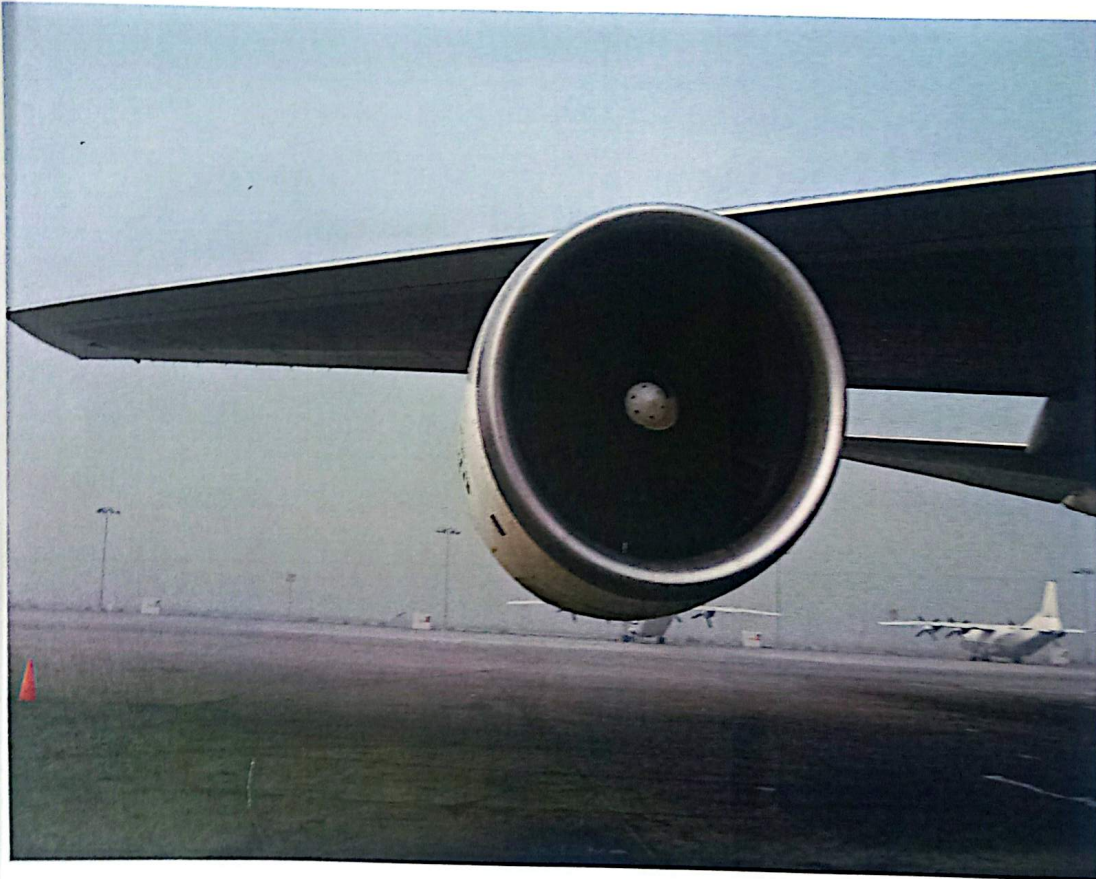




PAKISTAN CIVIL AVIATION AUTHORITY
(SAFETY & INVESTIGATION BOARD)



**SERIOUS INCIDENT TO M/S PIAC, AIRCRAFT
FLIGHT # PK-2226, B-747 , REG. # AP-BFY ON 23 NOV 2011
AT ALLAMA IQBAL INTERNATIONAL AIRPORT, LAHORE**

**INVESTIGATION REPORT INTO SERIOUS INCIDENT TO M/S PIAC, PK-2226,
B-747 AIRCRAFT, REG. NO. AP-BFY AT ALLAP, LAHORE ON 23 NOVEMBER 2011**

SYNOPSIS: On 23 November 2011, M/s. PIAC Flight No. PK-2226, Aircraft B-747, Reg. No. AP-BFY was scheduled from JED to Sialkot. Due to Sialkot visibility 250 meters, the flight diverted to AllAP Lahore and landed RWY-36R at time 0558 hrs local time (0058 UTC). There was no abnormality observed by any cockpit crew during landing. At AllAP, Lahore, during routine aircraft inspection PIAC Flight Safety Officer informed the Duty Manager Airside at 0630 hrs approximately, that the No. 4 Engine Pod has been found damaged. During runway inspection marks of scratches on right side of centre line Runway 36R abeam PAPI were observed, and Touchdown Zone Light No. 78 was found damaged.

The investigation was ordered by the Director General Civil Aviation Authority vide Memorandum No. HQCAA/1901/345/SIB/4026 dated 25 November 2011.

1. FACTUAL INFORMATION

1.1 History of the Flight : Scheduled Flight from JED – SKT. Diverted to AllAP Lahore

1.2 Injuries to Persons: No injury to any crew member or occupant was reported.

1.3 Damage to Aircraft: # 4 Engine Pod lower mid section dented / scratched with oil leakage, and right body gear rear tire deflated.

1.4 Personnel information

1.4.1 Capt. Khalid Karim Rizvi : Pilot in command and Pilot Flying

1.4.1.1 Total Flying Experience : 15500 hrs

1.4.1.2 Flying Hours on B-747 : 04600 hrs

1.4.1.3 As Captain on B-747 : 02000 hrs

1.4.2 F/O. Ikram-ul-Karim : First Officer and Pilot Monitoring

1.4.2.1 Total Flying Experience : 2800 hrs

1.4.2.2 Flying Experience as FO on B-747 : 1000 hrs

1.4.3 F/E Syed Athar Yazdani : Flight Engineer

1.5 Aircraft Information

1.5.1 Aircraft make/model : B-747-300

1.5.2 Aircraft Registration : AP-BFY

1.6 Meteorological Information: The weather reported at destination Sialkot was Vis 250 meters. Weather reported at Alternate Lahore was HAZE and visibility 1.2 KM. As per "Extracts of Area Radar (East) Log Book" the weather conditions recorded were;

1.6.1 At time 0530 hrs, the recorded weather was Met Vis 600 meters, and RVR 400, 450, & 500 meters.

1.6.2 At time 0600 hrs, the recorded weather was Met Vis 600 meters, and RVR 200, 250, & 500 meters.

1.6.3 At time 0545 hrs, the ATC reported Met Vis 1.2 km, and RVR 500.

1.6.4 At time 0553 hrs, the ATC reported weather was RVR 750, 400, 400.

1.6.5 Complete weather information including RVR, is attached.

- 1.7 Aerodrome Information:** AllAP Lahore is equipped with ILS Cat-II for RWY-36R. ILS Cat-II comes into operation whenever vis drops below 550 meters. At the time of incident Cat-II operation was in progress. The MDH for AllAP Lahore as per aircraft is as under;
- 1.7.1 a) Radio Altimeter - 100 ft
 - 1.7.2 b) Pressure Altimeter - 923 ft
 - 1.7.3 c) Company minima for Cat-II approach : 100 ft
 - 1.7.4 d) Company minima for Cat-I approach : 200 ft
- 1.8 FDR / CVR:** Flight Recorders were removed by Senior AW Surveyor, Lahore, downloaded at PIAC facilities by CS & QA Department and handed over to Safety Investigation Board, PCAA for investigations.
- 1.9 ATC Tape Extract:** Relevant portion of ATC tape extracts were made available by ATS, HQCAA.
- 1.10 Wreckage & Impact Information:** Runway-36R was inspected, and scratch marks were found on runway at 1200 ft beyond the threshold and the Touch Down Zone light No. 78 damaged due to impact of Engine No:4 Pod with the runway. The position of the scratches on the runway was observed in the right half of the runway. The scratch mark on the runway surface was 107 ft in length, and was at 42 ft right of centre line and 33 ft left of the runway shoulder.
- 1.11 Fire / Smoke:** No fire / smoke was reported.
- 1.12 Aircrew Medical Examination:** Following the incident, Blood and Urine samples of cockpit crew including the Captain, First Officer and Flight Engineer were managed by SMO AllAP Lahore. The results were examined by GM Aero-medical, HQCAA which did not reveal any abnormality.
- 1.13 Criteria of a Stabilized Approach (General):**
- 1.13.1 All flights must be stabilized by 1,000 feet (AAL) in Instrument Meteorological Conditions (IMC) and by 500 feet (AAL) in Visual Meteorological Conditions (VMC).
 - 1.13.2 An approach that becomes de-stabilized below 1,000 feet AAL in IMC or below 500 feet AAL in VMC requires an immediate go-around.
 - 1.13.3 An approach is stabilized when all of the following criteria are maintained below 1000 ft (AAL) in IMC or below 500 feet (AAL) to landing in the touchdown zone.
 - i. The airplane is on the correct flight path.
 - ii. Only small changes in heading/pitch are required to maintain the correct flight path.
 - iii. The airplane speed is not more than Bug + 20 and not less than Bug.
 - iv. The airplane is in the proper landing configuration.
 - v. Sink rate is no greater than 1,000 feet per minute; if an approach requires a sink rate greater than 1,000 feet per minute, a special briefing shall be conducted.
 - vi. Thrust setting is appropriate for the airplane configuration and is not below the minimum thrust for approach as defined by the airplane operating manual.
 - vii. All briefings and checklists have been conducted / completed.
 - viii. Minimum N 1 for approach

CF6	45% N1
RB211	40% N1

1.14 Instrument Approach

- a. If the visual references for a particular type of instrument approach are lost below MDA, DA or DH, a Go Around must be immediately executed.
- b. All crewmembers shall closely monitor the autopilot, auto throttle, and FMA changes throughout the approach.
- c. The PF shall have one hand on the control column, and the other hand on Thrust Levers, ready to disengage in the event of malfunction.

1.15 **Approach Ban:** An instrument approach may be commenced regardless of the reported RVR / VIS but shall not be continued beyond the OM (Outer Marker), or equivalent position, if reported RVR / VIS is less than the applicable minimums. Where no OM or equivalent position exist the pilot in command shall decide before descending below a height of 1000 ft.

1.16 **Standard Operating Procedures:** As per PIA SOP of Flight Operations "Approach", para 12.0.5 Flight Parameters deviation Calls, the PM shall call out deviation of the "BANK ANGLE" at any time the bank angle exceeds 30 deg during normal flight manoeuvring, 15 deg during final approach (within 5 NM to touch down), 10 deg below 300 ft, and 6 deg below 30 ft.

1.17 **High Drag / Side Load Landing:** A high drag / side load landing occurs if the airplane made a landing and two or more tires were blown (Boeing 747 Maintenance Manual).

1.18 **Enhanced Ground Proximity Warning System:** The EGPWS MODE 6 provides Bank Angle call out whenever the bank angle is in excess of +/-10 deg between 5 and 30 ft. whereas, the bank angle advisories are prohibited below 5 feet.

1.18.1 Following lists the priority of the warning and the alerts:

EGPWS Ranking	Aural Message
1	"WINDSHEAR, WINDSHEAR, WINDSHEAR"
2	"PULL UP" (MODES 1 & 2)
3	"TERRAIN, TERRAIN PULL UP"
4	OBSTACLE, OBSTACLE, PULL UP"
5	"TOO LOW TERRAIN"
6	"CAUTION TERRAIN"
7	"CAUTION OBSTACLE"
8	"TOO LOW TERRAIN"
9	ALTITUDE CALL OUTS
10	"TOO LOW GEARS"
11	TO LOW FLAPS"
12	"SINK RATE, SINK RATE"
13	"DON'T SINK, DON'T SINK"
14	"GLIDE SLOPE"
15	"BANK ANGLE, BANK ANGLE"

2 SEQUENCE OF EVENTS:

- 2.1 On 23rd November, 2011, PIA2226 B747 Reg: AP-BFY from Jeddah to Sialkot departed at 2035UTC for Sialkot ETA 0104UTC.
- 2.2 At 0029UTC the aircraft came in contact with Lahore ACC maintaining FL350. The aircraft was given track shortening and was cleared to Sialkot.
- 2.3 At 0035UTC the aircraft was given descent to FL310 by Lahore ACC.

- 2.4 At 0041UTC the aircraft was given further descent to FL150.
- 2.5 At 0043UTC the aircraft was informed of Sialkot visibility as 250 meters by Lahore ACC.
- 2.6 At 0045UTC PIA2226 inquired about the visibility of Lahore and aircraft was informed that Met reported visibility of Lahore airport was 1.2km and Runway Visual Range (RVR) 500 meters. Upon receipt of Lahore visibility, PK2226 requested diversion to Lahore airport. The aircraft diverted to Lahore when it was 80 NM short of Sialkot and was passing 21 DME West of Lahore. The aircraft was given vectors by radar for Runway 36R and was given further descent to altitude 2800 feet. Following are the track miles wrt time references:
 - 2.6.1 Time 0047:35 – 30 Track miles.
 - 2.6.2 Time 0048:50 – 22 Track miles.
 - 2.6.3 Time 0051:15 – 12 Track miles.
 - 2.6.4 Time 0052:20 – 10 Track miles.
 - 2.6.5 Time 0057:30 – 00 Track miles (landing time).
- 2.7 At 0053UTC the aircraft established on localizer Runway 36R at 10 DME came in contact with Lahore Control Tower. The aircraft was given landing clearance for Runway 36R and was informed of calm surface wind, and RVR 750 meters at Runway 36R, RVR 400 meters midpoint and RVR 400 meters Runway 18. The RVR values were acknowledged by PK2226.
- 2.8 At 0055UTC during approach on Runway 36R, the aircraft requested Control Tower to put Runway and Approach lights on full intensity.
- 2.9 At 0058UTC PK2226 landed on Runway 36R and was given taxi clearance by Control Tower.
- 2.10 At 0058UTC PK2226 informed Control Tower that the visibility observed was 700 meters.
- 2.11 At 0230UTC Safety Officer PIAC informed Duty Manager Airside (DMS) Lahore airport that No. 4 engine of PK2226 parked at stand No. 07 has been found damaged. On inspection by DMS it was observed that the engine was badly damaged / scratched with a hole at the lower pod and oil leakage from the engine. DMAS informed Tower controller about the occurrence who had no information about it. No CAA official was informed of the occurrence till this time by the operator. Runway36R was inspected and scratch marks were found at 1200 ft beyond the threshold. Touch Down Zone light No. 78 within the scratch marks was also found damaged. The position of the scratches on the runway was found 42ft from the centre line and 33ft from the runway shoulder and 107ft in length.

2. ANALYSIS

2.1 ATS Analysis.

- 2.1.1 Lahore Runway36R is equipped with ILS CAT-II which permits aircraft operation when visibility is less than 550 meters but not less than 350 meters. The commencement of ILS CAT-II operation is required to be logged as well as to be informed to other concerned ATS units and aircraft. As per the visibility record ILS CAT-II operation was in progress since 0400 hrs at Lahore airport. The "Low Vis Procedure in force" besides being documented, was also required to be announced by ATC. Whereas, ATC audio tape extracts revealed that PK-2226 was not informed of the ILS CAT-II operation by any of the ATS units.
- 2.1.2 As PK-2226 was passed with the RVR 500 meters, the Captain was expected to be aware of ILS CAT-II operation in progress at AllAP at the time of diversion. Later, the aircraft was also

informed of the RVR values (750, 400, 400 m) along with the landing clearance by the Control Tower. Till this time, as the aircraft was ILS Cat-II capable and the decision to continue approach in Cat-II conditions was in line with the ATS SOPs.

- 2.1.3 When PK-2226 was passing 1000 feet during final approach RWY-36R, its ILS CAT-II capabilities reduced to Cat-I when it's both AUTO STAB trim lights illuminated. At this stage, PF disconnected the Auto Pilot, and decided to continue approach with Cat-I capable aircraft in Cat-II conditions. Under such circumstances, when the aircraft was not Cat-II capable, the Cat-II ILS 36R approach should have been discontinued and the diversion to second alternate should have been planned.
- 2.1.4 After landing one of the rear body tire was found deflated. On query it was revealed by the air crew that the tire was deflated due to the hot brakes, as the No. 1 and No. 4 thrust reversers were not available. Operation of the aircraft with two thrust reversers not available in low visibility conditions could therefore cause deflation of tires and thus prolonged runway occupancy.
- 2.1.5 In order to plan an approach or a diversion to an airfield, primarily the prevailing weather conditions play a pivotal role in decision making by the flight crew. Mainly, there are two sources (Met Office & ATC Tower) from where the weather information originates. The Met Office at airports updates complete weather conditions after every half an hour, and Control Tower passes current weather, especially the visibility information to flight crew based on visual observation or RVR. At AllAP Lahore, ILS Cat-II operation commences with visibility falling below 550 meters, above which, ILS Cat-I operation remains in operation. Information regarding the ILS Cat-II operation is required to be transmitted to the concerned aircraft, so that ILS Cat-II capable aircraft continue to plan their approaches.
- 2.1.6 PK-2226 diverted from Sialkot primarily because of poor visibility equal to 250 meters. At the time of diversion, PK-2226 was informed about the Met visibility of Lahore as well as current RVR information. Based on the given input regarding weather / visibility by ATC, PK-2226 decided to divert to AllAP Lahore. Flight crew of PK-2226 diverted to Lahore considering the weather conditions (ILS Cat-II) appropriate. At the point of diversion, Lahore ATC was also required to pass the prevailing ILS Cat-II operation information to the PK-2226. Lahore ATC did not pass the information about ILS Cat-II operation to PK-2226 till the aircraft landed on RWY-36R. Had this information been passed by ATC; PK-2226 could have reviewed the decision to continue approach when it encountered ILS Cat-I conditions (both STAB trim lights illuminated) at 1000 ft on finals RWY-36R.
- 2.1.7 **Conclusion.** At the point of diversion, PK-2226 did not pay due attention to the prevailing weather at Lahore, especially the RVR value (500 meters). Lack of required emphasis by ATC on the current RVR, and not passing the information of prevailing ILS Cat-II operation at AllAP Lahore did not help flight crew in correct decision making.

2.2 Technical Analysis

- 2.2.1 Review of Technical log book was carried out at AllAP Lahore by Sr AW Surveyor. During the said flight, pilots reported "Cat II U/S, both auto stab 'A' and 'B' lights illuminated at 1000 ft". Operational check of Auto Pilot was carried out by the PIA engineering Lahore and was found satisfactory. Stab trim interface unit and its operation was also checked and found satisfactory.
- 2.2.2 Inspection of Engine # 4 (located at extreme right side) belly revealed as if it had been dragged on hard surface (pictures below). Runway inspections were also carried out and apparent marks of engine being dragged on runway were observed (picture below). Detailed inspection of aircraft was continued, and following was revealed:

- a. Damage to both fan cowls of engine # 4.
- b. Damage of translating cowl (Reverser) of engine # 4.
- c. Oil leakage from IDG of engine # 4.
- d. Right rear wheel # 12 deflated.

2.2.3 The flight crew had reported "right body gear tyre No. 11 and 12 deflated" during walk around. However, later inspection revealed only right rear wheel # 12 deflated which was replaced.



2.2.4 Following inspections / replacements were carried out by PIAC engineering for assessing / rectification of damage/defects:

- a. All main landing gear oleo - No leak observed.
- b. Wheels hub tie bolt - No abnormality.
- c. Condition of Fuse Pins associated with Engine # 4 Found Sat.
- d. Engine # 4 mounts creep marking - Found Sat.
- e. Engine # 4 MCD - Found sat.
- f. Free rotation of engine # 4 - Found Sat.
- g. Complete BSI of engine # 4 - Found Sat.
- h. Engine # 4 IDG found leaking - Same removed and blanking plate installed.
- i. Fan cowls of Engine # 4 found damaged - Both fan cowls of replaced.

- j. Engine # 4 thrust reverser sleeve damaged. Thrust reverser de-activated. Interim repair carried out. Referred to Base Station Karachi as replacement not feasible at Lahore.
- k. Manufacturer recommended inspection after Shock Landing of engine # 4 and engine # 3, fuselage area, wing area including leading edge flaps, trailing edge flaps and cabin area - Found satisfactory.
- l. Ground run of engine # 4 - All engines parameters found normal.

2.2.5 Additionally, Sr AW Surveyor also conducted following inspections:

- a. Operational check of ILS and LRRRA systems was carried out - Found satisfactory.
- b. In addition to Engine # 4, Engine # 3 shock landing inspection - Found Satisfactory.
- c. Precautionary NDT as per manual of Engine # 4 affected area - Found Satisfactory.

2.2.6 The aircraft was released to Karachi as non revenue positioning flight for replacement of Engine # 4 reverser sleeve at Karachi Base.

2.2.7 **Conclusion:** No aircraft systems malfunction, including illumination of Auto Stab Trim 'A' and 'B' lights, could be isolated as contributing towards the causation of this occurrence.

2.3 Ops Analysis

2.3.1 Sialkot and Lahore being in close proximity (within 75 NM) do not present altogether different weather conditions. In case of Sialkot weather reporting poor visibility (250 meters), would also, in most probability, entail that Lahore will not be extraordinarily better. It is further substantiated with the fact that AIIAP RVR was being reported as 500. Also, the RVR values reported when aircraft was established on ILS were 750m, 400m, & 400m.

2.3.2 The trend was deterioration in visibility, as it was reported later at 0630 hrs, that the visibility had further reduced to a value of just **50 meters**. In a situation, where there are no other ILS equipped airports available, weather diversions to places like Islamabad, or in southern part, like Karachi could serve the purpose.

2.3.3 Flight crew was fully aware of the prevalent weather, and the visibility conditions in terms of Met visibility and the RVR. Initially at 0545 hrs, the visibility reported by Lahore was 1.2 km and RVR 500 when the PF decided to divert to Lahore. During the approach to Lahore. When PK-2226 was established at LOC at time 0553 hrs, Lahore advised RVR 750. 400, 400. The aircraft asked Lahore "**request light to be on full intensity**", is indicative of nil / intermittent visual contact with runway or runway environment. The aircraft continued with the landing approach and landed at 0558 hrs. After landing, PK-2226 reported visibility observed as 700 meters.

2.3.4 As per the reported RVR 500 meters, Low Vis Procedure (LVP) / Cat-II Approach were in force. Though, the flight crew were cleared for LVP approaches during last Simulator check, but special crew briefing for Cat-II Approach was not adequately carried out.

2.3.5 As per Captain's statement, during flight Auto Pilot was disconnected and both AUTO STAB TRIM LIGHTS illuminated. The aircraft was then flown manually till touchdown, and continued to Cat-I. FO stated to have picked up the visual contact with Runway Approach lights at 300-400 ft AGL. Followed by which, Runway Centre line and Edge lights were also picked up. PF stated to have observed patches of Fog at 200 ft. Though, the visibility was observed by PF to be less than 01 km and noted RVR values of 750, 400, 400, PF continued descend to minima to decide for landing or missed approach.

2.3.6 The Pilots stated to have not observed any abnormality during landing phase and touchdown. After landing, pedal braking action was applied, as only 02 thrust reversers were

available to flight crew. During post flight inspection, one of the rear tires was observed deflated.

2.3.7 Following the incident, SIB Investigation team visited B-747 Simulator at PIAC Training centre. In order to understand the system and the degree of difficulty in Cat-II and other approaches with such a weather conditions, at least two Sim sessions at two different occasions were simulated. Also, FDM facility at PIAC CS & QA Department Karachi was also explored. It was opined by SIB and PIAC Sim members present during the session, that incident flight conditions when simulated, would result in similar consequences.

2.3.8 **Flight Data Recorder Analysis.** Analysis of FDR data reveals following facts, which were in support with the findings made during Simulator sessions and observations drawn at FDM.

2.3.8.1 **At 200 ft RA (Radio Altitude)**, the aircraft heading was 359 deg and decreasing, CAS 153 KIAS and decreasing, the Aircraft was established on GS and Loc on RWY-36R with AP disengaged. CAS and RAc continued to decrease proportionately. However, the heading instead of being at 360 deg (RWY-36), continued to gradually decrease due to a persistent bank angle to left.

2.3.8.2 **At 54 ft of height**, the CAS is 152 KIAS, **heading 354 deg** (-6 deg to RWY heading), bank angle 6.59 deg to left and the rudder at -2.7 (right) deg.

2.3.8.3 **At 46 ft**, the CAS was 151 KIAS, heading of 354 deg and Rol Att (bank angle / roll) still between 5-6 deg to the left. It is at this altitude that flight crew seemed to have pickup first visual contact with the Runway / Runway environment, and therefore started to apply manual correction to come over the Runway. The bank angle to the left started reducing, and the heading started to increase.

2.3.8.4 **At 36 ft**, the bank angle indicated -1.85 deg (to right), **pitch 2.81deg** (nose up) and rudder deflection equal to -10.6 deg (Right).

2.3.8.5 Above mentioned FDR parameters are indicative of following facts;

- Flight crew picked up late visual contact with the runway, and aircraft was right of Runway centre line, and angling.
- Flight crew headed towards Runway with headings 354 deg and increasing, until approaching over the Runway.
- Flight crew started to apply right rudder to gradually align with Runway heading.

2.3.8.6 **At a height of 24.1 ft**, the CAS was 147 KIAS, when bank angle starts to increase and reaches maximum of **-7.47 deg (roll right)**, the ruder deflection reaches maximum value at **-19.8 (right) deg** and the pitch at 2.46 deg (nose up), the heading starts to increase again till 003.9 deg.

2.3.8.7 **At a height of 10 to 12 ft**, the CAS is 142.9 KIAS, the bank angle is **-6.42 to right with nose up pitch angle of 4.22 deg** and the headings are reducing from **005.8 deg to 359 deg**. At this stage the heading variations of 10 degrees (354 to 006 deg) within 50 ft of height loss was rather fast, coupled with erratic rudder deflection inputs.

2.3.8.8 The touchdown speed is observed to be **137 KIAS** on a heading of **353.5 deg** with bank angle within 1.5 deg and 0.7 deg of pitch angle.

2.3.8.9 Above mentioned FDR parameters and runway marks are indicative of the facts that;

- At heights lesser than 20 feet above ground there have been substantial amount of changes made in aircraft attitudes, bank angle, pitch angles and rudder deflections.

- At a height of 10 feet and descending, the bank angle to the right was in excess of -6 degrees with nose up attitude of 4.22 degrees. These conditions are sufficient for engine pod located at extreme outboard side (No:4 engine) to touch the runway surface.
- The engine pod touching mark in the right half of the runway does correlate with the size (width) and marks on No:4 engine pod.
- The engine pod touched the runway for less than half of a second (0.45 sec) and created marks equal to 107 feet in length.
- As the No:4 engine pod brushed (touched) the runway for less than a half a second, flight crew could not monitor the incident.

2.3.9 Conclusion. En-route diversion to AllAP Lahore was a result of inclement weather (vis 250 meters) at Sialkot. Weather conditions at AllAP Lahore were well known to flight crew before taking the decision to divert. Flight crew continued to AllAP Lahore with reported **RVR 500** with Cat-II approach for Rwy-36R. PIC disconnected Autopilot due to, as stated, both AUTO STAB TRIM LIGHTS coming on at 1000 ft., and the inadequate visual cues available to flight crew did not allow aircraft to follow stabilized final approach path. Aircraft ended up angling to runway heading from right of track. Last minute correction by PIC to align with the runway, in fact, induced larger corrections (right bank angles, with pitch angles) at low height over the runway surface. With the result No:4 engine pod (located at extreme right side) brushed with the runway surface and caused damage to the engine pod and scratch marks on runway.

3. OBSERVATIONS:

- 3.1** Despite clear instructions from Manager Airside AAIAP, Lahore, the Safety Officer, QS & QA Div PIAC Lahore submitted his statement after 06 days, i.e. on 29 November 2011. There seems to be inadequate knowledge of CARs-1994 (Section-VX), ANOs and ICAO Annex-13 with PIAC personnel with the result, the statement of PIA Flight Safety Officer and collection of vital information got unnecessarily delayed.
- 3.2** Thrust reverser of No:2 engine was unserviceable. With maximum (POB 516) passengers and crew (499 +17) on board, and Max TO Wt equal to 323207, and Max Landing Wt equal to 285762, there were only 02 thrust reversers (No 1 & 4) available to cockpit crew. Further, if, due to the Pod of No: 4 engine had damaged enough not to provide reversal, there would have been a serious difficulty faced by flight crew in safely stopping the aircraft on available length without any thrust reversal.
- 3.3** As per ECR at RCC Lahore the landing time is recorded to be 0556 hrs, with Lahore ATC it was 0558 hrs, and with ATS tape extract it is recorded as 0554 hrs. There is a time difference equal to two minutes or more between Radar, ATC, ECR, which results in inaccurate time references and in correct correlation of various activities involved in investigation.
- 3.4** The information regarding the incident was brought considerably late (by 2.5 hours) by the Operator to the knowledge of CAA officials.

4. CONCLUSION:

Aircraft was airworthy, and flight crew were qualified to undertake the scheduled Flight PK-2226 on 23 November 2011 from JED to Sialkot. Flight crew correctly decided to divert away from Sialkot due low visibility. However, Lahore was not too good either, as Lahore was reporting Met visibility as One km, and RVR 500m. Diversion to AllAP Lahore due weather was a marginal decision. Call by PF for Runway Approach Lights to full intensity suggests marginal weather and visibility conditions. Angling approach path till coming over the

runway, and last minute correction of bank angle in excess of 6 degrees with pitch up angles of above 4 degrees at a height of just 10 ft above runway made the No:4 Engine Pod brush the Runway surface for 0.45 seconds. Violation of established procedures for continuing with the unstable approach and with less than required visual contact with Runway / Runway environment resulted into the incident. Three man cockpit remained deficient of CRM teachings and its application when required.

- 4.1 **Cause of the occurrence:** Non adherence to established SOPs for diversion to alternate and landing in low visibility conditions. Cat-II briefing not carried out as per SOP & FOM, and failure of CRM in 3-man cockpit.

5. FINDINGS:

- 5.1 Medical examination reports of flight crew did not reveal any abnormality.
- 5.2 Runway marks and the scratch marks observed on No:4 Engine pod are in correlation with each other, and hence caused by coming in contact with each other.
- 5.3 Aircraft systems including EGPWS and Stab lights for A & B, were functioning satisfactorily.
- 5.4 The reported visibility at AllAP Lahore was One km, and RVR 750, 400, 400meters. However, presence of patches of Fog on the threshold was stated by Flight crew.
- 5.5 There was no caution issued for patch of fog or poor visibility by ATS.
- 5.6 The Captain was flying the precision approach manually.
- 5.7 Violation to the established procedures, Flight crew continued approach with partial or no visual contact with the Runway-36R, till 300 ft AGL and asked for Approach lights at Full Intensity.
- 5.8 In order to salvage bad angling approach, flight crew used abrupt and erratic control inputs at lower heights.
- 5.9 None of the flight crew could observe any violation of procedures pertaining to established procedures.
- 5.10 Effective application of CRM was not evident during the process of decision making, approach path, and final approach to land by the cockpit crew.

6. SAFETY RECOMMENDATIONS

- 6.1 Plan for the alternate airfield in proximity of the destination aerodrome where similar weather conditions are expected to prevail, be avoided.
- 6.2 Application of CRM be emphasised by the Operators during initial courses / refreshers, as well as Simulator training. Same be ensured by CAA Flight Inspectors / DCPs.
- 6.3 PIAC to impart necessary corrective actions in the light of investigation for the prevention, with particular emphasis on adherence of procedures.
- 6.4 Simulator training of aircrew is to include greater emphasis on continuing for a landing in inclement weather conditions vis-a-vis execution of missed approach.

6. Weather reporting by ATC and Approach, as well as Meteorological data to be updated and passed to flight crew without ambiguity.
- 6.6 ATC to study and may review the procedures for passing / transmitting the prevalent weather condition vis-a-vis closing the airfield, if warranted, except for emergency landings.
- 6.7 Time references with ECR, ATC and Radar be synchronised to one standard value throughout Pakistan.
- 6.8 Allowing flight of aircraft like B-747 with max POB with just 02 Thrust Reversers may endanger the safety of aircraft in phases like RTO and landing with yet another failure of thrust reverser, and needs to be reviewed.
- 6.9 PIAC to ensure awareness of all aircrew on the contents of CARs, 94 in general and "Investigation of Accident and Incidents" in particular.
- 6.10 Time difference between PST/Z and UTC with that of ECR needs to be synchronized and maintained at all time.