately as it came to a stop. They immediately controlled the minor fires on the inboard engines and prevented any possible escalation.
- 4.4. The aircraft sustained major damage as a result of the accident. The runway remained blocked till 1830 hrs on 8th February, 1986 at which time recovery action was completed by the P.I.A. team.

5. INJURY TO PERSONS

- 5.1. One passenger, Mr. Duraiz a PIA Engineer sustained serious injuries whilst evacuating from the aircraft. His injuries were a fracture of the lower end of the right radius with dislocation of the right wrist joint. Two other passengers had contusion of the right ankle with no bone injury. No other occupants of the aircraft sustained injury except for minor friction burns and bruises, nor were injuries sustained by any other person as a result of the accident. (See statement of Dr. Sh. Sirajul Haq).

6. DAMAGE TO AIRCRAFT

- 6.1. The aircraft Boeing 747-200 Registration AP-AYW sustained substantial damage to its under belly, inboard flaps, and engines No.2 and No.3. See damage report. (Appendix "B"). and Boeing Team Survey (Appendix "C").

7. OTHER DAMAGE

- 7.1. As a result of the accident some damage occurred to runway lights and the runway surface. Additionally there was a loss of revenue to C.A.A because of blockage of the runway (Details are at Appendix "D").

8. METEOROLOGICAL CONDITIONS

- 8.1. Weather at the time of the accident (Crash Observation) was wind calm, zero knots, visibility 1.8 Kms, Mist, and temperature 8°C. (See Crash Observation for 0842 hours P.S.T and weather report for 0755 hours P.S.T Appendices "E1" and "E2". Weather was not a factor in this accident.

9. AIDS TO NAVIGATION

- 9.1. I.L.S was functioning normally and was serviceable. The aircraft made an I.L.S approach.

10. **COMMUNICATION**

10.1. Communication between, Islamabad Radar/A.T.C and the aircraft was normal (See ATC/Radar transcripts and cockpit Voice Recorder transcript. (Appendices "F", "G" and "H").

11. **AERODROME AND GROUND FACILITIES**

11.1. The runway at Islamabad International Airport is cement concrete. The runway length is 2743 meters. Runway width is 46 meters. The runway has stopways measuring 274 meters on each end. The runway direction is 120 degrees and 300 degrees. Runways are designated 12 and 30. The elevation of the airfield is 1665 feet.

11.2. Fire protection available is Category IX. The Crash Fire and Rescue Services reached the accident site immediately and extinguished the fires on No.2 and No.3 engines.

12. **FLIGHT RECORDERS**

12.1. Sundstrand Data Control Inc. Cockpit Voice Recorder (C.V.R) Model No.V-557 Part No.980-6001-010 serial No. 2072 and Sundstrand Data Control Inc. Digital Flight Data Recorder (D.F.D.R) Model 70-203F Part No.981-6009 serial No.3135 were removed from the aircraft after the accident.

12.2. The C.V.R tape was read out with laboratory assistance from the National Transportation Board in Washington D.C U.S.A. Copies of the tape on cassettes were made and a transcript of the last 10 minutes of the tape was made. (See Appendix "H").

13. **WRECKAGE**

13.1. Pakistan International Airline's Boeing 747-200 AP-AYW was located on the runway 12/30 of Islamabad Airport at a point 7000 feet from the threshold of runway 30. The heading of the aircraft was about 280 degrees. The nose wheel doors were open and the nose wheel was unlocked and was partially down. The nose wheel door trailing edges had scraped on the runway surface indicating that the nose gear doors opened as the aircraft came to a stop. The main

gear/.....

gear doors were closed and the main landing gears both body and wing were up. The belly of the aircraft, the inboard trailing edge flaps and the two inboard engines had scraped on the runway from the point of touch down. The aircraft and the two engines sustained major damage due to friction on the runway (See Appendix "B" for damage and Appendix "J" for location. Also see photographs at Appendices "K1" "K2" "K3" "K4").

13.2. After the accident 50,000 Kgs of fuel were defuelled from the aircraft.

13.3. The aircraft was jacked up, and prior to lowering the landing gear, it was established that the landing gear warning system was serviceable. The gear was then lowered and the aircraft was towed off the runway. The recovery of the aircraft was accomplished by a team of P.I.A Engineers, and the runway was cleared by 1830 hours on 8th February, 1986.

14. FIRE

14.1. When the aircraft came to a stop, the Flight Engineer, on getting a fire warning on the engines, pulled the fire handles and fired the engine fire extinguisher shots. This action and the prompt action by the Crash Fire Rescue Services extinguished the fires in the No.2 and No.3 engines. Due to the friction heat minor fires fed by engine oil and residual fuel had occurred in the two inboard engines. Fortunately no fuel leak occurred. The action by the Crash Fire Rescue Services was commendable, their prompt arrival at the scene and their subsequent fire fighting actions probably prevented an escalation of the fires which could have resulted in more serious problems of evacuation and in greater damage to the aircraft.

15. SURVIVAL ASPECTS

15.1. The accident was survivable and no high "G" forces were involved, and the fires occurring in the No.2 and No.3 engines were promptly extinguished through actions of the Flight Engineer and the Crash Fire Rescue personnel.

15.2. In/.....

15.2. In the absence of contact with the cockpit, the Customer Service Officer rightly initiated the evacuation. Slides at doors R1,2,4,5 and L1,2,4,5 were deployed. The slide at L5 adopted an "L" shape and was not used for evacuation. Slides at R3 and L3, which are overwing slides were not deployed because of the fires on No.2 and No.3 engines.

15.3. The passengers carried their carry on baggage with them in most cases, and tossed these items out on the slides ahead of them or carried them, whilst using the slides. In the process of evacuation, after 25 passengers had evacuated via slide R5, the slide was punctured and its use was discontinued. The remaining three or four passengers in this section were redirected to door R4 by the Flight Steward manning door R5. The cause of puncture of slide R5 was not determined, but was probably caused by a piece of luggage carried by or thrown onto the slide by a passenger.

15.4. The evacuation was an unplanned one and it is estimated that the total time for evacuation of all 248 passengers and 14 cabin crew was from 1½ to 19 minutes. The Flight Crew delayed in evacuating the aircraft by about 10 mts, after all other persons had evacuated.

16. TEST & RESEARCH

16.1. Nil.

17. OBSERVATION

17.1. It was observed that the operation at Islamabad is a single runway operation, and as a result of this accident the operation of the airport was brought to a stand still until partial operations were restored by use of the unused secondary runway after hurried cleaning. It is considered that single runway operations at airports will always result in closure of the operations in the event of wreckage blocking the runway. Serious consideration needs to be given to providing secondary runway at airports operating single runways, specially in the case of International Airports.

17.2. The/.....

17.2. The aircraft recovery operation by the PIA engineering team is praiseworthy. It was accomplished entirely by P.I.A personnel using, mainly, the recovery equipment held by them, with the addition of two special jacks obtained from Bombay and flown in to Karachi and then to a nearby airfield from whence all recovery equipment was transported by road to Islamabad Airport. The recovery was successfully accomplished within a period of $4\frac{1}{2}$ days from the time of the accident. It should be remembered, however, that the aircraft was resting on the hard surface of the runway, that weather was favourable, that the aircraft was in one piece, and that the landing gear was in a condition allowing its lowering and the subsequent towing of the aircraft. It is considered that it would be wise for P.I.A in co-operation with other airlines operating through Pakistan airports to review the need for obtaining, storing and maintaining recovery equipment. The C.A.A. Pakistan could obtain, store and maintain the medical equipment and the control and other vehicles required for rescue purposes in the event of a large airliner crash. (For the purposes of planning reference may be made to the following which are attached as Appendices "L" 1,2,3,4,5,6)

17.2.1. Equipment recommended by Mr. Stanton, ICAO Consultant.

17.2.2. Equipment recommended in ICAO Manual Doc.9137-AN/898 Pt.V.

17.2.3. Equipment available at New York.

17.2.4. Equipment (Airline Pool) available at Bombay.

17.2.5. Equipment available at Hong Kong.

17.2.6. Equipment available with P.I.A.C.

17.3. It was observed that the diagrams available in the Cabin Crew Manual were too small and therefore inadequate for refreshing memories concerning location of equipment. This was brought to the notice of Chief Pilot Safety alongwith copies of diagrams from manuals of another Airline.

18. INVESTIGATION

18.1. The landing accident to P.I.A Boeing 747 AP-AYW occurred at Islamabad International Airport on runway 30 on 4th February, 1986 at 0840 hrs P.S.T. The report of the

accident was received by 0900 hours giving initial information. The Investigators from Karachi reached the scene of accident at 1600 hours P.S.T. They were joined by Wing Commander Zaidi, President Accident Investigation Board, P.A.F. who had been appointed as an investigator to assist in the investigation.

- 18.2. Immediately after the accident occurred, Mr. Taj Mohammad the Senior Airworthiness Surveyor, C.A.A Islamabad, after checking the cockpit and noting positions of levers and switches, sealed the cockpit. He also arranged for photographs to be taken of the scene of accident, and prepared a rough wreckage trail diagram. These were handed over to the Investigator Incharge on his arrival.
- 18.3. Prior to his departure from Karachi the investigator-in-Charge permitted defuelling of the aircraft fuel tanks, and the removal of passenger baggage and cargo under the supervision of the Senior Airworthiness Surveyor, C.A.A Islamabad. At the time of arrival of the Investigators at the scene of accident, the baggage and cargo had already been removed, and defuelling operations were still in progress. These defuelling operations were completed by about 1500 hours P.S.T on 5th February, 1986. A total of 50,000 Kgs of fuel were removed from the aircraft fuel tanks.
- 18.4. Examination of the cockpit. The investigators examined the cockpit, and noted the following relevant facts: -
 - 18.4.1. The landing gear selector handle was in the "DOWN" position.
 - 18.4.2. The landing lights switch was "ON".
 - 18.4.3. The flap lever was fully down.
 - 18.4.4. The fire handles were "IN".
 - 18.4.5. The Auto Pilot Mode Selector switch was in the "Auto Land" position.
 - 18.4.6. All Auto Pilot levers were in the off position.
 - 18.4.7. All circuit breakers were noted to be in the "IN" position except those that are permanently disabled by a collar. It was specifically noted that the GPWS and the Aural Warn circuit breakers were in the "IN" position.
 - 18.4.8. The battery switch was in "OFF" position. At this time the Investigator-in-Charge permitted the battery to be disconnected.

18.4.9. It/.....

- 18.4.9. It was noted that in general the cockpit condition was such as to suggest that a normal shut down procedure had been accomplished by the Flight Crew before they left the cockpit.
- 18.1.10. The cockpit was resealed and orders passed that no one was to enter the cockpit without the permission of the Investigator-in-Charge.
- 18.5. At this time the Cockpit Voice Recorder (C.V.R.) and the Digital Flight Data Recorder (D.F.D.R.) were removed from the aircraft and taken into custody by the Investigators. The P.I.A were permitted to remove the catering items.
- 18.6. Examination of Wreckage. The investigators examined the wreckage and noted the following:-
 - 18.6.1. The aircraft Boeing 747 AP-AYW was on the main runway with its nose pointing approximately 20 degrees to the left of the runway heading i.e. on a heading of 280 degrees. The aircraft was resting on its belly, the two inboard engines, and the inboard flaps. The No.4 engine fan cowl was also touching the runway surface. The No.1 engine appeared to be undamaged and was clear of the runway surface. The aircraft was essentially complete, except for those portions of the two inboard engines and the inboard flaps which had either been rubbed away by friction or broken off during the skid of the aircraft down the runway. The nose of the aircraft was located at a point on the runway 7000 feet from the threshold of runway 30. (See Appendix "J" for location).
 - 18.6.2. The nose wheel doors were fully open and clear of the runway surface by a few inches. The rear corners of both nose wheel doors exhibited rub marks caused when these contacted the runway surface. Scrape marks on the runway surface just to the rear of the nose gear doors about a foot long indicated that the doors had contacted the surface moments before the aircraft came to rest. The nose gear was unlocked and had dropped down partially till the wheel tyres contacted

the runway surface. The nose wheel had not rolled as indicated by the marks on the tyres made by the nose wheel brake after the landing gear had been retracted after take off from Karachi. The foregoing conditions are indicative that the nose gear doors, opened, and the nose gear partially lowered just a moment prior to the aircraft coming to rest. It was later confirmed by statements made by the Flight Crew that the landing gear lever which was found to be in the "OFF" position was selected "DOWN" by the Co-pilot on the command of the Captain at a stage when the aircraft was coming to rest. (See Appendix "K1" for a view of the nose landing gear position as found after the accident.

- 18.6.3. The main landing gear doors were noted to be fully up with no indications of any kind that they were not in this position at touch down. This position of the doors is indicative that the main landing gears were up and locked, since the opening sequence requires the doors to be opened before the gears are unlocked.
- 18.6.4. The No.4 engine fan cowl was just touching the runway surface. Marks found on the runway surface indicated that this engine touched the ground about 150 feet from its final resting place. The slightly curving mark leading to the engine indicates that the engine contacted the runway surface while the aircraft was changing direction to the left just prior to its coming to a stop.
- 18.6.5. Both the inboard engines were examined. They had been severely damaged by heavy friction resulting from their skidding on the concrete runway surface, and from breaking of fan blades and turbine blades during this period. It was apparent that both these engines had been subjected to excessive frictional heat as the result of the skid after touch down. It was obvious from the condition of both these engines that there had probably been some fire on these engines when the aircraft came to rest. However there were no signs of extensive fires, and no fuel leaks were evident. It was concluded that fires if any were minor and were fed by residual fuel and sparks, or possibly flames from the burner section since the engines were operating at the time of touch-down (See Appendix "B" Initial damage report by PIA and App."C" Boeing Team damage survey report).

18.6.6. The/....

- 18.6.6. The trailing edge flaps were noted to be in the fully down position. The inboard flaps were ground away partially as a result of the friction with the runway during the skid after touch down. A number of turbine and compressor blades were noted to be imbedded in the lower surface of the trailing edge flaps. It was fortunate that none of the blades struck the undersurface of the wing and penetrated a fuel tank, or the outcome of this accident could have been more serious.
- 18.6.7. During the examination of the wreckage, it was noted that the evacuation slides at doors L1,2,4,5 and R1,2,4,5 had been deployed. it was further noted that the slide at door L5 had not deployed properly and had adopted an "L" shape. The slide at door R5 was noted to be deflated.
- 18.6.8. At this stage the P.I.A recovery team was given clearance to commence the lifting operation with the proviso that after the aircraft was lifted and on jacks, the gear would not be lowered till the investigators had inspected the under surface of the aircraft and had checked the landing gear warning system.
- 18.6.9. On 8th February, 1986 after the aircraft had been jacked up in preparation for lowering the Main Landing Gear, the investigators, assisted by Mr. Baber P.I.A Chief Engineer Maintenance, who was incharge of recovery, checked the serviceability of all the landing gear warning systems and found them to be operating normally. This was with the exception of the Ground Proximity Warning System which is activated by radio altimeters, since the radio altimeter antenna which are located under the belly of the aircraft had been destroyed during the landing.
- 18.6.10. After the aircraft had been jacked up the under surface was examined. It was noted that the lower surface of the aircraft body had sustained extensive friction damage. The landing gear doors were in the fully up position, and the main landing gear doors were prised open, and the main wing gears were unlocked; and after they dropped, they were manually forced into the down and locked position. The aircraft was subsequently towed off the runway in this configuration. The recovery to the designated parking position was completed by the P.I.A team at 0830 hours P.S.T on 8th February, 1986.

18.7. Examination of Ground Marks. The investigators examined the ground marks made by the aircraft during its landing on runway 30 Islamabad International Airport and noted the following:-

- 18.7.1. The first mark made by the aircraft during its landing was a metallic mark on the center line of the runway starting at a point 1610 feet beyond the threshold of runway 30. This mark continued upto the place where the aircraft came to a stop, and remained on the center line of the runway. This mark was identified as having been made by the under surface of the fuselage.
- 18.7.2. The next mark was to the right of the center line of the runway commencing at a point 1675 feet from the threshold runway 30. This mark was identified as having been made by the inboard starboard flap. Traces of this mark continued upto the point where the aircraft came to a stop.
- 18.7.3. To the left of the center line of the runway a metallic mark commenced at 1720 feet from the threshold of runway 30. Traces were continuous upto the point where the aircraft stopped on the runway. This mark was identified as having been made by the port inboard flap.
- 18.7.4. At 1760 feet from the threshold of runway 30 there was a mark made by the No.3 engine contacting the runway surface. This mark was superimposed on the mark made by the starboard inboard flap and was continuous upto the point where the aircraft came to a stop.
- 18.7.5. At a point 2,000 feet from the threshold of runway 30 the first contact mark made by the No.2 engine was superimposed on the marks made by the port inboard flap. This mark was continuous upto the point where the aircraft came to a stop.
- 18.7.6. At a point about 6750 feet from the threshold of runway 30 there was a curving continuous mark to the right of the mark made by the No.3 engine. The curve was towards the left and was traced to the No.4 engine. It was obvious

that/....

that this mark was made by the No.4 engine when it contacted the surface at the time that the aircraft swung through about 20 degrees just before it came to a stop.

18.7.7. Two thin scrape marks about a foot long were noted just aft of the rear edges of the nose gear doors which were found open. The scrape indications on the lower rear corners of the nose gear doors and the positions of the scrape marks observed on the runway surface relative to the open nose gear doors, made it obvious that these marks were made by the nose gear doors when they were lowered just as the aircraft was coming to a stop. This conclusion has been corroborated by the statements made by the Flight Crew concerning the down selection of the landing gear selector handle.

18.7.8. As the aircraft skidded down the runway on its belly, inboard flaps and inboard engines, pieces of the inboard flaps, under belly and the inboard engines were strewn along the runway all the way to the point where the aircraft came to rest (See Appendix "J".)

18.7.9. The only conclusion that could be arrived at from the foregoing examination of ground marks is that Boeing 747 AP-AYW touched down with all its landing gears fully up. This conclusion has been corroborated by reliable eye witnesses who observed the aircraft touch down on the runway with all landing gears fully retracted.

18.8. Witnesses. During the investigation statements of 43 witnesses were recorded. A list of Witnesses is at App. "M" and statements are at "N1" to "N43". Witnesses comprised flight and cabin crew, persons who observed or participated in the event, persons having specialist knowledge about the crew and passengers, and witnesses having responsibility for management, training, operating procedures and checking proficiency.

18.9. The relevant points brought out by the witnesses were as follows -

18.9.1. The landing gear was not selected down during the approach for the landing.

18.9.2. The Flight Crew became aware that the landing gear had not been selected down, only after the aircraft had landed.

18.9.3. The landing gear lever was in the "OFF" position. It was selected to the down position shortly before the aircraft came to a stop.

18.9.4. The/....

- 18.9.4. The aircraft was observed by witnesses on the ground approaching runway 30 at Islamabad Airport with all landing gears fully retracted, gear doors closed and flaps fully down. The aircraft was observed to touch down in this configuration.
- 18.9.5. Witnesses observed sparks and smoke from the aircraft as it skidded down the runway after touch down.
- 18.9.6. The A.T.C. transmitted to the aircraft after it had touched down and whilst it was skidding "Your left main wheels seem on Fire". This call was acknowledged.
- 18.9.7. Prior to take off from Karachi the Captain did not conduct a briefing of his crew. (This is a requirement of the P.I.A. Standard Operating procedures for the B-747).
- 18.9.8. No pre-landing briefing was conducted by the Captain (This is a requirement specified in the P.I.A Standard Operating Procedures (S.O.Ps) for the B-747).
- 18.9.9. The Captain did not call for the landing gear down.
- 18.9.10. The Flight Engineer commenced reading the landing check list before the check list was called for by the Capt. (This action is contrary to the S.O.Ps which specify that the Capt. will call for the final landing check list after the landing gear is lowered).
- 18.9.11. After the aircraft contacted Islamabad Radar, the aircraft was radar vectored for an approach to land on runway 30 at Islamabad Airport.
- 18.9.12. The auto throttles were inoperative.
- 18.9.13. The auto pilots were selected by the Captain for the triple autoland just short of the Outer Marker with the intention to check the system.
- 18.9.14. Prior to engaging auto pilots "B" and "C" (Auto Pilot "A" already engaged) for triple land, the pilot selected "Land Mode". At this time the Flight Engineer set the electrical panel as required. He stated that he did this on his own initiative without any command from the Captain. (The C.V.R. believes this statement since the Captain announced that he was selecting the auto-pilots).

18.9.15. On/...

- 18.9.15. On Glide Slope capture auto pilot "C" engaged lever dropped to "OFF". Differences exist in the statement of the Captain and the co-pilot concerning the colour of the accompanying auto pilot light. The Captain stated that it was accompanied by an amber light and not a red light, whereas the Co-pilot stated that it was accompanied by a flashing red light and the wailer.
- 18.9.16. After auto pilot "C" lever dropped to "OFF", auto pilot "B" light illuminated steady red. (A steady red light will only illuminate in single, or dual auto pilot operation. When auto pilot "C" lever tripped to "OFF", the auto pilots were operating in dual mode, thus a red steady light. This light is not accompanied by a wailer).
- 18.9.17. The Flight Engineer stated that he recycled the Aural Warn C/B, when the Capt. commanded him to pull the C/B. He stated that he advised the Capt. to disconnect the auto pilot. The Captain stated that he never asked for the C/B to be pulled. (The C.V.R read out confirms that the Captain called for the C/B to be pulled. From the read out, at no time did the Flight Engineer advise the Captain to disconnect the auto pilot. It was also noted that from this point till just after touch down, the landing gear warning horn was silent).
- 18.9.18. Both the Captain and the Co-pilot pressed the auto pilot warning light to reset the light and stop the wailer. (Since the lights extinguished and the Aural Warn C/B controls the horn but not the lights, it is probable that the action of the Captain and Co-pilot extinguished the lights).
- 18.9.19. The Captain called 1000 feet, and the Co-pilot replied 1000 feet. (In accordance with the SOPs this call is to be initiated by the Co-pilot and should be "1000 feet instruments cross checked" and this call will indicate: Final landing checks completed, landing clearance obtained and no instrument failures. Captain confirms by calling "Instruments Checked").
- 18.9.20. Neither the Captain nor the Co-pilot were aware of the implications of the 1000 feet call.
- 18.9.21. The G.P.W.S actuated at about 500 feet above airfield level with a Pull Up light and the aural warning PULL UP -PULL UP. All three crew members stated that they checked rate of descent and on G/S. The Capt. called for the circuit breaker to be pulled.

The/.....

The circuit breaker was pulled, and no member of the flight crew checked the landing gear position. (This failure indicates a lack of understanding by the flight crew of the functioning modes of the G.P.W.S).

- 18.9.22. Only the Flight Engineer recalls hearing the landing gear warning horn during the initial descent. He stated that he heard it a number of times and silenced it with the button. (This is confirmed by the C.V.R read out).
- 18.9.23. The Captain and First Officer do not recall having heard the landing gear horn at any stage of the flight including the landing till shut down. The Flight Engineer stated that he heard a number of horns, bells and chimes after touch down but due to preoccupation was unable to specifically identify these sounds. (The C.V.R confirms that at or just after touch down the landing gear horn sounded for five seconds and went off. It came on moments later with the fire bells and other sounds and continued till the battery was switched off).
- 18.9.24. The Customer Service Officer, who was stationed at Door "L5", observed smoke and flame through "L5" and "R5" window during the landing & alerted the crew. When the a/c stopped he attempted to contact the cockpit and when he received no reply he initiated the evacuation.
- 18.9.25. All slides except the Overwing Slides and the upper deck slide were deployed. Slide "L5" adopted an "L" shape and was not used. Slide at "R5" deflated after about twenty five passengers had used it. The remaining three passengers were directed to door "R4".
- 18.9.26. All passengers and cabin crew evacuated the aircraft within a period variously estimated at 1½ to 10 minutes. The Flight Crew were the last to evacuate via slide "L1" about ten minutes after the others, after a C.A.A Fire Leader went upto the cockpit and asked them to leave the aircraft. The Flight Engineer was the last to leave the cockpit.
- 18.9.27. The Crash Fire Rescue Crews reacted whilst the aircraft was sliding on the runway and reached the aircraft almost immediately when it stopped.

18.9.28. The/.....

- 18.9.28. The fire fighters quickly controlled the small fires on both the inboard engines.
- 18.9.29. Fires on the inboard engines were minor.
- 18.9.30. One passenger Mr. Duraiz a PIA employee travelling on the aircraft sustained a fracture of the lower end of the right radius with dislocation of the right wrist joint. Two other passengers sustained contusion of the right ankle with no bone injury. These injuries were sustained during evacuation.
- 18.9.31. Except for the injuries described at 18.9.30 no other occupants of the aircraft sustained any serious injury other than minor friction burns and bruises.
- 18.9.32. No injuries were sustained by any other person/persons as a result of the accident.
- 18.9.33. Witnesses varied on their opinion concerning whether Captain Siraj Ali always followed the procedures, from "Yes he always followed the procedures" to "He had to be reminded to follow procedures on occasion".
- 18.9.34. Witnesses were divided in their opinion as to whether Captains they had flown with always followed the Standard Operating Procedures, from "Always" to "Some did not".
- 18.9.35. All aircrew and management witnesses were of the opinion that the Standard Operating Procedures of PIA were adequate.
- 18.9.36. Of the management witnesses most were of the opinion that the proficiency, and other checks, were adequate some felt that more checks needed to be done.
- 18.9.37. The specialist medical witness was of the opinion that blood tests were not valid because of the delay in obtaining samples from the Flight Crew.
- 18.9.38. Most management witnesses were of the view that the failures by the crew to follow procedures and the break down of cockpit discipline which resulted in the accident was an isolated case involving the particular flight crew.

18.9.39. All.....

- 18.9.39. All aircrew witnesses other than the flight crew involved in the accident denied ever pulling the Aural Warn C/B.
- 18.9.40. Dr.Sh.Sirajul Haque Medical Officer Incharge, Crew Medical Centre, Rawalpindi was advised at 1115 hrs to examine the crew who operated the accident flight. He found no abnormality in the Capt.or Co-pilot. The Flight Engineer was not readily available and was not medically examined.
- 18.9.41. Dr.Sh.Sirajul Haque obtained blood samples from the Capt.and Co-pilot between 1230 and 1245 p.m. The blood sample of the F/E was collected at 1615 hours.
- 18.10. Documents. Documents relating to the aircraft, flight crew, weather, the ATC/Radar, the Standard Operating Procedures, the flight and the airfield were examined. Information obtained from these documents are included in this report at paras 1,2,8 and 11.
- 18.11. It was noted that a number of write ups on unserviceability of the auto-pilots had been recorded recently. However, it is the opinion of the investigators that the auto pilot warning during the approach was not a cause of the accident. The crew failed to follow the laid down procedures, and employed non-standard procedures resulting in disablement of the landing gear warning system, and this contributed to the accident.
- 18.12. The ATC and Radar radio channel tapes were checked and the transcripts (Appendices "F" & "G") were checked for accuracy and content. Contents of A.T.C and Radar radio transmissions were also confirmed by transmissions recorded by the aircraft cockpit Voice Recorder (Appendix "H").
- 18.13. The Cockpit Voice Recorder(C.V.R) tape was read out with assistance from the National Transportation Safety Board of the U.S.A at their Laboratory in Washington D.C., and copies of the tape were made. Capt.Shaukat Khan one of the investigators appointed to investigate the accident to B-747 AP-AYW at Islamabad on 4th Feb.1986, made a transcript of the relevant portion of the C.V.R tape using equipment provided by the N.T.S.B at their laboratory. On the return of Capt.Shaukat Khan considerable time and effort was put into listening to the C.V.R tape by all members of the investigation team. Various play back equipment were

employed for the purpose, including equipment available with the Shalimar Recording Company. The transcript originally prepared by Captain Shaukat Khan in U.S.A was verified and purified so as to provide the best possible transcript. Some difficulties were encountered in reading out the inter crew cockpit conversations because the crew had not switched off the cockpit loudspeaker prior to commencing descent, and were not using their microphones and head-sets as specified in Standard Operating Procedures for the Boeing 747, by P.I.A.

18.14. The read out of the C.V.R revealed the following: -

- 18.14.1. Standard Operating Procedures were not being followed.
- 18.14.2. The Captain did not call for the Landing Check List.
- 18.14.3. The Flight Engineer read out the first few items of the Landing Check List. This was done well before the time at which the Landing Gear should normally be lowered and is contrary to the S.O.P.
- 18.14.4. The Captain announced in urdu that the remaining two auto pilots were being engaged. This is contrary to the statement made by the Flight Engineer that the Captain engaged the three auto pilots after selecting "Land Mode" without informing him of his intention.
- 18.14.5. When the auto-pilot wailer sounded the Captain called for the Circuit Breaker to be pulled. There is no indication on the tape that the Flight Engineer advised the Captain to disconnect the auto-pilots as claimed by the Flight Engineer in his statement.
- 18.14.6. Immediately after the Command of the Captain to pull the circuit breaker, the wailer stopped.
- 18.14.7. It was noted that from this stage till just as the aircraft touched down, the Landing Gear Warning horn was totally silent. It was also noted that prior to this stage the Landing Gear Warning horn had sounded on a number of occasions and had been silenced.

- 18.14.8. At no stage during the approach for landing was there any command from the Captain to lower the landing gear. Nor were there any calls to the Captain from either the Flight Engineer or the Co-pilot advising that the Landing Gear had not been lowered.
- 18.14.9. When the Ground Proximity Warning System activated, the Captain called three times for the Circuit Breaker to be pulled. There is no indication on the C.V.R of any checks being done prior to the Captain's command for the Circuit Breaker to be pulled.
- 18.14.10. The Air Traffic Control whilst giving landing clearance asked for recheck of the gears down. The Co-pilot acknowledged the clearance, but did not confirm that the landing gear was down.
- 18.14.11. Shortly after the aircraft touched down the Flight Engineer announced that the landing gear was up.
- 18.14.12. A short while later the Captain noted that the landing gear was not down and commanded "select the gear down".
- 18.14.13. Just as the aircraft touched down, the gear warning horn sounded for five seconds, then went off. The horn came on again alongwith the fire bell and the sounds of the aircraft skidding on the runway. The landing gear horn continued from this stage till the C.V.R silenced. (Probably the battery was switched off during the shut down and evacuation action resulting in discontinuation of electric power to the recorder).
- 18.14.14. There was talk of fire handles and firing of extinguisher shots.
- 18.14.15. Sounds indicating that the evacuation drill was being carried out were recorded before the C.V.R tape ceased to record.
- 18.14.16. Communications from Radar and A.T.C with the aircraft were recorded on the C.V.R tape indicating that communications with the ground were normal.

- 18.15. The Digital Flight Data Recorder read out was accomplished at the National Transportation Safety Board laboratory in Washington D.C. U.S.A. Relevant points noted were that the landing gear was never lowered, the approach was unstable, and against a reference speed of 138 knots, the speed increased at one stage to 200 knots, the aircraft remained on glide slope, and the auto-pilots "A" and "B" were disengaged at 250 feet above airfield level.
- 18.16. Medical documents concerning the blood tests of the Flight Crew were checked. It was determined from the doctor, who obtained the samples from the involved crew, that these were obtained after a period of 4 to 8 hours had elapsed after the accident. The blood tests indicate normal conditions, however it has been determined that the tests are not valid for investigation purposes because of the delay involved in collecting the samples.

19.

DISCUSSION

- 19.1. Boeing 747 AP-AYW operating domestic scheduled flight PK-300 from Karachi to Islamabad, landed at 0842 P.S.T. on runway 30 at Islamabad International Airport with all its landing gears fully retracted. This landing with the gear up resulted from failure of the flight crew to lower the landing gear prior to landing.
- 19.2. The foregoing is in simple words a description of WHAT happened. In order to develop and recommend safety procedures aimed at preventing similar occurrences in the future, it has been the endeavour of the investigators to establish the HOW and the WHY for the flight crew failure, which resulted in this costly and but for good fortune, potentially

disastrous/.....

disastrous accident. Evidence from all available sources has been collected, and systems and procedures reviewed to this end.

- 19.3. To enable reviewing authority to better understand the reasoning and evidence used by the investigators in arriving at the findings and recommendations, it was considered necessary that an explanation in some detail needed to be made at this juncture of the report of procedures and systems involved in the events leading upto the accident.

19.3.1. Check list philosophy. Checklists are what their name implies, an aid to ensuring that all the necessary actions vital to a particular phase of flight have been accomplished. These checklists have been designed for the purpose described above, and are not do lists. Required actions are accomplished first and the checklists are used to ensure that no procedure has been overlooked by any of the flight crew responsible for the action. The P.I.A. Standard Operating Procedures for the Boeing 747 under the heading "General" page 1 paragraph 5 reads :

"5. All system checks if applicable and preparation for a particular phase will be carried out prior to reading of checklist. Upon completion of a particular checklist the crew reading the checklist will announce"..... CHECKLIST COMPLETE." Checklist will be carried out using the challenge and response method except for the after take off and landing check list."

19.3.2. Standard/....

- 19.3.2. **Standard Operating Procedures.** Paragraphs from the P.I.A Standard Operating Procedures B-747 that are considered to be relevant to the accident under investigation are reproduced for ease of reference :-

"GENERAL"

- "6. From the start of cockpit preparation until the completion of parking checklist, cockpit crew will not involve themselves in reading news papers, magazines, etc."
- "9. Head sets will be worn to monitor all conversation with ground agencies and ATC until top of climb, also when operating in high density traffic areas. Loud speakers may be used after the aircraft has stabilised in cruise until reaching top of descent. Thereafter, head sets must be worn until engine shut down. All H.F. monitoring will be carried out on head sets."
- "10. All configuration changes will be monitored by the flight engineer."

"COCKPIT PREPARATION"

"7. DEPARTURE BRIEFING

Prior to any departure the Captain will carry out departure briefing with the First Officer and Flight Engineer by reviewing ATC procedure for :-

- (a) Start up procedure.
- (b) The relevant VHF frequencies to be used.
- (c) Push back procedure.
- (d) The taxi out procedure to the runway in use.
- (e) The S.I.D procedure anticipated and the desired NDB, VOR and/or ILS frequencies to be used.

(f) The/

- (f) The noise abatement procedure if applicable.
- (g) The transition altitude.
- (h) The acceleration altitude.
- (j) The minimum safe altitude.
- (k) The radio failure procedure if non ICAO.
- (l) Any other pertinent procedure/s affecting departure(e.g.) weather conditions around the airport and runway conditions."

"8. For each originating flight or change of any crew member, captain will conduct the crew briefing and will also review the rejected take off items upto 80 knots and V1 to preclude any ambiguity as to the reasons for a rejected take off. For each take off Captain will announce to First Officer & Flight Engineer whether reduced or full power take off is to be conducted and flap setting for take off."

"DESCENT AND AREA ARRIVAL"

"3. Captain will carry out landing briefing with First Officer and Flight Engineer 10-15 minutes prior to commencing descent which should review :-

- (a) The weather conditions prevailing at the A/P of landing.
- (b) The relevant arrival procedure.
- (c) Missed Approach Procedure, and required fuel to alternate.
- (d) Runway length and taxi in procedure.
- (e) Minimum safe altitude.
- (f) The minimums of the type of approach to be carried out (If call outs during the instrument approach are to be made with reference to the pressure altimeter, Captain will specify the altitudes to be called out by the Flight Engineer. DH or MDA will be set by Capt. & First Officer during briefing).

(g) Terrain/....

- (g) Terrain conditions and restricted/prohibited areas around the approach and descent path.
- (h) Specific duties as dictated by the presence of any special weather phenomena.

NOTE:- In case of CAT II approach and landing Captain should carry out a detailed briefing so that each crew member understands his duties and functions."

"APPROACH GENERAL"

- "6. As a point of airmanship it should be remembered that during the arrival phase, manoeuvring should be carried out with flaps extended and airspeed decreasing at the appropriate distances and altitudes from 250 kts to 210 kts and then 170-160 kts till close to the outer marker or final approach fix."
- "7. The utmost attention should be given to good crew co-ordination during the approach phase of a flight regardless of the type of approach being conducted. The Captain must ensure that the landing briefing - as mentioned earlier - is completed and understood prior to the approach and landing."

"CREW CO-ORDINATION-APPROACH"

- "2. In addition to the above call outs, the First Officer will announce the following:-
 - (g) "1000' instruments cross checked."
When 1000' AAL. This call will indicate:
Final landing checks completed, landing clearance obtained and no instrument failures. Captain confirms by calling 'Instruments Checked'."

"I.L.S/...

"I.L.S. APPROACHES CAT-I"

- "5. When on vectors to the ILS inbound course the aircraft should be manoeuvred in the heading select mode until established on an intercept heading to the desired localiser track with flap at 20° and speed reduced to the flap 20° speed."
- "6. Lower landing gear at 1500' AAL (or as dictated by ATC approach procedure requirements). After gears are down and locked Flight Engineer will read out "LANDING CHECKS." Captain will call for landing flaps. Reduce speed to VREF + Wind correction(Max.20 kts) First Officer will set missed approach procedure heading and altitude and call 'MISSED APPROACH SET'"

19.4. At this stage it is relevant to review the progress of the flight as derived from the statements of the flight crew, the voice recorder and the D.F.D.R with reference to the S.O.P requirements indicated above :-

- 19.4.1. From crew statements and the read out of the Cockpit Voice Recorder it is obvious that the requirement for using head sets was never complied with and the Loud Speaker was being used during the descent and approach for landing.
- 19.4.2. From the statements made by the Flight Crew, it is evident that the Flight Engineer failed to monitor all configuration changes. Had he done so, it is more than probable he would have detected the fact that the landing gear was in the "up" position.
- 19.4.3. From the statement of the Flight crew it emerges that the Captain failed to carry out the required departure briefing prior to taking off from Karachi. Also the Captain failed to carry out the required landing briefing with his flight crew prior to commencing the descent. Since he intended practicing a

CAT-II approach procedure he was required to have carried out a detailed briefing of the crew.

- 19.4.4. From the Captain's own statement and those of the First Officer and Flight Engineer it is obvious that the aircraft was never at the correct speeds for a stabilised approach. From the D.F.D.R read out, at 1500' against approx: 143 knots, the speed was 200 knots, at 1000 feet it was 185 kts, at 500 feet the speed was 163 knots, at 100 feet it was 155 kts, and at touch down it was 143 knots, which was the target speed. In the conditions prevailing in relation to approach speeds the Captain should have discontinued the approach and made a missed approach.
- 19.4.5. The Captain initiated the 1000 feet call which is required to be initiated by the First Officer or pilot not flying. The first officer replied 1000 feet. From their statements, it is obvious that neither of these crew members appreciated the implications of this call. Had they done so it is more than probable that they would have discovered that the landing gear had not been selected "down".
- 19.4.6. The landing gear was not lowered at 1500 feet Above Airfield Level as required by the S.O.P., and as such the Captain failed to call for the "LANDING CHECKS" The F.C.O.M calls for landing gear to be lowered when at $1\frac{1}{2}$ dots below the glide slope whilst approaching the outer marker. Since the landing gear was never lowered, these differences in the procedure for lowering the landing gear do not appear to be a contributing cause for the failure. However the fact that the Flight Engineer read part of the "LANDING CHECKLIST" at a stage earlier than normal, accompanied by the sounding of the wailer possibly causing a distraction may have resulted in all flight crew members overlooking the landing gear at that stage.

19.4.7. It/.....

- 19.4.7. It is more than obvious from the foregoing facts that the Captain failed to follow Standard Operating Procedures, thus failing to ensure cockpit discipline. This is considered to be a major factor in causation of this accident.
- 19.4.8. Also evident from the foregoing and corroborated by some of the witnesses is the fact that not all Captains strictly adhere to and follow the Standard Procedures. Such a condition existing is an indication that the training and checking organisation of P.I.A Flight Operations is inadequate in their checks.
- 19.4.9. From the read out of the Cockpit Voice Recorder the investigators are of the opinion that during the descent and approach phase, the crew, mainly the Captain, were talking too much, thus causing distraction from the task of landing the aircraft. During the take off and climb phase, and the descent and approach phase for landing, cockpit talk should be limited to that required to correctly operate the aircraft. This though not stated as such in the S.O.P is implied in paragraphs quoted at para 19.3.2. preceding.
- 19.5. During the approach to land when approximately at a point where the landing gear should have been lowered and LANDING CHECKLIST accomplished, the auto pilot wailer sounded, and the warning lights illuminated. Both the Captain and the First Officer attempted to reset the light and silence the wailer by pressing the light. The wailer and lights did not go off immediately by this action so the Captain commanded "Pull the Circuit Breaker" He did not specify which circuit breaker he meant should be pulled, and later even after hearing the C.V.R tape was unable to specify which Circuit Breaker he meant but said he did not mean the Aural Warn C/B. The Flight Engineer stated that he recycled the Aural Warn C/B on the P-6 panel and the wailer ceased and the auto pilot warning lights went off. Whereas, pulling the

Aural/.....

Aural Warn C/B would deactivate the loudspeaker and thus the auto-pilot wailer, since the Aural Warn C/B does not control any cockpit lights except for the red landing gear warning light, the auto pilot lights should not have extinguished. Moreover if the Aural Warn C/B had been recycled as stated by the Flight Engineer, then the wailer should have restarted. It would not have restarted however if the flashing red light had been pressed by the Captain or First Officer. These two have stated that they pressed the auto pilot warning light, and it is therefore most probable that their action reset the lights and wailer, whilst the Flight Engineer was recycling the Aural Warn C/B. Notwithstanding how the wailer was silenced, the command by the Captain to pull the circuit breaker, and the action by the Flight Engineer was not a specified procedure. The correct procedure specified is to press the light to reset, or disconnect the auto-pilots with the button on the control column and take over manual control.

- 19.6. The activation of the auto pilot wailer approximately at a point where the landing gear should have been lowered caused a distraction which possibly caused the Captain and the rest of his flight crew to overlook the lowering of the landing gear in the normal sequence. However, had the Captain employed specified procedures for silencing the auto pilot warning, either pressing the associated warning light, or better still disconnecting the auto pilots by use of the button on the control wheel, the auto pilot warning would not have caused such a distraction. The engagement of auto pilots was not a necessity for the execution of a proper approach and landing. The weather was good and a manual approach could have been accomplished safely. If work load in the cockpit had increased because of the activation of the auto pilot wailer, then such work load was self induced by employment of non-standard procedures. The circular on auto pilot Cat-II approaches issued by P.I.A clearly requires the auto pilots to be disconnected by pressing the control wheel button and manual take over. The foregoing leads to a conclusion that the Captain, and also the Flight Engineer and First Officer displayed poor knowledge of the auto pilot system.

19.7. After/...

19.7. After the accident the Flight Crew were confused concerning the auto pilot warning lights that illuminated at the time when the auto-pilot wailer activated. The Captain stated on questioning that auto pilot "C" lever tripped to the "off" position, it could not be re-engaged, it was accompanied by a steady amber light. He also stated that immediately after auto pilot "C" tripped to "OFF" the auto pilot "B" steady red light came "ON" with auto pilot "B" lever still engaged, the steady red light was accompanied by the auto pilot wailer. The First Officer stated concerning the auto pilots "About the time of Glide Slope intercept Auto Pilot "C" tripped and the wailer sounded accompanied with the Auto Pilot red flashing light. I attempted to silence the wailer by pressing the light." Later on questioning, the First Officer confirmed "The red flashing light was of auto pilot "C" and red steady light was of auto pilot "B" The Flight Engineer stated "At glide slope capture auto pilot "C" lever dropped to off" and "soon after, auto pilot "B" steady red warning light illuminated, and the auto stabilizer "B" light was also illuminated, accompanied by the wailer." The Flight Engineer at no stage talked about auto pilot "C" light illuminating.

19.8. The investigators after studying the auto pilot system find that the observation of the auto pilot lights described by the First Officer is correct. A brief description of the auto pilot warning system follows:-

19.8.1. The auto pilot warning system on Boeing 747 AP-AYW consists of three auto pilot warning lights on the flight mode annunciator, plus an audio warning circuit which operates only upon auto pilot disconnection. The warning lights can flash red, light steady red, flash amber, or light steady amber. The meaning of a particular lamp indication is a function of the number of Auto Pilot channels engaged and type of malfunction.

19.8.2. A/....

- 19.8.2. A flashing red warning light is always accompanied by the auto pilot aural warning (wailer). It warns of total electrical and hydraulic disengagement of the auto pilot system. Flashing red lights may be reset by pressing the control wheel disconnect switch or by pushing the light cap.
- 19.8.3. There is no steady red light in triple auto pilot mode.
- 19.8.4. In triple auto pilot operation, if one auto pilot disengages, the system automatically transfers to Dual operation.
- 19.8.5. A flashing red light can occur in single, dual and triple operation. This indicates the auto pilot system concerned has been totally lost.
- 19.8.6. In dual auto pilot operation a steady red light indicated loss of applicable arm mode valids.
- 19.8.7. A flashing amber warning light warns that only one auto pilot channel is engaged in LAND mode above 150 feet.
- 19.9. From the foregoing it is obvious that the Flight Crew were not adequately conversant with the auto pilot warning system, and as such the Captain called for the C/B to be pulled, which action was accomplished by the Flight Engineer without questioning this non-standard procedure. Though the Flight Engineer stated that he recycled the Aural Warn Circuit Breaker, it was noted from the Cockpit Voice Recorder read out that the landing gear warning horn which had been operating normally upto this stage did not sound until the aircraft touched down. The action taken to silence the wailer disabled the landing gear warning system so that the crew were not given a warning that the landing gear was in fact not down.
- 19.10. Aural Warn Circuit Breaker. From the statements of the Flight Crew, corroborated by the Cockpit Voice Recorder read out, the Aural Warn C/B was pulled or recycled to silence the wailer. Whilst there are occasions in which the

Aural Warn C/B is to be pulled in flight, and these occasions are specified in the procedures in the Flight Crew Operating Manual for the aircraft, such procedures warn of the consequences of such action. Thus the Flight Crew are fully alert to the conditions existing and exercise greater care.

19.11. When the Aural Warn Circuit Breaker, which is located on the P-6 panel, is pulled it de-activates the following aural warnings and lights:-

- 19.11.1. Interrupted Horn for warning of cabin differential rise - cabin altitude rise or loss of pressurisation. Also warns of unsafe or abnormal take off conditions.
- 19.11.2. Continuous Horn - warns of Landing Gear abnormal conditions.
- 19.11.3. Continuous clacker - warning of an over speed condition.
- 19.11.4. Auto Pilot Wailer - warning of disengagement of Auto Pilot.
- 19.11.5. All chimes - SELCAL high/low chime, cabin to cockpit low chime.
- 19.11.6. Continuous Bell - warning of Fire or Smoke detection.
- 19.11.7. Red landing gear unsafe warning light. This is the only light controlled by the Aural Warning Circuit Breaker.

19.12. Experience worldwide of aircraft accidents has clearly demonstrated that humans are apt to forget. For this reason various warnings either visual or aural have been designed to remind the Flight Crew that they have failed to take necessary action or that some action is necessary in a particular area to ensure continued safety of the aircraft and passengers. Airline operation has developed Standard Operating Procedures and checklists for phases of flight, which if correctly followed will make the warning system only a back up system and not a primary system. In the accident under investigation evidence

indicates/.....

indicates that Standard Operating Procedures were not followed and this includes reading of the check list to ensure all necessary action had been taken. It is our opinion that in the accident under consideration, had the Flight Crew followed the S.O.Ps and checklist the accident would not have occurred even if the warning system had failed for any reason.

- 19.13. From the C.V.R read out it has been established that the landing gear warning system was working normally prior to the Captain's call for the Circuit Breaker to be pulled when the auto pilot wailer activated. From this point the landing gear warning horn did not sound till the aircraft touched down. Even at this stage the horn sounded for five seconds and stopped for a few seconds before sounding again continuously till the C.V.R stopped recording, presumably when the battery was shut off during the evacuation checklist conducted by the Flight Engineer. It is not possible for this horn or the fire bells to activate if the Aural Warn circuit breaker was out. Therefore it is considered that there were only two possibilities for failure of the horn during the approach and its coming on at the moment of landing. These are, firstly, that the Flight Engineer on realising that the gear was not down had pressed the Aural Warn Circuit Breaker "IN" thus restoring the warning functions, or secondly, that the Flight Engineer had indeed recycled the circuit breaker as stated by him, but for some reason full contact was not made when he pressed the C/B "IN", thus deactivating the warning systems, and on touch down the electrical contact was restored and the system was activated as designed. The first possibility is considered to be the more probable, though the second possibility cannot be entirely ruled out.

The/....

The foregoing does not detract from the action by the Flight Engineer to pull/recycle the Aural Warn C/B to silence the wailer. The action is not specified in the aircraft manuals except for emergency use, and it is obvious in view of the CVR recording that the action by the Flight Engineer disabled the Aural Warn System so that the Landing Gear warning failed to function as designed. It had been functioning properly prior to the action by the Flight Engineer.

- 19.14. Landing Check List. As is obvious from the statements of Flight Crew and from the read out of the Cockpit Voice Recorder the crew failed to follow the Standard Operating Procedures and in doing so failed to accomplish the "Landing Checklist". As stated earlier it is our opinion that had the Landing Checklist been accomplished as specified in the Standard Operating Procedures, the Flight Crew would have discovered the discrepancy of the landing gear not being down. The Flight Engineer's reading of the first three items of the check list which should have been after the gear was lowered, and additional actions taken to silence the wailer, resulted in a break of habit pattern, resulting in all crew members forgetting the remainder of the Landing Checklist. Thus perhaps in their minds they considered that the Landing Checklist had been fully accomplished, and that the landing gear had been selected down. Such errors have been recorded worldwide in accidents, where distraction has caused a break in habit pattern and has resulted in similar type occurrences. The absence of landing gear warning is a contributory factor resulting in failure of the crew to discover their error and correct it. The items of the Landing Checklist are as follows:-

B-747-NORMAL CHECKLIST

LANDING

Altimeters	SET & X-CHECKED	ALL
Auto-Brakes.....	AS DESIRED	C
Speed - Brakes.....	ARMED	C

Cabin/.....

Cabin Signs.....	ON	F/O
LANDING Gear.....	DOWN IN, GREEN LIGHT	C
Ignition.....	FLIGHT START	E/E
Flaps	GREEN LT/8 GREEN LIGHTS	ALL
Landing Lights	AS REQUIRED	C
Hydraulics	NORMAL	F/E
Fuel Heat Switches (AYV/AYW)	OFF	F/E
Landing Checklist	COMPLETE	F/E

19.15. Landing Gear Warning System. The landing gear warning system warns that the landing gear is "UP" or not fully down. The warnings are by a continuous horn through the loud speaker and by lights on the pilots forward panel and on the Flight Engineers panel. There are three lights on the pilots centre panel, one is a green light which illuminates when all landing gears are "down" and "locked"; a red light which illuminates when the landing gear doors are open with the landing gear not in the locked down condition; and, a red light for the Gear which illuminates when any gear is not locked down, or any thrust lever is brought to idle with the landing gear not locked down, or landing gears are in transit or not in agreement with the Landing Gear control lever selection, or when flaps are lowered to the landing range (25 or 30 degree position) with the landing gear not down and locked. Additionally there are fourteen lights on the Flight Engineers panel which have to be pressed before they illuminate. These lights are employed to check individual gear and door positions should a malfunction be indicated on the pilot's centre panel landing gear lights or when the landing gear aural warning horn sounds to indicate an anomaly. The Aural Warning Logic for the landing gear senses, one, any gear not down and locked as sensed by the Landing Gear primary or alternate logic circuits and any throttle is in the idle position, this causes the landing gear warning horn to blow steady, the horn can be silenced by pressing the horn silencing button on the centre pedestal, and, two, the Aural Warning Logic

senses/.....

senses any gear not down and locked with the flaps in the landing range and causes the warning horn to blow continuously regardless of throttle position, this horn cannot be silenced by the button on the centre pedestal. It will silence only when all landing gears are locked down. The procedures for pulling the aural warn circuit breaker in certain conditions to silence the warning horn are specified in the F.C.O.M. These conditions are whilst ditching, landing with partial landing gear, and cautions that other aural warnings will be deactivated by pulling the Circuit Breaker. Pulling of the aural warn circuit breaker in other circumstances is not specified as a procedure, and certainly not for silencing the auto pilot wailer as was done in this instance.

- 19.16. Ground Proximity Warning System(GPWS). The following is the description of the G.P.W.S from the Flight Instruments Supplementary Information section of the Boeing 747 Operations Manual:-

"GROUND PROXIMITY WARNING
SYSTEM (G.P.W.S)

CAUTION: THE GPWS MAY NOT BE
DEACTIVATED BY PULLING
THE CIRCUIT BREAKER
EXCEPT FOR APPROVED
PROCEDURES WHERE USE
OF FLAPS AT LESS THAN
NORMAL LANDING FLAP
POSITION OR LANDING
GEAR UP IS SPECIFIED.

The Ground Proximity Warning System alerts the flight crew when one or more of five thresholds is exceeded.

Mode 1 - Excessive descent rate

Mode 2 - Excessive terrain closure rate

Mode 3 - Altitude loss after take off or go-around.

Mode 4 - Unsafe terrain clearance while not in landing configuration.

Mode 5 - Below glide slope deviation alert.

Note:- The GPWS will not provide a warning if an airplane is flying directly towards a vertical cliff.

Inputs/.....

Inputs to the ground proximity computer are radio altitude, barometric altitude rate, glide slope deviations from the VHF navigation unit used by the Captain, and landing gear and flap positions.

Warning for modes 1 through 4 consists of a red PULL UP light and an aural warning "WHOOOP- WHOOOP - PULL -UP. Alerting for Mode 5 consists of an amber BELOW G/S light and an aural alert for Mode 5 in either soft or loud, as a function of radio altitude and below glide slope deviation. The rate at which "GLIDE SLOPE" is repeated increases as the airplane deviates farther from the glide slope, or flies closer to the ground.

Mode 1 through Mode 4 aural warnings have priority over Mode 5 aural alerting. The visual warning and alerting may occur at the same time. The warning and/or alert will continue until the condition/s are corrected.

The system is armed when all required inputs are valid and the airplane is flown into one or more of the five warning/alerting areas.

- 19.17. As will be noted from the foregoing description of the Ground Proximity Warning System the Captain's call for pulling the G.P.W.S circuit breaker and the Flight Engineers action to do so ignored the caution in the F.C.O.M. The Captain, the First Officer and the Flight Engineer on hearing the aural warning "Whoop-Whoop-Pull-Up" state that they checked rate of descent and on glideslope before pulling the G.P.W.S circuit breaker to deactivate the system. The Cockpit Voice Recorder read out revealed that moments after the G.P.W.S activated, the Captain commanded three times "Pull the Circuit Breaker" shortly after the third command the G.P.W.S warning ceased, when the Flight Engineer pulled the G.P.W.S circuit breaker. When the GPWS sounded a warning "Whoop-Whoop -Pull-Up" the flight crew, if they understood the system would have checked: rate of descent, and configuration, since they were not taking off,

since/....

since they could see the runway, and they were not receiving an aural alert signal for below glide slope deviation. The fact that not one of the three Flight Crew in the cockpit checked the configuration, indicates a general lack of understanding of the G.P.W.S. Had any one of the crew understood the functioning of the G.P.W.S the configuration would have been checked, and the problem discovered and corrected. Procedures to be followed are not specified in the F.C.O.M or in the SOPs in the event of a GPWS activation. The D.F.O P.I.A. considers that normal airmanship would have resulted in correct action by the Flight Crew and specific procedures being laid down were not necessary. He also brought to attention a letter written by the Chief Flight Inspector of the defunct Department of Civil Aviation in June 1983 to a senior pilot of P.I.A criticising the actions of the pilot in going round from the approach on getting a G.P.W.S. warning. This letter attached with the statement of the DFO is at Appendix "N36" of this report. The letter is in a different context since it criticises the go-around made on a G.P.W.S warning after a fault in the indicating system of the landing gear had been checked earlier and the status of the landing gear checked on the Flight Engineer panel and found to be locked down. Whilst not agreeing fully with the contents of the letter, in no way can it be implied that this was an instruction to the P.I.A to disregard G.P.W.S warnings. In the light of the circumstances of the accident under investigation it is considered that it would be wise for P.I.A Management to ensure adequate technical knowledge of their flight crews during proficiency and other checks, and also to insist that Flight Crew follow the G.P.W.S warning and then check the reasons. Had the Captain gone round on the GPWS warning, he would have discovered that his landing gear was not down, and would have made sure that the landing gear was down and locked on his next approach.

- 19.18. Aircrew of P.I.A normally follow the procedures specified by the manufacturers in their Flight Crew Operation Manual which is approved by the C.A.A. The Standard Operating Procedures of P.I.A are prepared from the F.C.O.M and, therefore, no changes should be effected without C.A.A approval. In this investigation it has been noted that whilst the F.C.O.M requires lowering of the landing gear $1\frac{1}{2}$ dots below the glide slope, the S.O.P specifies the gear to be lowered at 1500 feet, most of the flight crew questioned seem to be following the F.C.O.M procedures, therefore two things are evident, one, that the change had been effected in the S.O.P, arbitrarily, and secondly adequate steps were not taken to retrain and familiarize crew with new procedure. It should be emphasised on the Management that non-compliance with proper procedures is a safety hazard.
- 19.19. Proficiency and Standardisation Checks. It is evident from the foregoing discussion that the flight crew involved in the accident failed to follow standard operating procedures, and also exhibited an inadequate technical knowledge of the auto pilot system and the G.P.W.S. These factors are considered to be the main causes for this potentially disastrous accident. The Captain had undergone a proficiency check in January 1986 just one month before the accident, the Co-pilot had undergone an enroute check on 14th January, 1986 and had recently been upgraded to the Boeing 747 as Co-pilot after completing 25 hours under supervision, and Flight Engineer had completed his proficiency check just seven months before the accident. The Captain had a total flying experience of over 18000 hours with 4000 hours in command on the Boeing 747; the First Officer had a total flying experience of over 4000 hours and though he had only 48 hours experience on the B-747, had considerable experience as a Co-pilot on the Boeing 707; the Flight

Engineer/.....

Engineer had a total flying experience of nearly 13000 hrs with nearly 3000 hrs on the Boeing 747. With this experience level and the recency of checks the crew should have been upto date on Standard Operating Procedures and technical knowledge, the fact that they were not and the circumstances of this accident are indicative that the proficiency checks are inadequate. The views expressed by crew members interviewed, varied from "the proficiency checks and the S.O.Ps are adequate" to "there is a need for stricter checks to ensure S.O.Ps are followed." The investigators, despite the view by the Operations Management of P.I.A expressed in their statements that the accident was an isolated case of a crew failing, and that existing checks and S.O.Ps were adequate, do not agree with this view, and are of the considered opinion that the circumstances of the accident, and the fact that not all Captains strictly follow the S.O.Ps, indicates a weakness in the checks and controls by the management. The Operations Management must therefore bear some responsibility for the accident. It is considered that there is need for continuous and stricter checks by the Operations Management to ensure that all their flight crews strictly follow the Standard Operating Procedures, and that the crews are at all times adequately knowledgeable about the functions of their aircraft systems. There is also a need for increased checks by the C.A.A Inspectors to ensure that the checks conducted by the Airline are ensuring that correct procedures are being followed as well as adequate technical knowledge of aircraft system is maintained by the Flight Crew at all times. From the records there is a positive indication that P.I.A management has been resisting the C.A.A requirement for checks by the Chief Flight Inspector, C.A.A.

20.

FINDINGS

20.1. From the foregoing investigation and discussion based on the available evidence, the investigators find:-

- 20.1.1. Boeing 747-200 aircraft Registration AP-AYW owned by P.I.A, whilst operating scheduled domestic passenger flight PK-300 from Karachi to Islamabad on 4th February, 1986 landed on

runway 30 at Islamabad International Airport with all its landing gears fully retracted at about 0840 hrs P.S.T.

- 20.1.2. The flight crew failed to select the landing gear down prior to landing. There were no defects in the landing gear systems.
- 20.1.3. Boeing 747-200 AP-AYW sustained substantial damage as a result of the accident. *
- 20.1.4. Crash Fire and Rescue personnel reacted promptly and controlled the fires on the two inboard engines in a short time.
- 20.1.5. The C.S.O on observing smoke and sparks alerted the cabin crew whilst the aircraft was skidding down the runway, and on failing to obtain contact with the cockpit, initiated evacuation.
- 20.1.6. All 248 passengers and 14 cabin crew evacuated the aircraft via the escape slides in a short period. The Flight Crew evacuated the aircraft via the slide at door L-1 some ten minutes after all persons had evacuated.
- 20.1.7. During the evacuation one passenger, Mr.Duraiz a P.I.A Engineer sustained serious injury, suffering a fracture of the right radius and dislocation of the right wrist. Two passengers sustained minor injuries consisting of contusion of the right ankle with no bone injury.
- 20.1.8. The wreckage of B-747 AP-AYW blocked the runway at Islamabad International Airport till 1830 hours P.S.T on 8th February, 1986 at which time the P.I.A team of Engineers completed the recovery operation.
- 20.1.9. The accident resulted in damage to the runway lights and in loss of revenue to C.A.A due to closure of the Airport. (Details at Appendix "D").
- 20.1.10. Weather was not a factor in this accident.
- 20.1.11. No fuel leaks occurred and there was no major fire.
- 20.1.12. Boeing 747-200 aircraft Registration AP-AYW was properly certificated, equipped and maintained in accordance with the requirements of the Civil Aviation Rules 1978 and was serviceable and Airworthy for the flight.

20.1.13. There/....

- 20.1.13. There was no recent history of malfunctions or failures of the landing gear system, or its indicating and warning systems.
- 20.1.14. The flight crew members namely, Captain Siraj Ali, First Officer Ahsan A. Bilgrami, and Flight Engineer Arif Rabbani, had had adequate rest prior to reporting for duty, and were properly licenced, adequately experienced, qualified and medically fit to undertake the flight.
- 20.1.15. First Officer Ahsan A. Bilgrami was the least experienced of the crew on the B-747 aircraft, having only 48 hrs experience on this type. He has no command experience on civil airliners, however, in the Air Force he had flown high performance jet fighters, and has approximately 3000 hrs flying experience as a co-pilot on the F-27 and Boeing 707 with P.I.A.
- 20.1.16. All the above mentioned Flight Crew members had recently been checked for thier proficiency by Flight Instructor Check Pilots of P.I.A in compliance with the Civil Aviation Rules 1978 and ICAO Annex-6 requirements.
- 20.1.17. Captain Siraj Ali during the accident flight failed to follow the Standard Operating Procedures. He failed to conduct a pre-take off briefing, a briefing before landing, and failed to ensure that all crew were wearing head sets, and the cockpit loud speaker was off, as specified by the Standard Operating Procedures for the Boeing 747.
- 20.1.18. Captain Siraj Ali as pilot in command failed to ensure that the Landing Checklist was accomplished as required by SOPs for the B-747 and was thus in breach of Rule 272(4) of the Civil Aviation Rules 1978 which reads: "The pilot in command shall ensure that the flight check system is carried out in detail".
- 20.1.19. Captain Siraj Ali on getting an auto pilot warning wailer commanded that the circuit breaker be pulled. The Flight Engineer without advising the Capt pulled or recycled the Aural Warn, Circuit Breaker on the P-6 panel. They are both guilty of employing procedures that/....

X (2) that are not specified in the Aircraft Operating Manual, and are therefore in breach of Rule 251(9) which reads: "Each member of the operations personnel employed by an operator shall comply fully with all instructions relating to his duties contained in the operations manual".

(3)

20.1.20. Pulling or recycling of the Aural Warn, Circuit Breaker disabled the landing gear warning horn and the gear warning red light. The action was not a specified procedure and in the event resulted in the crew not obtaining a warning through the landing gear warning system.

20.1.21. The command by the Captain to pull the circuit breaker to silence the auto pilot wailer, and the subsequent action by the F/E indicates a lack of knowledge of procedures, and of technical knowledge of the auto pilot system.

20.1.22. Though the Captain was aware that his speed was too high, and should have realised that his approach was not stabilised, he failed to analyse the reason, or go around for another approach as required by S.O.Ps.

20.1.23. When the G.P.W.S warning activated, none of the crew checked the configuration of the aircraft, but were content with checking "On Glide Slope" and "rate of descent" prior to the GPWS circuit breaker being pulled by the Flight Engineer on the Captain's command. This action besides being a non specified procedure, cautioned against in the Boeing 747 Operations Manual, indicates a lack of technical knowledge of the G.P.W.S and its modes by the Flight Crew.

X (4)

20.1.24. After the G.P.W.S was silenced, and the approach continued, the Co-pilot, and also the Captain and Flight Engineer failed to check the gear down and locked, when asked by ATC to "Recheck Landing Gear" at the time of giving final clearance for landing.

20.1.25. The /.....

20.1.25. The crew were negligent in the operation of the aircraft by failing to follow S.O.Ps, failure to lower the landing gear, failure to read the Landing Checklist, and use of non-specified procedures in pulling circuit breakers, which disabled the warning systems. All three crew members are guilty of a breach of Rule 155(1) and Rule 251(9) of the Civil Aviation Rules 1978.

20.1.26. Not all crew members of P.I.A are strictly following the Standard Operating Procedures.

20.1.27. Checks and controls by the training and checking organisation in the form of proficiency checks, standardisation checks, and enroute checks are inadequate. In view of the recency of checks of the involved flight crew P.I.A Management share a responsibility for the accident.

21. CAUSE OF THE ACCIDENT

21.1. From the foregoing investigation and discussion of the evidence, the investigators, after considering all the available evidence, are of the opinion that the probable cause for the accident to Boeing 747 AP-AYW at Islamabad International Airport at about 0840 hours P.S.T on 4th February, 1986 was the disregard by the Flight Crew of Standard Operating Procedures, which resulted in their failure to lower the landing gear prior to landing, and their inadequate technical knowledge of the systems led them to adopt non-standard procedures, which resulted in deactivation of the landing gear warning system, and failure to appreciate the reason for the G.P.W.S activation, and thereby failure by the Flight Crew to discover that the landing gear had not been selected down till after they had landed. Contributing were the Captain's failure to maintain cockpit discipline, and inadequacy of P.I.A Operations Management proficiency and other checks to ensure that all their crews follow the

Standard/.....

Standard Operating Procedures, and also that the crews maintain an adequate technical knowledge of the functions of various systems for the safe operation of aircraft.

22. RECOMMENDATIONS

22.1. In view of the findings in this investigation and the observations by the investigators, the following recommendations are made:-

- ✓ 22.1.1. Disciplinary action under the Civil Aviation Rules 1978 be instituted against Captain Siraj Ali ALTP No.33 for operating the aircraft negligently, for failing to ensure that the flight check system was carried out in detail, and failure to follow the Standard Operating Procedures. Rules 155(1); 251(9); and 272(4) of Civil Aviation Rules 1978 are applicable.
- ✓ 22.1.2. Disciplinary action under the Civil Aviation Rules 1978 be instituted against First Officer Ahsan A.Bilgrami ALTP No.647 for his failure to follow the S.O.Ps and failure to ensure that the landing gear was down and locked prior to the landing. His failures amount to operating the aircraft negligently. Rule 155(1) and Rule 251(9) of the Civil Aviation Rules 1978 are applicable.
- ✓ 22.1.3. Disciplinary action under the Civil Aviation Rules 1978 be instituted against Flight Engineer Arif Rabbani holder of Flight Engineer Licence No.53 for his failure to follow S.O.Ps, and Flight Crew Operating Manual procedures, and for his failure to ensure that the landing gear was down and locked prior to the landing. He is guilty of negligent operation and Rule 155(1) and Rule 251(9) of the Civil Aviation Rules 1978 are applicable.
- 22.1.4. Crash Fire and Rescue personnel should be commended for their prompt action in reaching the aircraft and initiating fire fighting action thus preventing any escalation of the fires.

22.1.5. The/....

- 22.1.5. The Customer Service Officer and members of the cabin crew may be commended for the prompt action in evacuating the passengers.
- 22.1.6. In addition to checks conducted by P.I.A's training and checking organisation of Flight Crews proficiency and standardisation, the C.A.A Flight Inspectors should undertake yearly checks of all Flight Instructors, and a minimum of 25% of all other Flight Crew to ensure that standards are being maintained and procedures are being followed.
- 22.1.7. P.I.A's Training and recurrent training programme be reviewed to ensure that adequate flying and technical knowledge is imparted to the Flight Crew.
- 22.1.8. P.I.A Management must take proper steps to ensure adherence to S.O.Ps at all times and check that technical knowledge of aircrew is maintained.
- 22.1.9. Any changes in S.O.Ps that vary from procedures specified in the F.C.O.M must be approved by C.A.A prior to issue.
- 22.1.10. Flight Crew employed as Co-pilots on wide body aircraft of P.I.A must have had adequate experience in command on other equipment of P.I.A.
- 22.1.11. C.F.I of the C.A.A to maintain a strict surveillance on the P.I.A Training and Recurrent Training programmes to ensure that they are adequate.
- 22.1.12. Procedures be instituted by P.I.A Operations specifying that in the event of G.P.W.S warnings being triggered during the approach for landing it must be complied with and properly analysed before action is taken to deactivate it.
- 22.1.13. P.I.A Flight Crew must be cautioned against adopting procedures that are not specified in the Flight Manual.
- 22.1.14. A.T.C/....

- 22.1.14. A.T.C must ensure confirmation that the landing gear is down and locked when clearing aircraft for landing. (Applicable to Pakistan only). The landing clearance for aircraft on instrument approach should be given when the aircraft is established on the final approach.
- 22.1.15. Chief of Aviation Medicine, C.A.A to ensure that Flight Surgeons/Doctors are immediately instructed that in the event of an accident, blood and urine samples of Flight Crew involved is to be collected without undue delay.
- 22.1.16. Consideration be given by the authorities for the provision of a second runway at all International/Major airports in the country.
- 22.1.17. P.I.A in co-ordination with other airlines operating through Pakistan should review its requirements for obtaining, storing and maintaining recovery equipment in Pakistan to facilitate early recovery of crashed aircraft. Reference for this purpose may be made to Appendices L1 to 6 of this report.
- 22.1.18. C.A.A Pakistan should obtain, store and maintain medical equipment, and control and other specialist vehicles that would be required for rescue purposes in the event of a large airliner accident. Reference Appendices L1 to 6.
- 22.1.19. C.A.A recover from P.I.A the costs, for the repair of damage to the runway, and the loss of revenue resulting from the the accident. (Appendix "D").







