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PAKISTAN CIVIL AVIATION AUTHORITY
(SAFETY & INVESTIGATION BOARD)

AIRCRAFT INCIDENT INVESTIGATION REPORT
NAVIGATION ERROR IN BOMBAY FIR BY PIAC
FLIGHT # PK-275, BOEIN-737, REG. # AP-BCA
ON 29-12-2008
(SECTOR BOMBAY – KARACHI)

FINAL REPORT

NAVIGATION ERROR IN BOMBAY FIR BY PIAC FLIGHT NO. PK-275 B-737, REG. NO. AP-BCA ON 29-12-2008 (BOMBAY - KARACHI)

Authority: Director General Civil Aviation Authority Memorandum No. HQCAA/1901/329/SIB dated 1st January 2009 (**Appendix 'A'**).

Synopsis

PK-275 was a scheduled flight from Mumbai to Karachi on 29 December 2008. Earlier, same aircraft had arrived from Karachi to Mumbai as flight PK-274. The departure of flight PK-275 from Mumbai was uneventful till it levelled off at FL-360 and had flown for about 170 NMs out of Mumbai. While passing ground position, the Captain of the aircraft realized that the aircraft is heading in opposite direction towards Mumbai. He announced the error and turned the aircraft on correct course. He also apologized on his error. Indian Radar controller asked Captain to despatch his de-brief as soon as he lands, before flights on next day. Captain's de-brief was faxed to Station Manager PIA Mumbai and the matter was resolved. PIA continued scheduled flights to Mumbai as planned. (**Appendix 'B'**).

1. Factual Information

- 1.1 **History of the Flight:** Karachi – Mumbai – Karachi.
- 1.2 **Maintenance History:** No significant maintenance was carried out in past few weeks which could have contributed towards the incident. VHF and Transponders were found serviceable, and Flight Management System (FMS) had no discrepancy. (**Appendix 'C' & 'D'**). However, its HF coupler was found defective during shop check at Karachi.
- 1.3 **Injuries to Persons:** Nil.
- 1.4 **Damage to Aircraft:** Nil
- 1.5 **Crew Information:** Following are the particulars of aircrew. Details at **Appendix 'E'**.
 - 1.5.1 **Captian Hadi Rizvi:** Captain of aircraft (Pilot Monitoring) ATPL # 809
 - 1.5.2 **First Officer Furrukh Chohan:** First Officer (Pilot Flying) CPL # 2089
- 1.6 **Aircraft Information:** Manufacturer Boeing Company, Aircraft Reg. No. AP-BCA.
- 1.7 **FDR / CVR:** Information retrieved from FDR was help full in establishing the route deviation. However, because of the system limitation of maximum 30 minutes recording capability of CVR on board AP-BCA, useful data was not available.

2. Analysis

In order to determine whether the occurrence was caused due to malfunction of aircraft components / system or due to operating procedures, both technical as well as operations were critically analysed.

- 2.1 **Technical Analysis:** Various aircraft systems responsible for aircraft Navigation / Flight Management were tested for any possible malfunction / un serviceability. It was found that technically there was no abnormality with the aircraft Flight Management System or Autopilot. The failure of HF coupler indicated that the pilots must have had difficulties in HF communication (**Appendix 'F'**).
- 2.2 **Weather:** There was no significant weather, which may have contributed towards the occurrence. The weather at and around Mumbai and enroute was fine. However, Mumbai-Karachi sector was being undertaken around sunset / night timings.
- 2.3 **Flight Planning and Scheduling:** Captain Hadi had done a flight PK-303 on 28 December 2008 for Karachi-Lahore-Karachi. Total duty time for the Captain operating-cum-supy of the flight previous to 29 December 2008, was **16:37** hrs. The extended duty time was mainly due to poor visibility at LHE which caused delayed operations of PK-303 on 28 December 2008. In lieu the Captain was to avail a rest for **33 hrs and 14 minutes**.
- 2.4 On 29 December 2008, Captain Hadi and F/O Furrukh were originally scheduled for flight PK-272 for a departure of 0555 LT and were picked up at 0855 LT. Capt. Hadi could therefore avail a total of **13:03** hours of rest against 33 hrs and 14 minutes. However, he could fulfil minimum requirement of at least 12 hrs of rest as per FOM PIAC including the night before he was picked up (**Appendix 'G'**). F/O Furrukh met normal rest requirement.
- 2.5 **Ground Operations:** Both the crew members were in the cockpit of flight PK-272/273 prepared for Karachi – Delhi – Karachi when they were informed from Central Despatch that Delhi flight is cancelled, and same crew is scheduled to operate flight PK-274/275 for Mumbai and back. It was approximately 2 hours before take off of PK-274 from Karachi. The flight PK-275 departed Mumbai at 1742 hrs LT and arrived Karachi at 1914 hrs LT.
- 2.6 **Departure Preparations:** As per the Captain's statement, RWY 14 was the expected runway for departure. Accordingly, PF selected relevant Standard Instrument Departure (SID). However, during taxi clearance RWY-27 with RAXET 1A (**Appendix 'H'**) as SID was cleared for departure to airway M638. This SID was not

available in the aircraft FMC and so was built up to point BIDIX by the First Officer during taxi out.

- 2.7 The route, which was cleared to PK-275 (as per Captain's Statement), was M638 (RAXIT A1, SAKUN, BIMOT, BIDIX, NOBAT, SAPNA, MINAR, KC) (**Appendix 'I'**). Whereas, PF selected the only available company (PIA) route in FMC. The company route Mumbai – Karachi (VABB-OPKC) displayed D-BIDIX, D-EXOLU, N519, MINAR, D-KC (**Appendix 'J'**). Two destination options (D-BIDIX and D-EXOLU) of company route displayed did create ambiguity in the mind of PF as the PF was not well familiar with various departure procedures from Mumbai.
- 2.8 N519, the company Route, and M638 are two different routes. Both the air routes originate from VABB; continue on same track till point EXOLU. At EXOLU, M638 diverges toward west to point NOBAT via BIDIX and joins N519 again at point SAPNA (**Appendix 'K'**) for Karachi.
- 2.9 The route (M638) which was cleared for PK-275 on 29 Dec 08 was the route flown the most, but still not available in FMC database. Whereas, a route (N519) which is flown rarely was the only route available in FMC as a company route.
- 2.10 **Departure:** Take off was uneventful, aircraft levelled off at FL360 and all points in the SID were reported on VHF till reaching point BIDIX on the route M638. Next expected heading was to be westerly i.e. 285° (approximately), in the direction of NOBAT (**Appendix 'L'**).
- 2.11 **Flight Enroute:** Five minutes after levelling off while PM (Captain) was still busy in establishing radio contact on HF, the left pack trip off light came on. Pilot Monitoring (Captain) advised FO (pilot flying) to carry out the checklist.
- 2.12 Since the time of level off, both the crew-members got occupied; PF into resetting pack Tripp off light, and the PM in establishing radio contact on HF. As such, neither PF nor the PM was monitoring the flight profile of the aircraft and flight continued on Company Route.
- 2.13 **Detection of Route Error:** Deviation in the route was detected only when crew was unable to establish contact with Mumbai on HF, and the Captain wanted to inform Mumbai Radar on already in-use VHF that the flight was 70/80 miles from NOBAT. At this very time it was realized by the Captain that the flight was heading towards point EXOLU (South-Easterly) and not towards NOBAT (North-Westerly). Captain took over the control of the aircraft and informed Mumbai Radar accordingly. To which Indian Radar inquired that whether the flight was turning back to Mumbai. Captain replied that, PK-275 had error and re-establishing the course, to which radar acknowledged.

- 2.14 **Deviation from the Route:** As the point EXOLU was not deleted from the FMC and the route was also not correctly cross checked against track and distances, at point BIDIX, instead of continuing in same heading for NOBAT, the aircraft turned right through 200° towards EXOLU. The aircraft continued on a heading of 156° initially and then turned left on to 109° (to intercept) till the time error was detected. The flight continued towards wrong direction for approximately 08 minutes unnoticed by any of the crew members. Complete flight profile flown by PK-275 indicating a heading flown against time references is attached at **Appendix 'M'**.
- 2.15 Most probable reason for the deviation (initially about 200 deg RH than 45 deg LH) to go unnoticed could be that pilot flying (FO) assumed that flight is turning for SAPNA (next expected point) while he was also performing the checklist. Whereas Pilot Monitoring (Captain) was still busy with the HF. The FO did not follow the SOP, whereas, Captain seemed not well attentive in the cockpit as he was flying after having completed only the minimum rest requirement and possibly fatigued. Resultantly both the crew members were not attentive enough in the cockpit to perform their primary duties.
- 2.16 **Post Error Detection Actions:** The Captain of the aircraft maintained his cool, analysed the error correctly, and apologized to Indian Radar / Mumbai FIR for causing an error. Following the instructions of Mumbai FIR, the Captain re-established correct route to Karachi.
- 2.17 Indian Airlines Despatch informed PIA Station Manager, Mumbai at 1935 hrs LT that PK-275 had disappeared from Indian radar for almost 15 minutes. Therefore Captains de-brief with his signature and staff number was to be faxed immediately to Indian Radar (ATC and Military Local Unit- MLU). Otherwise further flights were not to be cleared from 30 December, 2008 (**Appendix 'N'**).
- 2.18 The Captain's de-brief was written, signed and faxed to SM Mumbai without further delay. SM Mumbai through local staff submitted the Captain de-brief to Indian Radar on the same day before midnight. The matter was closed (**Appendix 'O'**).
- 2.19 **Radar Contact:** At no time during entire flight was the squawk put off after it was selected 'ON' at take-off point. Neither its un-serviceability was highlighted nor intimated by any agency including the Mumbai Radar. As per Captain's statement, Positive Radar identification was done after departure. At no stage neither, the loss of radar contact nor was deviation from route intimated by Indian radar. Apparently, Mumbai radar had positive radar contact with the flight as it was evident from the fact that when the error was detected and the captain initiated a LH turn on to heading of 330 degrees, the Radar insisted on PK-275 to turn right to assume desired heading. Moreover, it may not be incorrect to assume that the radar controller was also not

attentive enough to point out the route deviation which lasted for about 08 minutes in the first place.

- 2.20 **FMS Management:** Route and Navigation Section of PIA Flight Operations is responsible for ensuring that required SIDs / STARS are available in FMS Nav database. It was not in the knowledge of Route / Nav section that RAXET 1A was not available in B-737 FMS data base in general and in the case of PK-274/275 in particular, as normally if not all, most of the published SIDs / STARS are available in FMS database. There was only one route “**VABB. D BIDIX. D EXOLU. N519. MINAR. D OPKC**” available in the FMS as a Company Route. The route was to be flown did not exist in FMC database at all. The operational flight plan provided to the pilot was the correct one and crew was required to update the FMS route according to the operational flight plan as per the SOPs.
- 2.21 B-737-300 NAV Data (FMCS Company Routes) dated 14 Nov 08 (**Appendix ‘P’**) and later version of Dec 2008 was provided by M/s. Jeppesen and validated by Routes and Navigation Section, PIAC for its use. In fact, the company route VABB. D BIDIX. D EXOLU, N519, MINAR, D OPKC could not have been cleared by ATC due to the fact that such routing was to bring back the aircraft in the opposite direction from BIDIX to EXOLU.
- 2.22 Having known the details of the incident, Route and Nav Section of PIA has requested M/s. Jeppesen to add all applicable SIDs ex-Mumbai. The Section was soon to send a correction for this particular FMS route on VABB – OPKC sector. Jeppesen Company had confirmed to PIAC that these procedures will be available in next AIRAC cycle which was to be effective from 12-02-2009. (**Appendix ‘Q’**).
- 2.23 **Crew Resource Management (CRM):** Captain Hadi Rizvi was the captain of aircraft and First Officer Furrukh Chohan was the co-pilot. The Captain of the aircraft was Pilot Monitoring and First Officer was pilot flying for the sector Mumbai – Karachi and at the time of occurrence. At FL 360 when left pack trip off light came on, PF retained the control of aircraft and carried out checklist actions, whereas, the PM remained busy in establishing contact on HF. First Officer was undertaking the flight from Mumbai for the first time. He was deficient of adequate knowledge / SOPs applicable to such a flight from Mumbai. The Captain though, completed minimum rest requirement of 12 hours as per CAR and PIA OM, but he could not display required attentiveness as pilot monitoring and the Captain of the aircraft.
- 2.24 When the error was caused, neither PF nor PM followed the SOP of checking next course selection, and checking of track and distances for the next destination accordingly.

- 2.25 **Aircrew Training:** As F/O had never flown Karachi-Mumbai-Karachi sector before this flight, he did not have adequate knowledge of various Mumbai departures available on charts, the company route vis-à-vis route being actually flown as per PIA operational flight plan. Had it been the Captain or any other aircrew familiar with Mumbai plates on FMC, and track / distances positively cross-checked after completion of FMC loading, the error could not have gone unnoticed beyond the stage of FMC loading.
- 2.26 **Conclusion:** Operational flight plan being flown did not exist in FMC database of aircraft. First Officer had inadequate familiarization / knowledge of Mumbai departure procedures and happened to be the Pilot Flying for the sector which he had never flown earlier. Less than desired attentiveness of Pilot Monitoring, who was also the Captain of the aircraft, could not fully compensate for the deficiency in the performance of PF. With the result, required deletion of an extra point in FMC went unnoticed. Oversight of not removing a way point "EXOLU" from the FMC flight plan caused the aircraft to deviate from the route. Not following the correct CRM while in the cockpit, both the flight crew members could not timely detect route deviation of 210 degrees for approximately 08 minutes.
- 2.27 **Cooperation:** Adequate cooperation and support was provided from PIAC and other departments during the course of investigations. However, availability of PIAC co-opted member to the Board needed extra ordinary coordination.

3. Observation

- 3.1 PK-272/273 (B-737) to Delhi was cancelled at the last minute. PK-274/275 was scheduled with B-737 due to change of equipment (from A-310 to B-737). Capt. Hadi was asked to operate the flight due to non-availability of B-737 captains at Karachi base.
- 3.2 There is shortage of aircrew in PIAC due to retirements and massive promotion on different aircraft. Furthermore, during the month of December weather also causes delayed operations and had two a fold the crew shortage.
- 3.3 The fact that when Captain informed of their wrong heading and direction, Indian Radar asked PK-275 that "are you coming back to Mumbai" to which Captain replied "we had an FMC error and we are re-establishing course to NOBAT", and that Indian Radar replied "Don't turn left, turn right" indicated positive radar contact even at that particular time. Even when correct route was established, no calls indicating on or off track were given by Indian ATC / Radar. A fact based on Captain's statement.
- 3.4 As per the Crew scheduling and Planning Section of PIA, KHI-BOM-KHI is a normal sector and no special clearance is required for this sector. Whereas, it is indicative of FO performance that the F/O was not well familiar, therefore not fully prepared for Mumbai-Karachi flight procedures.

4. Findings

- 4.1 Captain Hadi Rizvi was Pilot Monitoring and First Officer Farrukh Chohan was the Pilot Flying at the time of occurrence. However, the route deviation was detected by pilot monitoring.
- 4.2 F/O Chohan was well rested, however, Captain Hadi was asked to take a flight after 13 hours of rest against 33.25 hours of rest requirement due to previous flight.
- 4.3 Last minute changes (02 hours before the flight PK-274 and 275) were made in the scheduling of flight crew to a new sector.
- 4.4 It was the first flight of F/O Farrukh Chohan to undertake any flight to Mumbai, and he was not well conversant with the Mumbai departure procedures, SIDs and routes.
- 4.5 The RWY and SID were changed to RWY 27 and RAXIT 1A during taxi as against the expectations of aircrew who was expecting RWY 14 and SID associated to it.
- 4.6 PF selected the only company route VABB. D BIDIX. D EXOLU. N519. MINAR. D OPKC available in FMC and built it up, which possessed inbuilt ambiguity and

sufficient to cause error as same was not carefully fed, connected to the route and cross checked by Captain.

- 4.7 The error in the route could not be registered by either of the crew while feeding the SID / route as well as during its cross check. Same could not be correctly flown and monitored during flight.
- 4.8 The Captain and the F/O remained engaged in establishing HF communication and Pack Tripp Off Light respectively. Apparently none was monitoring the flight – the primary responsibility of cockpit crew, and as pilot flying.
- 4.9 Around 170 NM out of Mumbai, the primary HF was changed; however, contact could not be established despite numerous attempts. During this time, left pack trip off light came on and the First Officer was asked by Captain (Pilot Monitoring) to carry out the relevant check-list. Here onwards, PF remained busy with pack trip off light checklist action and did not pay required attention to aircraft flight profile. Similarly, the captain was also not able to appreciate the deviation in route for about 8 minutes.
- 4.10 While reporting position, the Captain of the aircraft (Pilot Monitoring) detected that the aircraft was heading in reciprocal direction. He informed Mumbai radar with whom no contact had been lost on VHF since first established.
- 4.11 Thereafter, cockpit crew remained vigilant and successfully maintained the air corridor cleared for Karachi.

5. **Recommendations**

- 5.1 Work study to determine actual aircrew requirement be undertaken by PIAC for better utilization of aircrew and further recruitment, if required.
- 5.2 PIAC need to emphasize more on focused training of its aircrew to avoid recurrences of similar nature.
- 5.3 Last minutes aircrew changes for new sector be avoided as far as possible, and be made only after fulfilling crew pairing (CRM) requirements and with necessary briefings.
- 5.4 Nav / routing section of PIAC may be asked to provide all essential and practical SIDs / STARs in FMC with complete details to minimize aircrew work load in the cockpit.
- 5.5 Scheduling policy for Aircrew on contract basis needs review, as handsome monetary benefits for extra flights is likely to lure them in taking risks / short cuts / compromise on required attentiveness.
- 5.6 CRM / crew pairing be given extra emphasis to minimize human factor (HF).

6. **Finalization.**

The occurrence is caused due to non adherence of CRM, inadequate training / performance level of Pilot Flying and less than required attentiveness of captain of aircraft. Timely reaction / response from Mumbai FIR to the route deviation could have averted the occurrence.