

ORIGINAL

HQ CAA / 1901/135/AIB



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CIVIL AVIATION AUTHORITY

AIRCRAFT INCIDENT INVESTIGATION

A - 300 AP - BBA

WHICH OCCURRED ON
16TH JULY 1991

AT

QUAID-E-AZAM INT'L AIRPORT

CIVIL AVIATION AUTHORITY
KARACHI, PAKISTAN

AIRCRAFT ACCIDENT INVESTIGATION REPORT

INCIDENT TO PIAC AIRCRAFT A-300 AP-BBA
WHICH OCCURRED ON 16TH JULY 1991
DURING TAKE-OFF FROM QUAID-E-AZAM
INT'L AIRPORT KARACHI

AUTHORITY Director General, Civil Aviation Authority Memorandum
No. HQCAA/1901/135/AIB dated 16th July 1991.(Appendix 'A')

COMPOSITION OF INVESTIGATION TEAM

- | | | |
|-----|--|------------------------|
| (a) | Mr. Abdul Basit
Chief Inspector &
President A.I.B. | Investigator-in-Charge |
| (b) | Mr. Mohammad Ali Siddiqui
Ops. Investigator | Investigator |
| (c) | Mr. Ghulam Murtaza
Controller of Airworthiness | Investigator |
| (d) | Capt. M.Saleem
Chief Pilot Technical
M/S. P.I.A.C., Karachi. | Co-opted Member |

1. AIRCRAFT INFORMATION

1.1. Registration Marking	AP-BBA
1.2. Aircraft type and Maker's Sl. Nos.	A-300-B4 S/No. 114
1.3. Engine types, airframe Positions & maker's S.No.	CF-6/50/C2 No. 1 S/N. No. 2 S/N.
1.4. Certificate of registration No. and validity.	No 550 (Rev-I) Permanent
1.5. Certificate of Air- worthiness No.& date of expiry & flight manual No.	No. 503 valid upto 17.8.91
1.6. Certificate of safety date and time (GMT) of issue and period of validity	31.1.91 at 1400 Hrs. C of M till-29870-36 Hrs.
1.7. Date of construction of airframe.	1980
1.8. Name and address of owner	PIAC, QIAP Karachi.
1.9. Gross Weights Maximum Permitted by C. of A of this flight, at the time of accident.	165000 Kgs. (C of A) 141572 Kgs.

- 1.10. Loading Centre of gravity limits in C. of A. and centre of gravity position at the time of accident and commencement of flight. 26.2
Limit 18-33.
- 1.11. Airframe history. (Give flying times since manufacture, last overhaul and last periodic check. List also essential modifications completed TSN: 29633-92
TSO: 9501 (16-4-88).
Last check 'A' 29557 (6-7-1991).
- 1.12. Engine history. (Give flying time since manufacture, last overhaul and last periodic check. List also essential modifications completed). No.1 455339 TSN:33942-48
TSI: 11-00
- 1.13. Accessory history. (Give details of operating life and operating A/C time since manufacture and operating time since manufacture and overhaul). TSN: 29633-32 Hrs.
TSO: 9501 Hrs.
- 1.14. Defects. (List and remark any technical defects in airframe engines or accessories, discovered during investigation). See paras 4.1 to 4.7

2. CREW INFORMATION

2.1. PILOT-IN-COMMAND

2.1.1. NAME : FARRUKH NAQI MIRZA

2.1.2. Position in the Cockpit: Captain

2.1.3. Date of Birth : 04.06.1945

2.1.4. Type of Licence and No : ALTP No. 415

2.1.5. Medical date with status : 30.1.91 fit for
renewal of ALTP
licence subject to
use of corrective
glasses.

2.1.6. RATING

2.1.6.1. Type(s) held : P-I = F-27, B-707/
B-720 and A-300
P-II F-27, B-707/ B-
720 and B-747

2.1.6.2. Type current : A-300

2.1.6.3. Assist/Flight: NIL
Instructor
Rating

2.1.6.4. Flt. Engineer: NIL
Inst. Rating

2.1.6.5. Check Rating : NIL

2.1.7.FLYING EXPERIENCE

2.1.7.1. Grand Total : 9236.54

2.1.7.2. Total in : 4319.00
Command

2.1.7.3. Total in : 2534.00
Command/Co-
Pilot/Flight
Engineer on
the type
accident/
incident
occurred

2.1.8.Where trained : PIA

2.2. CO-PILOT

2.2.1.NAME : SHUJA AHMED RIZVI

2.2.2.Position in the Cockpit : Co-Pilot

2.2.3.Date of Birth : 29.09.1956

2.2.4.Type of Licence and No : CPL No. 1037

2.2.5.Medical date with status : 09.04.1991 Fit

2.2.6.RATING

2.2.6.1. Type(s) held : Piper Cherokee,
C-152, F-27 B-737.

2.2.6.2. Type current : Airbus A-300

2.2.6.3. Asst/Flight : Nil
Instructor Rating

2.2.6.4. Flight Engineer : Nil
Instructor Rating

2.2.6.5. Check Rating : Nil

2.2.7.FLYING EXPERIENCE

2.2.7.1. Grand total : 5922 Hours on 9.4.91

2.2.7.2. Total-in-command : 265 Hours

2.2.7.3. Total Co-Pilot/ : 912 Hours
Flight Engineer on
the type accident/
incident occurred

2.2.8.Where trained : PIA

2.3. FLIGHT ENGINEER

2.3.1.NAME : M. MUNNAWAR NADIR

2.3.2.Position in the Cockpit	:	Flight Engineer
2.3.3.Date of Birth	:	25.12.1951
2.3.4.Type of Licence and No.	:	A-300 Licence No.194
2.3.5.Medical date with status	:	6.11.90 (Fit for Renewal) F/E Lic.
2.3.6. RATING		
2.3.6.1.Type(s) held	:	B-707/720-B
2.3.6.2.Type current	:	A-300 (Airbus)
2.3.6.3.Assist/Flight Instructor Rating	:	Nil
2.3.6.4.Flight Engineer Instructor Rating	:	Nil
2.3.6.5.Check Rating	:	Nil
2.3.7.FLYING EXPERIENCE		
2.3.7.1.Grand total	:	6318.00
2.3.7.2.Total in command	:	
2.3.7.3.Total in command/Flt.: Engr. on the type accident/incident occurred.	:	564.00
2.3.8.Where trained	:	PIAC

3. SUMMARY

3.1. PIAC Airbus A-300 AP-BBA was on take-off at Karachi for Islamabad operating flight PK-308. During take-off roll immediately after crossing V_1 complete core cowling of No. 2 engine dislocated and flew off. The Pilot felt vibrations but decided to continue with the take-off. After take off check list was completed the Captain asked ATC to inspect the runway for tyre pieces as he suspected a tyre burst during take-off roll. ATC informed the aircraft of the cowling found on the runway. The Flight Engineer confirmed the difference in nacelle temperature of both engines which made the Pilot decide to land back at Karachi. In the mean time the runway got blocked due to another Airbus incident. The aircraft finally landed safely after holding for 1:30 hrs. The Pilot's decision to continue the take-off after V_1 was in order and was as per laid down SOP in PIAC flight operation manual. The Pilot handled the emergency well, and followed every step as per the requirement and the laid down procedures, he however failed to report to CAA for investigation. Instead without prior approval from CAA operated PK-308 on a different aircraft. For this the licence of the crew was suspended but restored after a warning was issued to them.

3.2. Preliminary investigation showed that the hooks provided on core cowl latches, to keep them in locked position were found broken on the latches of AP-BBA. This short coming can give rise to opening of latches resulting in opening of the cowling. It was therefore,

required by CAA that latch locking mechanism on all the Airbus A-300 aircraft be checked.

- 3.3. Airbus A-300-57-165, covered by French AD. No. 90-222 - 116(b) calls for periodic inspection of (Nacelle Pylon) Rib-6 Skin panel L and R and second core cowl fitting. During investigation the failure of this area was revealed on AP-BBA aircraft.

4. INVESTIGATION

- 4.1. Both the halves of No. 2 engine cowlings had detached from the aircraft and had fallen on the runway during take-off.
- 4.2. Locking mechanism of front latch (two halves of the cowlings are locked at the bottom by 3 latches) was found broken. The locking mechanism of the latch consists of two small hooks engaging with two pins on the latch shaft. One hook and opposite side pin were found broken. Thus the front latch was not locked.
- 4.3. Locking mechanism of rear latch was found partly broken (One of the two locking hooks was broken).
- 4.4. Middle latch was found to be engaged after the incident.
- 4.5. Skin at I/B, side of No. 2 pylon was found ripped at Rib No. 6.

- 4.6. L/H cowl forward and middle hinge fittings were missing and were found alongwith the cowling which fell off the aircraft.
- 4.7. Airbus Service Bulletin No. A300-71-027 dated 2nd April 1981, requiring installation of shear pins on engine core cowl latches, to minimise the possibility of latch opening, was not found embodied on the cowling.
- 4.8. Maintenance Card No. 540001-2 under which pylon skin at Rib 6 (forward attachment of core cowling) and second core cowl fitting are inspected (during alternate 'A' check) in accordance with Airbus Service Bulletin No. A300-54-066(RI) (AD No. 90-222-116(B) was carried forward, from last due check (check A-08 dated 4th July 1991), by the assigned AME.
- 4.9. Card No.540001-2(covering compliance with AD No. 90-222-116(B) was not scheduled by PIA Technical Record Section in the preceding check (check 'A' of 26th April 1991) .
- 4.10. Card No. 540001-2 (coverin compliance with AD No. 90-222-116(B) was not readable.
- 4.11. There was shortage of manpower in Technical Record Section due to retirement/prolonged sickness of senior persons. The management did not replenish the manpower. "Daily Wage" Staff was employed in the Section who had

been preparing maintenance check packages. Regular staff was not cross checking if the check package cards prepared by the temporary staff were in accordance with the prescribed bill of work.

5. **OBSERVATIONS**

5.1. Aircraft parts are cannibalized from parked aircraft for maintenance of urgently required aircraft without making proper entries in aircraft records.

5.2. In General following shortcomings were noticed in maintenance work sheet/cards:-

5.2.1 Registration numbers of aircraft were not recorded on many work sheets/cards.

5.2.2. Serial number of the periodic check was not indicated.

5.2.3. Serial numbering of papers for maintenance check cards/package was not reliable.

5.2.4. Quality of printing/copying of maintenance cards was poor and a number of cards were not readable.

5.2.5. The cards were not segregated according to the category of AME licence/approval under which the same were to be rectified.

6. DISCUSSION OF EVIDENCE

- 6.1. LOCKING OF CORE COWLING The originally designed locking mechanism of the core cowling had certain shortcomings due to which cases of forward latch opening or damage to the core cowling, resulting from weakness in the latching system, were reported in the industry. Accordingly the manufacturer issued some Service Bulletins for introducing modifications to supplement the original locking system.
- 6.2. Airbus Service Bulletin No. A300-71-027 dated 2nd April 1981 (Appendix-M) required installation of shear pins on each latch, which prevents opening of forward latch by preventing the decay in latch closing force caused by cowling vibrations. It was noted that the aforementioned **Service Bulletin had not been incorporated on No. 2 engine cowling.** Thus the latch locking force had been diminished. This Service Bulletin is not mandatory but all other cowlings installed on A-300 fleet were found modified as per the S.B.
- 6.3. 19 Instances were reported on DC-10 aircraft, where core cowl doors were lost or damaged in flight. The investigations by the manufacturer attributed the loss or damage to the cowl doors to improper engagement of the core cowl forward latch. The manufacturer also concluded that:-

"Improper latch engagement may be caused by a damaged latch that appears to be in the over-centre or lock position even though it may not be properly engaged."

- 6.4. As such installation of secondary latching system was introduced, vide DC-10 Service Bulletin No. 71-142. This Service Bulletin was also adopted by Airbus industries (Same engines are installed on DC-10 and A-300 B4 Aircraft) and was covered under their Service Bulletin No.A300-71-053 (Appendix 'O'). In view of the significance of this modification, the French Airworthiness Authorities classified it as mandatory through their Airworthiness Directive No. 87-132-082(B) RI dated 10th November 1987 (Appendix'N') last date for compliance with the Airworthiness Directive was 30th September 1988. (Compliance with French Airworthiness Directives is mandatory on Pakistan Registered Aircraft, manufactured in France).
- 6.5. The above mentioned modification required installation of a locking bolt at forward latch of the cowling to prevent opening of the core cowling in the event of failure of forward latch. This lock bolt was found missing on this cowling.
- 6.6. Locking mechanism of front latch was found broken (The locking mechanism of the latch consists of two small hooks engaging two pins on the latch shaft). One hook and opposite side pin were found broken as such slight vibration could cause the front latch to open. Close

inspection of the broken pin indicates that it had failed much earlier. Minute inspection of the broken portion of locking hook reveals that major portion of the hook had an old failure and the remaining portion had a fresh failure, thus indicating that at the time of departure of the aircraft the front latch was in latched configuration and the portion of hook which was engaged with the pin broke during take-off. More over it was confirmed through physical Test that the latch may adopt the latched position even with the locking hook/pin broken but gets disengaged on slight disturbance. As such latch opening could have taken place even if the same was apparently latched prior to departure of the Aircraft. In fact this is in line with the DOUGLAS findings which states that:-

"Improper latch engagement may be caused by a damaged latch that appears to be in the over-centre or locked position even though it may not be properly engaged."

- 6.7. In view of the above it is concluded that the front latch was initially disengaged and due to absence of secondary latching mechanism forward portion of the cowling was lifted by the huge volume of fan air. As second latch was properly engaged, the two halves of the cowling remained connected at that location and lifting of forward portion of the cowling resulted in rupturing the same. After the cowling had disengaged at the bottom, its flaping movement caused breakage at the hinge points. The front attach fitting had broken from

the pylon skin which is prone to develop cracks, but in any case cyclic flapping of the cowling had to ultimately cause its breakage at the upper attach points.

7. **COMPLIANCE WITH FRENCH AD NO. 87-132-082(B)RI**

7.1. PIA had modified their cowlings in accordance with French AD No. 87-132-082(B)RI (Airbus A-300 SB No. A300-71-053). However, appropriate inspections were not introduced to check the presence of secondary latching system introduced vide the aforementioned A.D. As such No. 2 engine cowl of AP-BBA got demodified due to falling away of locking bolt. After this incident, cowlings installed on A-300 fleet were inspected and it was revealed that the secondary latching system was missing on most of the cowlings and thus other aircraft were also exposed to the same risk. This incident has highlighted the need for introducing a reliable system for tracking the compliance of mandatory modifications. The following immediate action has been taken:-

7.1.1. All the missing parts, in relation to core cowl secondary latching system required vide AD No.87-132-082(B)R/1, were provided on A-300 fleet. Confirmation to this effect was submitted by PIAC.

7.1.2. In order to ensure continuing Airworthiness of other aircraft, PIA was asked to ascertain the current status of their aircraft (all

types) in respect of compliance with all mandatory modifications. In response to that PIA have checked the status of their aircraft in respect of most of the modifications and remaining are being checked in next due 'A' or 'B' checks.

7.1.3. Thorough inspection of cowling latches has been included in every 'A' check falling due after every 350 flying hours.

7.2. DEFERING OF SCHEDULED TASKS Maintenance Card No. 540001-2 introduced for compliance of AD No. 90-222-116(B) in accordance with Airbus S.B. No. A-300-54-066(R 1), was scheduled in the work package of 'A-08' check dated 4th July 1991, but the requisite inspection was not performed during this grounding of the aircraft. The engineer carried forward the inspection after consulting his shift incharge. PIA has not prescribed, in writing, the procedure to be followed while carrying forward an inspection. The shift incharge Mr. T.H. Qureshi has mentioned in his statement that he advised the assigned AME to enter "**CARRIED FORWARD**" on the inspection card which was followed by the AME, before releasing the aircraft. Mr. T.H. Qureshi has also mentioned in his statement that entry made regarding carrying forward the inspection was in accordance with the practice followed in Line Maintenance II. However, Mr. Akhtar Ali, Technical record officer has mentioned in his statement that:-

"If a task card from Check sheet/Pkg is carried forward for the remaining hrs. The engineer makes a separate entry in continuation sheet as n/a declaring a definite time for these items and the same is reproduced by Tech. Asst/Insp. Officer".

- 7.3. The two procedures were contradictory hence Mr. Laeeq-ur-Rehman present CE (QC) was requested to furnish the correct procedure to be followed in such cases. The procedure furnished by Mr. Laeeq is placed at (Appendix 'K') Mr. Laeeq has also mentioned in his letter that he had not been able to locate proper procedure for use of form on deferred scheduled tasks.
- 7.4. The above details indicate that PIA did not have proper prescribed procedure for deferred scheduled maintenance tasks. However Mr.M.Siddiqui Niazi followed the procedure as advised by his shift incharge Mr.T.H.Qureshi. In spite of confusion regarding proper procedure to 'carry forward' an inspection card, the assigned engineer and the shift incharge should have checked the relevant records to ascertain if deferring of the relevant card was permissible as per the limits prescribed by the manufacturer. Moreover they should have made an appropriate entry, in the records, to ensure that the deferred job be positively performed within stipulated period. Unfortunately Mr.T.H.Qureshi has expired.

7.5. Maintenance tasks are performed by production engineers working in different shifts. The individual AMEs certify the work performed by them during the 8 hours of their duty only. The aircraft is released from the Base check by Engineers working in the last shift. Tech. clerks of Technical Record Section were deployed to check that all the scheduled cards were appropriately actioned. By virtue of being very Junior as compared to Aircraft Maintenance Engineers, the technical clerks were not in a position to get the deficiencies corrected prior to release of the Aircraft. As such it is considered necessary that Senior Persons, preferably Quality Control Engineers, should be assigned to check positive certification of all the due tasks.

8. FINDINGS

8.1. Secondary latching system (installation of a bolt to lock two halves of the core cowling), required vide French AD No.87-132-082(B)R/1, to prevent opening of core cowling in the event of failure of forward latch, was found missing.

8.2. Locking mechanism of front latch (two halves of the cowling are locked at the bottom by 3 latches) was found broken. The locking mechanism of the latch consists of two small hooks engaging with two pins on the latch shaft. One hook and opposite side pin were found broken. Thus the front latch was not locked.

- 8.3. Airbus Service Bulletin No.A-300-71-027 dated 02.04.81, requiring installation of shear pins on engine core cowl latches, to minimise the possibility of latch opening, was not found embodied on the cowling.
- 8.4. Locking mechanism of rear latch was found partly broken (one of the two locking hooks was broken).
- 8.5. Middle latch was found engaged after the incident and falling of the cowling.
- 8.6. Maintenance Card No.540001-2 under which pylon skin at Rib 6 (forward attachment of core cowling) and second core cowl fitting are inspected (during alternate 'A' check) in accordance with Airbus Service Bulletin No.A-300-54-066(R/1) (AD No.90-222-116(B) was carried forward, from last due check (Check A-08 dated 04.07.91), by the assigned AME.
- 8.7. Card No.540001-2 (covering compliance with AD No.90-222-116(B) was not scheduled by PIA technical record section in the preceding check (Check 'A' of 26.04.91). As such this inspection was missed on two consecutive occasions.
- 8.8. Card NO.540001-2 (covering compliance with AD No.90-222-116(B) is not readable. As such, the AMEs performing the inspection can not make proper decision as required by the Service Bulletin.

- 8.9. Tech record staff did not get the carried forward card recorded as pending job and aircraft was released for normal operation.
- 8.10. Development engineering section of PIAC maintains records pertaining to compliance with mandatory modifications (including Airworthiness directives Service Bulletins etc). But in case of mandatory modifications requiring repeat inspections, the compliance status of effected aircraft is not fed back to Development engineering section. As a result, compliance with such requirements is not properly monitored.
- 8.11. Development engineering section which is responsible for preparation of maintenance schedule does not get a positive feed back regarding Master index card to include all the required tasks.
- 8.12. In general following shortcomings were noticed in maintenance work sheets/cards.
- 8.12.1. Registration number of aircraft was not recorded on many work sheets/cards.
 - 8.12.2. Serial number of the periodic check was not indicated.
 - 8.12.3. Serial numbering of papers for a maintenance check cards/package was not reliable.

- 8.12.4. Quality of printing/copying of maintenance cards was poor and a number of cards were not readable.
- 8.12.5. The cards were not segregated according to the category of AME Licence/approval under which the same were to be rectified.
- 8.13. There was shortage of manpower in Technical record section on retirement/prolonged sickness of senior persons the management did not replenish the manpower. 'Daily Wage' staff was employed in the section who had been preparing maintenance check packages. Regular staff was not cross checking if the check package cards prepared by the temporary staff were in accordance with the prescribed bill of work.
- 8.14. Aircraft parts are cannibalized from parked aircraft, for maintenance of urgently required aircraft, without making proper entry in aircraft records.

9. **CAUSE**

- 9.1. Primary cause of the cowling failure is de-modification of cowling in relation to French AD No.87-132-082(B)/R/1, complete failure of locking mechanism of its front latch and non existence of shear pins required vide Airbus SB No.A-300-71-027 dated 2.4.81. Moreover non-inspection of pylon inaccordance with French AD No.90-222-116(B) further aggravated the failure process.

10 RECOMMENDATIONS

- 10.1. PIA should, introduce a reliable system for checking compliance with the mandatory modifications, on the basis of which CE(QC) should annually furnish a certificate confirming that none of the incorporated modifications has been demodified.
- 10.2. No maintenance task should be carried forward from Base Checks. Where inspection frequency permits deferring of certain tasks, it should not be left to the discretion of assigned AME, rather it should be evaluated by the section which had introduced that task. PIA should introduce a proper procedure for this purpose wherein responsibility of involved persons should be clearly defined.
- 10.3. System for preparing master card for Base Check and compiling of the base check work package should be re-organized to ensure that none of the due tasks is missed.
- 10.4. Only regular and properly trained staff be deployed in Technical Record Section, Manpower requirement of the section be reviewed and responsibility of each functionary be clearly spelled out.
- 10.5. Quality Control Engineers of PIA should ensure that all the scheduled tasks are appropriately certified prior to release of an aircraft from Base check.

- 10.6. Whenever a component is cannibalised from an aircraft, an appropriate entry, pertaining to this effect should be made in tech log book of that aircraft so that the same is positively re-installed prior to release of the aircraft for flight.
- 10.7. Master index for periodic checks should be controlled through computer and it would be more appropriate if this function is performed by Development engineering section who are responsible for preparing maintenance schedules and adding different tasks in individual checks, Moreover all Master indexes should be periodically reviewed for currency.
- 10.8. The cards introduced for compliance of mandatory modifications should have different colour coding and on the top of the work sheet 'AD' should be printed on each card.
- 10.9. Quality control section of PIA Engineering should monitor maintenance activities performed in line maintenance section. Specially work performed during periodic checks should be closely monitored.
- 10.10. PIA should review all maintenance cards to check clarity of information contained in the same. The cards of a periodic checks should be segregated according to the categories of AME under whom these are certified. Registration number of aircraft should be indicated on each card. All cards of a periodic check package should be given proper serial number.

- 10.11. The aircraft maintenance engineers should be provided refresher courses to keep them current on aircraft systems, latest modifications, current defects/developments etc.
- 10.12. Until a person is trained on basic maintenance practices and has obtained training on specific equipment, he should not be deployed in the capacity of aircraft technician.
- 10.13. Mr.M.Siddique Niazi AME No.668 be warned for carrying forward Card No.540001-2 on AP-BBA, during A-08 check date 04.07.91, without properly evaluating the repercussions and also for failure to make appropriate entry regarding re-scheduling the relevant inspection within the due interval.
- 10.14. Action under the CAR 1978 be taken against Mr.S.N.A.Naqvi, Manager Technical Record Section and Mr.Mohsin Ali Meerza, the then Chief Engineer Quality Control being overall incharge, for non compliance with French AD No.90-222-116(B) (Para No. 4.8); due to
pancies in Technical Record Sec