

ORIGINAL

NO. HQ CAA/1901/161/AIB



سول ایوی ایشن اتھارٹی

CIVIL AVIATION AUTHORITY

AIRCRAFT INCIDENT INVESTIGATION

F-27 AP-BDS

WHICH OCCURRED ON

26TH SEPTEMBER, 1993

AT

QUAID-E-AZAM INT'L AIRPORT



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QUAID-E-AZAM INT'L AIRPORT

CIVIL AVIATION AUTHORITY
KARACHI, PAKISTAN

AIRCRAFT INCIDENT INVESTIGATION

WHEEL FELL-OFF INCIDENT OF PIA FOKKER (F- 27)
AP BDS ON 26-9-93 DURING TRAINING FLIGHT
AT QUAID-E-AZAM INT'L AIRPORT

Authority: Director General Civil Aviation Authority
Memorandum No.HQ.CAA/1901/161/SIB dated 2nd
October, 1993.

COMPOSITION OF INVESTIGATION TEAM

- | | | |
|-----|--|------------------------|
| (a) | Wg Cdr (Retd) Sajjad Ahmed
Technical Investigator CAA | Investigator-in-Charge |
| (b) | Mr.Muhammad Ali Siddiqui
Ops.Investigator | Investigator |

1. AIRCRAFT INFORMATION

- | | | |
|--|---|------------------|
| 1.1. Registration Marks | : | AP-BDS |
| 1.2. Aircraft type and
maker's Sl.No. | : | F-27 S.No. 10133 |

- 1.3. Engine types, airframe : R.R.Dart 532-7E
positions and maker's No.1 S/N 13323
Sl.Nos. No.2 S/N 13365
- 1.4. Certificate of Reg.No. : No.618 permanent
and validity.
- 1.5. Certificate of Airworthi-: No.571 valid upto
ness No. and date of 18-3-94
expiry, and flight manual
No.
- 1.6. Certificate of Safety : C of M signed on 21-9-93
date and time (GMT) of at 0500 hrs valid for
issue and period of 21 days/125 hrs.
validity.
- 1.7. Date of construction : 5-10-1959
of airframe.
- 1.8. Name and address of Owner: PIA, QIAP, Karachi
- 1.9. Gross Weights. Maximum : 36178 Lbs
permitted by C of A for
this flight, at the time
of incident.

- 1.10. Loading. Centre of : 29.8%
gravity limits in C of A
and centre of gravity
position at the time of
incident and commencement
of flight
- 1.11. Airframe history. (Give : Total A/F hrs 68791-56
flying times since manu- on 26-9-93 Chk "D"
facture, last over haul 66072-30 on 17-5-92
and last periodic check. Chk "A" 68749 on 25-9-93
- 1.12. Engine history. (Give : No.1: 13323 No.2: 13365
flying time since manu- TSN 34171-40 33521-58
facture, last over haul TSO 3469-27 4481-28
and last periodic check. TSI 685-48 276-48
- 1.13. Accessory history. : As per approved Maint.
(Operating life and schedule.
operating time since
manufacture and over haul.
- 1.14. Defects. (List & remarks : Port Mlg.
upon any technical defects
in airframe engines or
assessories, discovered
during investigation).

2. CREW INFORMATION

2.1. Pilot-in-Command

2.1.1. Name : Salahuddin

2.1.2. Position in the cockpit : Captain

2.1.3. Date of Birth : 8-5-1958

2.1.4. Type of Lic and No.: ALTP NO.744

2.1.5. Medical date with status : 18-3-93 Fit for renewal of ALTP Lic.

2.1.6. Rating

2.1.6.1. Type(s) held: C-172, F-27, B-707/720B
B-737 and A-300

2.1.6.2. Type current: F-27

2.1.7. Flying Experience

2.1.7.1. Grand Total: 6607.00

2.1.7.2. Total-in- command : 1102.00

2.1.7.3. Total-in- command on the type incident occurred : 1102.00

2.2. Co-Pilot

2.2.1. Name : Shams Qureshi

2.2.2. Position in the : Cadet Pilot (Trg)
cockpit

2.2.3. Date of Birth : 25-5-1964

2.2.4. Type of Lic and No.: CPL No.1616

2.2.5. Medical date with : 14.4.93 (CPL Standard)
status

2.2.6. Rating

2.2.6.1.Type(s) held: Cessna-172

2.2.6.3.Type current: Cessna-172

2.2.7. Flying Experience

2.2.7.1.Grand Total : 387 hrs

2.2.7.2.Total-in- : 312.1 hrs
Command

2.2.8. Where trained : FAA/PIAC

3. SUMMARY OF INCIDENT

3.1. PIAC Fokker (F-27) aircraft registration No. AP-BDS while flying a training mission on 26th September, 1993 experienced an incident at about 2130 hours PST in which its left outer main wheel fell-off during take-off. Soon after take-off ATC received a message from ASF that one of their guard near the fence had reported that something had fallen from the aircraft. The Captain was informed who confirmed that left outer main wheel was missing. Subsequently, the aircraft landed safely. During post flight inspection metallic burs were found accumulated in the axle. Except for inboard bearing grease cover, retaining circlip and wheel spacer rest of the parts alongwith the main wheel were missing. The wheel was recovered 50 feet outside the airport fence.

4. INJURY TO PERSON(S)

None

5. DAMAGE TO AIRCRAFT

None

6. OTHER DAMAGES

None

7. METEOROLOGICAL CONDITION

Not relevant

8. NAVIGATION & LANDING AIDS

Not relevant

9. COMMUNICATION

Not relevant

10. AERODROME & GROUND FACILITIES

Not relevant

11. FLIGHT RECORDERS

Not relevant

12. WRECKAGE & IMPACT INFORMATION

Not relevant

13. FIRE

13.1. No smoke or fire was caused due to the incident.

14. SURVIVAL ASPECTS

14.1. All crews disembarked from normal exit. No passengers were on board.

15. TEST & RESEARCH

15.1. A one time check of the wheel collar part No.200042310 Fig index 6/60 Dowty Rotol Component Maintenance Manual No 32-10-43 revealed that out of 14 aircraft

i.e. 56 main wheels the collar with 3 witness holes located 120 degrees apart on the cylindrical surface were installed on 7 wheels, the details of which are given in Appendix-'A' to this report.

15.2. It was observed that no service bulletin provided by the manufacturer covered the witness holes modification on the collar.

16. OBSERVATIONS

16.1. During the main landing gear wheel installation double check is not required as per maintenance policy for double checks stipulated in CAA Air Safety Circular No.55.

16.2. The Quality Control Engineers do not check work of production engineers in line maintenance and QC only monitors the maintenance work by reviewing the technical log. As such, the line maintenance has no quality control involvement in the production.

16.3. Mechanics performing maintenance task under the supervision of an AME are not required to sign on the technical log.

16.4. On 6th July, 1991 F-27 aircraft registration No AP-BCT had a similar incident in which its right main inner wheel fell-off after take-off due to incorrect installation of towing lug Part No. 9027Y10 (Refer No. 380 Appendix-'B' to this report).

17. WITNESS

17.1. Statement of witnesses are given in Appendix-'J' to this report.

18. INVESTIGATION

18.1. PIAC Fokker (F-27) aircraft registration No. AP-BDS, during a training mission at Karachi Airport on 26th September, 1993 at about 2130hrs PST the left outer main wheel fell-off soon after the aircraft took-off. ATC was informed by ASF that something falling from the aircraft has been observed by the guard deployed near the airfield fence. The Captain of the aircraft was advised to make a full-stop landing after it was confirmed by the crew on board that the left outer main wheel was missing. Subsequently, a safe landing was carried-out.

18.2. During search the main wheel was found about 50 feet near the airfield fence and following additional parts were located from the airfield vicinity:-

<u>NOMENCLATURE</u>	<u>PT.NO.</u>	<u>FIG.INDEX</u>	<u>T.O</u>
(a) Collar	200063307	5/390E	Dowty Component
(b) Axle Nut	200042339	5/370B	Maint Manual
(c) Lock Bolt	20003616	5/330A	
(d) Outer Bearing Race (No Pt Number) (Ref Appendix-'B' to this report)			

18.3. It was observed from the technical log that subject wheel was installed on 25th September, 1993 at Karachi the details of which are given in Appendix-'C' to this report. After wheel installation on 25th September, 1993 the aircraft had flown PK-144 on 26th September, 1993 and had executed 5 take-off and landings. During operation of PK-144 three transit checks were carried out by the ground crew and subsequently on the same day the aircraft was detailed for the training mission. Prior to the training mission the maxaret (anti-skid) operation was checked and no abnormality was reported by the ground/air crews.

18.4. After the incident during post flight inspection metallic burs were found accumulated around the landing gear axle and inboard bearing grease cover, retaining circlip and wheel spacer were found on the axle. However, rest of the parts used for wheel installation were missing. (Refer Appendix-'D' to this report).

18.5. During the investigation process it was observed that:-

18.5.1. Lock bolt tip or shank had no evidence of scratch or deterioration. (Ref Appendix -'E' to this report).

18.5.2. Lock bolt was wire locked in fully screwed-in position (Refer Appendix-'E-2'to this report).

- 18.5.3. No aircraft pulling tendency or abnormal vibration was reported by the pilot during aircraft operation after the wheel was installed on 25th September, 1993.
- 18.5.4. Rotation of left outer main wheel is such that it will unscrew the axle nut.
- 18.5.5. Collar installed on the subject wheel had no witness holes. (Refer Appendix-'F').
- 18.6. While installing main landing gear wheel the axle nut is given a torque of 120 ft-lbs to ensure proper seating of the wheel. The axle nut is then untorqued to a zero value and finally, the axle nut is given a torque of 40 ft-lb and lock bolt is wire locked after it is fully screwed-in. The lock bolt is required to be seated in one of the slots located circumfencially on the axle lip. As such, the lock bolt will distort the axle slots before unlocking of the axle nut. However, in the subject case no evidence of scratch, dent or deterioration was observed on the tip/body of the lock bolt. Therefore, it is inferred that the lock bolt was not seated in the axle groove despite the fact that the bolt was screwed-in fully and was wire locked.
- 18.7. Out of 56 wheels checked during the one time inspection the three 1/8 inch dia holes located 120 degree apart on the cylindrical surface were found on seven wheels. A positive seating of the lock bolt in the axle slots can be physically seen through these holes. Presently, PIAC Fokker fleet comprises of

aircraft received from different sources and origin of these holes could not be traced back. As such, in order to guarantee positive locking of the main wheel and to avoid such an incident in future the problem was referred to Dowty Rotol (landing gear manufacturer) and Fokker aircraft Company, who agreed to the proposal of the board vide their fax dated 13th January, 1994 the details of which are given in Appendix-'G' to this report.

19. FINDINGS

- 19.1. Documentation of the aircraft was in order.
- 19.2. The crew licences were appropriate and valid.
- 19.3. Subject main wheel was changed at about 2300 hours PST on 25th September, 1993.
- 19.4. After wheel change the aircraft flew PK-144 on 26th September, 1993 and during the mission the aircraft executed Five landings.
- 19.5. After flying PK-144 the same aircraft was detailed for a training mission at about 2117 hours PST on 26th September, 1993. Soon after the aircraft took-off its left outer main wheel fell-off near the airfield fence.
- 19.6. While installing the left outer wheel on 25th September, 1993 the lock bolt did not seat in one of the axle slots although the bolt was fully screwed in and was wire locked.

- 19.7. Positive seating of lock-bolt in the landing gear axle slots can be seen through the witness holes on the cylindrical surface of the collar part No. 200063307 Fig index 6/60 Maintenance Manual Dowty Rotol.
- 19.8. The axle collar Pt No. 200063307 installed along with the subject wheel did not have three witness holes located 120 degree apart on the collar surface.
- 19.9. Out of a total of 56 aircraft wheels the collar with witness holes were found on seven wheels.
- 19.10. The manufacturer of landing gear Dowty Rotol had not issued any service bulletin on the subject of witness holes in the wheel collar.
- 19.11. The role of QC in the line maintenance is limited to establishing reason(s) for the flight delays and QC personnel do not check the maintenance operation to validate correct maintenance operation.
- 19.12. A duplicate inspection is essentially required on any assembly, system or component, whose failure or incorrect operation could effect the safe operation of an aircraft as per duplicate inspection policy stipulated in CAA Air Safety Circular No 55 . While the subject circular categorically covers the requirements of duplicate inspection on engine/flight controls as defined therein, it does not cover the landing gear and wheel system which is a critical area from aircraft safety point of view. (Refer Appendix-'H' to this report).

21. RECOMMENDATIONS

- 21.1. Witness holes of 1/8 inch size should be drilled on the radial surface of the collar (Pt No. 200063307) 120 degrees apart for validating proper seating of lock bolt (PT.No 20003616 in the landing gear axle slot as per details given in Appendix-'I' to this report).
- 21.2. The quality control should focus on quality of maintenance by taking appropriate corrective measures in the maintenance recovery process, on 24 hours basis alongwith the production shift.
- 21.3. Duplicate inspection should be introduced for all maintenance operation in landing gears and wheel areas and CAA Air Safety Circular No.55 should be amended accordingly.