

FINAL INVESTIGATION REPORT



**INCIDENT OF PIAC FLIGHT PK-755 (SIALKOT TO RIYADH) A320-200
REG NO AP-BLU FIRE WX IN THE AFT CARGO COMPARTMENT
DATED 11 OCTOBER 2017**

SCOPE

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FINAL REPORT

INCIDENT OF PIAC FLIGHT PK-755 (SIALKOT TO RIYADH) A320-200 REG NO AP-BLU FIRE WX IN THE AFT CARGO COMPARTMENT DATED 11 OCTOBER 2017

Synopsis

On 11 October 2017 M/s PIAC Flight No PK-755, A320-200 aircraft Reg No AP-BLU, from Sialkot to Riyadh, during initial climb experienced smoke warning in AFT cargo compartment on Electronic Centralized Aircraft Monitor (ECAM). Accordingly, ECAM actions were taken and the aircraft was diverted to Lahore. On landing, no signs of actual fire / smoke were observed. This incident was reported to Safety Investigation Board (SIB) Pakistan by the operator through Mandatory Occurrence Report (MOR). The incident was notified in accordance with ICAO Annex-13 and Aviation Division Government of Pakistan issued memorandum authorizing SIB to investigate the incident.

1. FACTUAL INFORMATION

- 1.1. **History of the Flight.** M/s PIAC PK-755 was operating on a routine flight from Sialkot to Riyadh on 11 October 2017. During initial climb, AFT cargo ECAM smoke warning appeared. ECAM actions were carried out. During descend warning became constant and ECAM actions were completed. Aircraft was diverted to Lahore. On arrival no signs of actual fire / smoke were observed.
- 1.2. **Injuries to Persons.** There were no injuries to any person during the incident.
- 1.3. **Damage to Aircraft.** There was no damage to the aircraft.
- 1.4. **Other Damage.** None.
- 1.5. **Personnel Information.** Not applicable.
- 1.6. **Aircraft Information.** The aircraft was being maintained by the operator in accordance with the regulations of Pakistan Civil Aviation Authority. Maintenance and life information of the aircraft and relevant parts is as follows :-

1.6.1. Aircraft

Aircraft Make & Model	Airbus A320-214
Registration Marking	AP-BLU
Manufacturer Serial No	2719
Year of Manufacture	March 2006
C of A (expiry date)	02-07-2018
Daily inspection prior to occurrence	9-10-2017 at Karachi
Transit check prior to occurrence	11-10-2017 at Sialkot
Total Aircraft hrs as prior to occurrence	35171

Total aircraft cycles prior to occurrence	16918
Total Landings prior to occurrence	16918
Last Check-C (type, date, hrs, cycles, agency performed & location) prior to occurrence	Check-3C, Date 29-03-2017 33341 Hrs, 16045 Landings
Last Check-A (type, date, hrs, cycles, agency performed & location)	Check-4A, Date 03-10-2017 35098 Hrs, 16879 Landings

1.6.2. Information on all the removed components at LHR / KHI from AP-BLU after the reported incident :-

Component Noun	Part No / NSN / S No	Installation date	Hrs flown since installation	OEM	Total Hrs flown
CIDS DIR	P/N: Z014H000131A S/N: 014H00001136	25/05/15	TSI: 15351	Airbus	Since New: 15351 Since O/H: 15351
Smoke Detector (FWD)	P/N: PPC1102-00 S/N: 2200	14/07/15	TSI: 17258	Siemens	Since New: 17258 Since O/H: 17258
Smoke Detector (AFT)	P/N: PPC1102-00 S/N: 1732	27/10/15	TSI: 13526	Siemens	Since New: 37463 Since O/H: 13526
Smoke Detector (AFT)	P/N: PPC1102-00 S/N: 4083	14/07/15	TSI: 17258	Siemens	Since New: 17258 Since O/H: 17258

- 1.7. **Meteorological Information.** The humidity factor at the time of departure at Sialkot was above 70%.
- 1.8. **Aids to Navigation.** Not applicable.
- 1.9. **Communications.** Not applicable.
- 1.10. **Aerodrome Information.** Not applicable.
- 1.11. **Flight Recorders.** Not applicable.
- 1.12. **Wreckage and Runway Marks Information.** Not applicable.
- 1.13. **Medical and Pathological Information.** No injury reported to any person.
- 1.14. **Fire.** There was no evidence of actual fire after the occurrence.
- 1.15. **Survival Aspects.** Not applicable.
- 1.16. **Tests and Research.** Not applicable.
- 1.17. **Organizational and Management Information.** Not applicable.

- 1.18. **Additional Information.** Not applicable.
- 1.19. **ATC Tape Extracts.** Not required.
- 1.20. **Useful and Effective Investigation Techniques.** Standard investigation techniques were used.

2. ANALYSIS

- 2.1. On arrival at Lahore no evidence of any fire, smoke or overheat was found inside the cargo area. Cargo fire bottle was found to be operated and discharged.
- 2.2. The Post Flight Report (PFR) generated by ECAM pertaining to this occurrence is as follows :-



- 2.3. Functional check of the smoke detection system was carried out and was found normal. However, as per recommended troubleshooting manual, two aft and one forward cargo smoke detectors were replaced as part of the rectification. Additionally, CIDS (Cabin Intercommunication Data System) Director # 1 was also replaced.
- 2.4. Subsequently, the related smoke detector test was carried out and found satisfactory.
- 2.5. Cargo fire extinguisher bottle was replaced as per task card 26-23-000-004-A.
- 2.6. Aircraft was released after seeking clearance from Airworthiness PCAA for Flight PK-317 Sector Lahore-Karachi dated 11-10-2017.
- 2.7. After arrival at Karachi, wiring insulation and resistance checks were also carried and found satisfactory. Aircraft subsequently operated normally without any defect repetition.
- 2.8. A review of the aircraft documents for the current year (1 January to 11 October 2017) revealed that the aircraft had a recent history of similar maintenance messages related to smoke. The details are as follows :-

S No	Reported Defect	Date	Action Taken	Reference of the maintenance manual
1	MIANT MSG SMOKE IN VIEW.	Date 5/04/17 Log Pg- 39	Date 8/04/17 log Pg-82 refers item # 80. CIDS 1&2 reset c/out FWC 1&2 reset c/out no smoke maint msg in view.	1. TSM Task 24-00-0081007 7-D (CIDS 1 & 2 Reset procedure) 2. TSM Task 24-00-0081008 1-A (FWC 1 & 2 Reset procedure)
2	MAINT MSG SMOKE ON ECAM	Date 15/09/17 Log Pg- 26	Date 24/09/17 log Pg-2 system CB's recycled lavatory, cargo and "AV" smoke test c/o o.k. msg disappeared. C/F removed.	1. AMM TASK 26-15-007100 01-A Operational Test of the Avionics Smoke Detection 2. AMM TASK 26-16-00-710-001-A Operational Check of Cargo Compartment Smoke-Detection by PTT.
3	MAINT MSG SMOKE ON ECAM	Date- 28/09/17 Log Pg- 42	Date 1/10/17 log Pg- 68 Aft cargo smoke detectors disconnect cleaned & re-installed.	1. Cleaned as per procedure recommended by the Vendor
4	MAINTENANCE MSG "SMOKE" DISPLAYED.	Date 6/10/17 Log Pg- 17	Date- 6/10/17 log Pg- 17 relevant CB recycled and CIDS test c/out normal msg cleared.	1. TSM Subtask 26-16-00865 -055-A A. Table of the circuit breakers used in this procedure: 2. AMM TASK 23-73-00-740-005-B Interface and Power-Up test of the Cabin Intercommunication Data System (CIDS) through the CFDS

- 2.9. The above defect history indicates that the smoke warning messages had appeared three times in the last one month prior to the occurrence and same were cleared by resetting the system.
- 2.10. Cargo Smoke detectors get due for cleaning after accumulating 18000 hrs. There is no inland overhauling / cleaning facility available; hence the smoke detectors are to be sent to the OEM.
- 2.11. The life information of all three smoke detectors indicates that these were at a HI-LIFE regime, hence more chances of being contaminated. Life details of the removed smoke detectors are as follows :
- 2.11.1. Forward smoke detector : 17258 hrs (96% life availed)
- 2.11.2. Rear smoke detector-1 : 17258 hrs (96% life availed)
- 2.11.3. Rear smoke detector-2 : 13526 hrs (75% life availed)
- 2.12. As per Airbus ISI # 26.10.00004, the contamination of smoke detectors by dust, textile fibers, and particles floating in the air can lead to:-
- 2.12.1 Spurious warning.
- 2.12.2 A significant decrease of the smoke detector sensitivity due to the background caused by the contamination.
- 2.12.3 A loss of smoke detection function.

- 2.13. As per another reference (Airbus ISI #26.10.00007), the smoke detection system can create false alarm without an actual fire / smoke. Such spurious smoke warnings can occur due to following reasons:-
- 2.13.1 Use of spray in cabin / cargo compartment.
 - 2.13.2 Contamination of the smoke detectors.
 - 2.13.3 Extreme condensation / humidity / dust.
 - 2.13.4 Bleed air oil vapor.
 - 2.13.5 Entrapment of fumes in cargo compartment (smoke / fumes from the ground handling equipment).
 - 2.13.6 Terrestrial fires.
 - 2.13.7 Ingestion of anti-ice / de-icing fluids into bleed air system.
 - 2.13.8 Ingestion of engine cleaning agent into the ECS.
- 2.14. During this flight, 444 Kg cargo of horse bridle (a chemically treated item) was placed in rear cargo compartment. Such chemically treated goods (if not adequately packed) can contaminate the environment surrounding the smoke sensors installed in the cargo compartments. During this flight, the mentioned horse bridle was packed as shown below :-



- 2.15. As mentioned above, high humidity can also cause a spurious warning. The humidity factor at Sialkot at the time of departure was above 70%.
- 2.16. M/s PIAC was required to dispatch the faulty components for investigation under the oversight of BEA, France (the state of design and manufacture). However same were sent for a routine repair. As a result, the tear down examination of the removed 04 components couldn't be performed. Consequently, the investigation process had to be prematurely ceased due to loss of evidence.

3. CONCLUSIONS

3.1 Findings

- 3.1.1 The reported smoke warning was a false alarm and there were no signs of actual fire, smoke or heat inside the cargo area.
 - 3.1.2 The aircraft had a recent history of smoke warning (03 defects appeared in one month prior to the occurrence), however, same were rectified by resetting the fire detection system.
 - 3.1.3 After this occurrence, the reported defect was rectified by replacing 04 components related to the fire detection system ie 02 smoke detectors in the rear cargo compartment, 01 in forward cargo compartment and the CIDS Director.
 - 3.1.4 The fire detection system installed on Air Bus aircraft is vulnerable to create spurious fire alarm without an actual fire / smoke owing to contamination, higher humidity levels, chemical fumes etc (Airbus ISI # 26.10.00004 and ISI # 26.10.00007).
 - 3.1.5 In the rear cargo compartment, 444 Kg of chemically treated horse bridle was loaded. Possibly an in-adequate packing / wrapping of such a stuff may have polluted the environment surrounding the fire sensors installed in aft cargo compartment.
 - 3.1.6 Two out of three removed smoke detectors had consumed more than 95% of their stipulated life before getting due for an overhaul / cleaning at 18,000 hrs. With such a HI-LIFE, these detectors were more contaminated from dust / external pollution for being in service since long.
 - 3.1.7 The humidity factor at the time of departure at Sialkot was above 70%.
 - 3.1.8 No inland cleaning facility was available for the smoke detectors.
 - 3.1.9 The tear down examination of the removed 04 components couldn't be performed because the components weren't provided to BEA, France contrary to the instructions issued by SIB, Pakistan. The components were sent for routine repair / cleaning by PIAC which lead to loss of the evidence. Consequently, the investigation process had to be prematurely ceased.
- 3.2 **Cause(s) of the Occurrence.** With the available evidence, the occurrence may have been caused due to one or the combination of the following factors :-
- 3.2.1 Loading / placing of the chemically treated leather goods in the AFT Cargo compartment with a possible in-adequate packing.
 - 3.2.2 HI-LIFE of the smoke detectors before getting due for an overhaul / cleaning.
 - 3.2.3 High humidity level (70%) at the time of departure from Sialkot.

4. SAFETY RECOMMENDATIONS

- 4.1 In view of the environmental / technical aspects that increase the susceptibility of spurious warning, a proactive safety oversight mechanism may be devised by PIAC to improve the maintenance troubleshooting.
- 4.2 The packing of all cargo may thoroughly be inspected / verified by PIAC for its adequacy in light of Airbus ISI #26.10.00007.

- 4.3 PIAC may consider inland cleaning facility for the smoke detectors.
- 4.4 PIAC may consider adherence to the recommended practices / instructions related to preservation / handling of evidence during an investigation.