

REPORT ON INCIDENT TO M/s.PIAC's BOEING-707
A/C AP-AXA ON 19-4-88 AT KARACHI AIRPORT WHILE
PUSH BACK FOR PK-266 KARACHI - DHAKA FLIGHT

Authority: Director General Civil Aviation Authority's

MEMORANDUM NO.HQ.CAA/1901/85/AIB DT 19-4-88

(Attached to this Report as App.-'A')

1. Aircraft Information:

- 1.1. Registration Marking : AP-AXA
- 1.2. A/C type & makers S.No.: B-707 S.NO.19286
- 1.3. Engines, type, airframe: Pratt & Whitney JT3D-3B
position & makers S.No. (Attached to wings)
Hrs/Landings No.1. S.NO.668756
No.2. S.NO.642740
No.3. S.NO.644927
No.4. S.NO.667815
- All 4 engines were airworthy in all respects and not attributing factor in this incident. No modification was pending. Total airframe hrs 56,603. 23408 landings.
- 1.4. Certificate of Reg. : No.449 (Rev-1), till further
No. & validity orders.
- 1.5. Certificate of Airwor- : No.402 (Rev-1) valid till
thiness No.& date of 24-9-1988.
expiry
- 1.6. Certificate of Maint., : Certificate of Maints., issued
date & time of issue at Aircraft 56541-35 hrs and
and period of validity 23377 landing. Valid for a
period of 125 days or 700 flying
hrs, whichever falls earlier,
(issued after check C-7) on
10-4-88 at 2100 hrs(PST).
- 1.7. Date of construction : September, 1967
of airframe
- 1.8. Name & Address of owner: M/s.PIA, PIA Building Karachi
Airport, Karachi
- 1.9. Gross weight, maximum : Certified maximum take-off
permitted by Chief of weight based on structural
Airworthiness and strength 150412.7 KG. Weight
for this flight & at the is not a factor in this incident.
time of incident
- 1.10. Loading, centre of : Empty weight = 6158.7 KG
gravity in Chief of Centre of gravity within limits.
Airworthiness and centre Loading is not a factor in this
of gravity, position at incident.
the time of incident and
commencement of flight

1.11. Airframe History

- 1.11.1. Flying time since : Time since new (TSN) = 56603-15
manufacture last hours. Landings since new =
overhaul and last 23408 time since Major check.
periodic check MID-OSM 6363-10 hours. Landing
since Major MID-OSM check
2546 hrs. Time since field
base check = 016-40 hrs.
- 1.11.2. Major part of a/c : Nose landing gear P/N-65-27501-3
component, failure S.NO.P-0896/75 (Steeple failure)
involved in this Appendix - 'B'.
incident P.No. &
S.NO.(Sketch)
- 1.11.3. History of nose : Covered in 17.17 of this
landing gear report.
- 1.11.4. Time since new : 24751 hours
- 1.11.5. Time since last : 8399 hours
Installation
- 1.11.6. Part No.& S.No.of : P-No.65-27147-LS.NO.2128
outer cylinder
- 1.11.7. Date of last : August, 1982
overhaul
- 1.11.8. Major work done at: Outer cylinder repaired/
overhauled by M/s.MENASCO
USA in August,1982
- 1.11.9. Date of Installa- : 30-02-1984
tion on aircraft
- 1.11.10.CAA approved
overhaul
Overhaul TBO : 15000 hrs
Removed for shop : 10000 hrs
check
- 1.11.11.Service letters/ : covered in 17.18 of this
service bulletins report
carried out during
C-7 checks on nose
landing gear
- 1.11.12.Name of part : Steeple Appendix 'C'
sheared of nose
landing gear outer
cylinder report
from Boeing Factory
- 1.11.13.Primary damage of : Appendix 'D'
NLG steeple failure
photos
- 1.11.14.Secondary damage : Appendix 'E'
report/photos
- 1.11.15.Defects reported : Appendix 'F' (Chapter-32)
on NLG gear/steer-
ing system for the
last 3 months.

- 1.11.16. Defects reported on the aircraft brakes for the last 3 months : Appendix 'F' (Chapter-32)
- 1.11.17. Any heavy landing reported or check carried out for the last 3 months : Appendix 'F' (Chapter-32)
Noted: Nil
- 1.11.18. Technical log defects history : Appendix 'G'

2. Crew Information:

2.1. Pilot-in-Command

- 2.1.1. Name : Mr.Mohammad Ghaisuddin Iqbal
- 2.1.2. Position in the cockpit : Left seat
- 2.1.3. Date of Birth : 30-11-1929
- 2.1.4. Type of lic & No. : ALTP Lic No.95
- 2.1.5. Medical date with status : 19-2-88 (fit for renewal of ALTP Lic by board. Subject to use of corrective glasses and restricted to fly in a dual controls aircraft only.
- 2.1.6. **Rating**
- 2.1.6.1.Type(s) held : B-707/720-B,F-27,Trident I.E.
- 2.1.6.2.Type(s)current: B-707/720-B
- 2.1.7. **Flying experience**
- 2.1.7.1.Grand total : 16,691.14
- 2.1.7.2.Total-in-command : 16,000.00
- 2.1.7.3.Total-in-command on the type on which incident occurred : 13,000.00
- 2.1.8. Where trained : PAF - PIAC
- 2.1.9. Position in cockpit : left seat

2.2. Co-Pilot

- 2.2.1. Name : Mr.Mohammad Jamil gill
- 2.2.2. Position in the cockpit : Right seat
- 2.2.3. Date of Birth : 15-5-1946
- 2.2.4. Type of Lic and No. : CPL No.449
- 2.2.5. Medical date with status : 7-3-88 (Fit for renewal of CPL subject to use of corrective glasses.

2.2.6. Rating

2.2.6.1. Type(s) held : GP-1, GP-11, C-150, C-206,
Piper Aztec, F-27, B-707/720-B

2.2.6.2. Type(s) current : B-707/720-B

2.2.7. Flying Experience

2.2.7.1. Grand Total : 2685 hrs

2.2.7.2. Total-in-
Command : 1876.40 hrs

2.2.7.3. Total as Co-Pilot on the
type on which
incident occurred : 1223.00 hrs

2.2.8. Where trained : M/s.PIAC

2.3. Flying Experience

2.3.1. Name : Mr.Khalid Javed

2.3.2. Position in the cockpit : Flight Engineer

2.3.3. Date of Birth : 20-12-1952

2.3.4. Type of Lic and No. : F/E Lic No.249

2.3.5. Medical date with
status : 24-12-1987 (Fit for renewal
of F/E Licence)

2.3.6. Rating

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

2.3.6.2. Type(s) current: B-707/720-B

2.3.7. Flying Experience

2.3.7.1. Grand total : 1474.00

2.3.7.2. Total as
Flight Engineer
on the type
on which incident
occurred : 1474.00

2.3.8. Where trained : M/s.PIAC

73.Summary of

3. Summary of Incident;

3.1. On 19th April, 1988 Boeing 707 aircraft bearing Nationality & Registration Marks AP-AXA belonging to Pakistan International Airlines was scheduled to operate flight No. PK-266 on Karachi - Dhaka sector. It was parked on bay No.14 at Karachi Airport. There were 3 cockpit crew, 6 cabin crew and 106 passengers and cargo on board.

3.2. The engines were started at scheduled time followed by push back using standard operating procedure. Cockpit to ground intercom was connected & in use for communication during towing/push back operation.

3.3. The aircraft was stopped on taxiway (E), after completion of push back with nose down lock pin installed as the chock was being placed in front of nose wheel and tow bar wheels were being extended, the aircraft nose landing gear collapsed suddenly in rearward direction with a big thud.

3.4. All 4 engines were immediately cut by the Pilot. There was no injury to any-one in the aircraft or on ground. There was no fire during or after the occurrence.

3.5. All passengers dis-embarked using passenger rear door through normal passenger steps.

4. Injury to Person(s)

4.1. None

5. Damage to Aircraft

5.1. Nose gear and frame in neighbouring area damaged. Details at appendix 'D' and 'E'.

6. Other Damage

6.1. Nil

7. Meteorological Condition

7.1. The weather was fair.

7.2. Weather is not a factor in this incident.

8. Navigational & Landing Aids

8.1. There were operating normal.

8.2. There were not a factor in this incident.

9. Communication

9.1. All radio facilities were serviceable.

9.2. There were not a factor in this incident

10. Aerodrome Ground Facilities

10.1. Adequate for operation of B-707 aircraft.

10.2. There were not a factor in this incident.

11. Flight Recorders

11.1. Flight Data Recorder was removed from the aircraft.

It's read out is attached as Appendix 'H' to this report. Indicates no heavy landing nor previously reported.

11.2. No information available regarding parking brakes application, instructions in C.V.R.

12. Wreckage & Impact Information

12.1. Not applicable.

13. Fire

13.1. No fire occurred during or after the occurrence.

14. Survival Aspects

14.1. It was as survivable incident.

15. Test & Research

- 15.1. Fractured steeple was hand carried to Seattle for metallurgical examination. Results conducted in the lab at Boeing confirms two cracks propagated by intergranular stress corrosion.
- 15.2. The cracks initiated at corrosion pit in the bore of hole drilled for heat treatment process during manufacture.
- 15.3. The fracture basically occurred as a result of this corrosion.
- 15.4. This failure is new to Boeing and Boeing will have to update to have this area inspected.

16. Observations

- 16.1. It was noted that the aircraft was parked 8 feet North of the taxiway centre line. This resulted in No.1 engine projecting on Kucha surface thus exposing it to ingestion of foreign object. Area along the taxiway was examined thoroughly. It was noted that it appears to be practice to tow the aircraft to this position. This explains the reason for the foreign object damage to M/s.PIA engines.
- 16.2. Tug Master PIA 524 operator Mr.Khalid Hussain P-14671 was detained on overtime after performing night duty. He was holding current apron driving permit and was medically fit. He has been engaged in towing of aircrafts for the past one year. It was noted that push back was not aimed to position the aircraft on centre line of the taxiway. Engine No.1 was projecting over Kucha exposing it to ingestion of foreign object. Maintenance personnel incharge, was not supervising the tow operator,

especially at the end of towing. Tug master 524 used is very powerful for push/pull for Boeing-707/B-737 aircrafts.

- 16.3. Tug Master No.524 involved in this incident was removed by M/s.PIA without prior approval of the Investigation Incharge. Position and serviceability could not be therefore ascertained by the investigating team. This aspect is considered very important.
- 16.4. Aircraft Technical Log book was also removed from the aircraft without prior permission of Investigator Incharge.
- 16.5. Pilot has pointed out in his report that he could not contact Karachi ATC due no transmission from aircraft on VHF or emergency VHF with battery switch ON. Maintenance after repairs has confirmed that the system was serviceable. During repairs it was not possible to check as electrical power remained disconnected.

17. Investigation:

- 17.1. The investigation team reached the place of incident at 0818 hrs. It was noted that the PIAC Maintenance Management, Corporate Safety Section Incharge, Chief of Airworthiness CAA and Controller of Airworthiness CAA had already arrived.
- 17.2. On 19th April, 1988, Boeing aircraft bearing Nationality and Registration Marks AP-AXA was scheduled to operate flight PK-266 from Karachi to Dhaka. The aircraft was parked on bay No.14 at Karachi Airport. The passengers had boarded and baggage Cargo had been loaded in the aircraft.

- 17.3. The engines were started on schedule. Tug Master No.524 was positioned after tow bar was attached to the nose wheel. Mr.Khalid Hussain P-14671 operated the Tug Master under instructions of Sr.Tech.(Engines) P-37023. Intercom had been connected for Radio Communication between ground party & cockpit, & for co-ordination purpose Mr.Hasan Akhtar AME No.1079, the duty Engineer was also present.
- 17.4. Push back finished after the aircraft had covered a distance of about 100 yards with nose wheel facing East on the taxiway. The nose ground safety pin was in position. When the chocks were being positioned in front of nose wheel by Cleaner Mr.Mohammad Shabbir P-3535 and tow bar wheels were being extended by Mr.Fida Hussain, Senior Technician (A/F) P-17162, the aircraft nose landing gear suddenly collapsed with a big thud. Nose landing gear shock strut assembly with wheels swung backward under-neath electronic access door. The tow bar connect/disconnect block remained stuck with the NLG tow collar. All 3 bolts were sheared from the main tow bar causing damage to the tow bar.
- 17.5. The Investigation Team examined nose gear area while it was resting on the taxiway. The examination revealed that the outer cylinder steeple fitting had fractured and completely separated from the outer cylinder. The aircraft front fuselage had settled on nose gear tyres.

- 17.6. It was seen that secondary damage had occurred from frame station 360 to frame station 460 and between stringers 25L and 25R, clam shell door, L-41 door, nose area pressure and return hydraulic tubings, all were damaged.
- 17.7. Before Investigating Team reached the place of incident, the Tug Master 524 had been removed from the place of occurrence. Position of Tug Master in relation to aircraft could not therefore be established. Serviceability status of Tug Master brakes/gears could not be checked. A very important source of evidence was therefore lost.
- 17.8. Statement of Pilot-in-Command and First Officer were handed over to investigator incharge at the airport. For cross examination they reported to the team after the flight/refresher course on 23-5-88 and 8-5-88 respectively. Concerned Flight Engineer reported and submitted his statement on the 25th April, 1988.
- 17.9. The Tug Master operator had submitted his statement on 19-4-88 and 24-4-88. The maint staff statement was obtained on 26-4-88. Corporate Safety section and TGS section personnel statement was recorded on 25-5-88.
- 17.10. On scrutiny of statements some conflict between statement of cockpit crew and ground maintenance staff was noted. Ground crew had stated that the pilot did put the parking brakes on. They have further stated that the nose landing gear collapsed when the chocks were being positioned and tow bar being disconnected while aircraft was stationary.

- 17.11. Cockpit crew has stated that the aircraft was slightly moving when nose gear collapsed. The maintenance personnel have confirmed aircraft was stationary when nose gear collapsed.
- 17.12. Recording of cockpit voice recorder is not clear. Hence parking brake position can not be confirmed. The parking brake lever was found in the off by the investigation team after the incident.
- 17.13. After occurrence the flight crew tried to establish contact with tower on VHF/RT with battery switch in on position. No contact could be made, M/s.PIA could not confirm the snag, as electrical power remained off during repairs. But there was no previous report.
- 17.14. Due to airline schedule, the flight crew was not available for collection of additional information till 23-5-88.
- 17.15. Aircraft Technical log book was not traceable in the cockpit. The duty engineer had also no knowledge of this document. Technical service section brought it from the maintenance hangar for production before the investigation team.
- 17.16. Before the investigation team reached the place of incident, Tug Master PIAC No.524 was not traceable near scene of occurrence. It was produced after lapse of one hour. Statements of General Manager Corporate Safety, Safety Officer, Manager Operations TGS and Manager Maintenance TGS were recorded. No one has accepted responsibility of removing this Tug Master.

17.17. Details of the failed Nose Landing gear

- Nose landing gear complete assy part number 65-2750-3.
- S.NO.P-0896-75 TSO/TSI 8399 hrs.
- Outer Cylinder of the assy part No.65-27147-1 bearing S.No.2128.

The landing gear since new had accumulated 24,751 hours. All modifications had been embodied and during this period this nose landing had been overhauled three times. The landing gears has a life of 15,000 hrs between the overhauls and are due for shop check after 10,000 hrs. This assy was last overhauled in August,1982. Reason for removal was pitting on the outter cylinder inner bore. Since this was beyond the scope of local repair facilities, the same was sent to M/s.MENASCO U.S.A. Nose gear was installed on AP-AXA in 1984 and manufacturers recommendation including ultrasonic inspection as per 3218 had been carried out.

17.18. Following cards pertaining to nose gear area and nose landing gear were accomplished during C-7 checks grounding of aircraft:-

Card No.	1022-2	- Nose section inspection.
"	1052-2	- Nose gear lubrication.
"	2200-2	- Nose section inspection.
"	2452-2	- Nose gear shock strut servicing.
SB	3005-2	- Nose section special item.
SB	3150-2	- Nose landing gear lock actuator.
SL	32-10	- Nose gear outer cylinder Dye Penetrant and Ultrasonic inspection.
SB	3427-2-	- Nose wheel-well pressure web inspection.

17.19. SL-707 SL-32-10 concerning nose landing gear outer cylinder material discrepancies was published in 29 June 1982 by Boeing Company after several reports of cracking of 707/720 NLG outer cylinder made of 7079 Al-alloy. The nose gear on AP-AXA, which failed, is of P/N 65-27147-1 and of 7079 Al-alloy. This material is one of the earliest forgings and had a history of susceptible to corrosion.

17.20. The failure which occurred in the above incident was at a point not known to Boeing Airplane Company earlier. Therefore, a specific inspection at this location was called for.

18. Witnesses

Statements of the following witnesses are attached to this report:

18.1. Capt.Ghaisuddin of PIAC	App 'K'
18.2. F/O Jamil Gil	App 'L'
18.3. F/E Khalid Javed	App 'M'
18.4. AME Mr.Hasan Akhtar	App 'N'
18.5. Sr.Tech.Mr.Fida Hussain	App 'O'
18.6. Sr.Tech. Mr.Khalid Farooq Ahmed	App 'P'
18.7. Aircraft Cleaner Mr.M.Shabbir	App 'Q'
18.8. Tug Master Operator Mr.Khalid Hussain	App 'R'
18.9. G.M.Corporate Safety Air Cdre (Rtd) M.Choonara	App 'S'
19.10. Safety Officer Corporate Safety Mr.Atiq ahmed Khan	App 'T'
18.11. Manager Ops.T.G.S Mr.Sarwar Shad	App 'U'
18.12. Manager Maint.TGS Mr.Fazal M.Khan	App 'V'

19. Discussion of Evidence

- 19.1. The aircraft had arrived after operating flight No. PK-268/269 on Karachi - Khatmandu - Karachi sectors. No snag was reported by the flight crew concerning nose landing gear system. Before releasing aircraft for this flight, Maintenance Engineering had carried turn-around checks. They had not found any abnormality, including nose landing gear, on this aircraft.
- 19.2. History of previous snag was also studied. There was no pilot reported maints report(s) (Chapter-32) which could point out to the failure of steeple area. No heavy landing has been reported or indicated in the read out of the flight data recorder.
- 19.3. Scrutiny of statements given by flight crew and maintenance personnel, indicates non-coordination between them with regard to operation of parking brakes. Maintenance and First Officer have stated that parking brakes were set in on position by the Captain. While Captain and Flight Engineer state, nose landing gear collapsed during turn whilst the aircraft was still slightly moving and parking brakes were not engaged. They have further stated they did not receive any instructions from ground engineering staff to this effect.
- 19.4. Failed parts were sent to the manufacturer for tests. Report has been received (App-'C'). The manufacturer have concluded that the failure occurred due to "Intergranular Stress corrosion in the steeple". The operating crew/maintenance personnel can not therefore be blamed for this failure.

19.5. This failure was new to Boeing Airplane Company and the Industry. The manufacturer had made no decision till 24th June relative to adding additional inspections. However they anticipate their review to conclude by 25th August, 1988. They will advise M/s.PIAC the status of the review formalizing inspection on or before 25th August, 1988.

20. Findings

- 20.1. The aircraft was Airworthy and properly certificated for flight.
- 20.2. The flight crew were medically fit, properly licenced and held valid licences/rating to operate B-707 aircraft.
- 20.3. The aircraft was correctly refuelled and properly loaded with passengers and cargo for the subject flight. The C.G position and take-off weight were with-in-limits.
- 20.4. Nose landing gear down lock pin was installed.
- 20.5. Parking brake lever in cockpit was in off position.
- 20.6. Tow bar broken and pieces lying all around near the nose wheel.
- 20.7. The flight crew adopted proper technique to shut off all four engines immediately after the collapse of nose landing gear at the end of push back.
- 20.8. Aircraft was parked in-correctly on the centre line of taxiway at completion of push back operation, No.1 engine was projecting over Kucha surface.

- 20.9. CAA Fire tenders reached within 30-40 seconds after the nose landing gear collapsed.
- 20.10. The passengers disembarked through rear passenger door using passenger steps.
- 20.11. There was no injury to any one on board nor there was any fire during or after this incident.

21. Cause

- 21.1. Nose landing gear collapse occurred because of material failure under load.

22. Recommendations

- 22.1. M/s.PIA must issue warning to person(s) responsible for
 - i. removal of technical log book from the a/c
 - ii. removing tug master from the scene of accident without authorisation.
- 22.2. M/s.PIA to arrange for tug master/towing tractor to have adequate horse power or pull force commensurate with size of aircraft being towed (B-707, B-737 especially).
- 22.3. M/s.PIA must ensure not to detain operators on over time for such exacting operation.
- 22.4. M/s.PIA Corporate Safety section must carry out routine visit to TGS, Workshop, for checking condition of equipment and proper functioning.
- 22.5. M/s.PIA to carryout immediate planning of discarding nose landing gear outer cylinder of 7079 material and having these replaced by 7075 or other modified recommended material by the manufacturers.

22.6. M/s.PIA to follow instruction of Boeing Company to carryout inspection at regular intervals of nose landing gear and steeple areas.



APP. 'D',



APP D₂



APP "E₂"



APP. "E₃"



APP. E4



APP. E5



★ APP E6



APP E-7

