AIRCRAFT ACCIDENT REPORT No 2/2007

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REPORT ON THE SERIOUS INCIDENT TO BOEING 777-236, G-YMME ON DEPARTURE FROM LONDON HEATHROW AIRPORT ON 10 JUNE 2004

Registered Owner and Operator:	British Airways PLC
Aircraft Type and Model:	Boeing 777-236
Registration:	G-YMME
Place of Incident	On departure from London Heathrow Airport Latitude: 51º 29' N Longitude: 000º 28' W
Date and Time	10 June 2004 at 1907 hrs All times in this report are UTC unless otherwise stated

Synopsis

The incident was notified to the Air Accidents Investigation Branch (AAIB) on 11 June 2004. The AAIB investigation team comprised:

Mr J J Barnett	(Investigator-in-Charge)
Mr K Conradi	(Operations)
Mr S J Hawkins	(Engineering)
Mr C Pollard	(Engineering)
Mr A Foot	(Flight Recorders)

After takeoff from London Heathrow Airport a vapour trail was seen streaming aft of the aircraft. The flight crew diagnosed that the aircraft was probably leaking fuel from the centre wing fuel tank. They declared an emergency and decided to jettison fuel to reduce to maximum landing weight before returning to Heathrow. Their intention was to minimise heating of the brake units during the landing roll in order to reduce the risk of fire if fuel was to leak onto the wheelbrakes. After landing, the aircraft was met by the Airfield Fire and Rescue Service who reported some vapour emanating from the left landing gear but no apparent fuel leaks.

The fuel leak was caused by fuel escaping through an open purge door inside the left main landing gear bay, on the rear spar of the centre wing tank. The purge door had been removed during base maintenance at the operator's maintenence organisation in Cardiff, between 2 May and 10 May 2004, and had not been refitted prior to the aircraft's return to service.

The investigation identified the following causal factors:

1. The centre wing tank was closed without ensuring that the purge door was in place.

2. When the purge door was removed, defect job cards should have been raised for removal and refitting of the door, but no such cards were raised.

3. The centre wing tank leak check did not reveal the open purge door because:

   a. The purge door was not mentioned within the Aircraft Maintenance Manual (AMM) procedures for purging and leak-checking the centre wing fuel tank.

   b. With no record of the purge door removal, the visual inspection for leaks did not include the purge door.

   c. The fuel quantity required to leak check the purge door was incorrectly stated in the AMM.

4. Awareness of the existence of a purge door on the Boeing 777 was low among the production staff working on G-YMME, due in part to an absence of cross references within the AMM.

Following the incident, significant safety action was taken by both the maintenance organisation and the aircraft manufacturer to address issues discovered during the investigation. The AAIB made five safety recommendations.

Findings

1. The fuel leak was caused by fuel escaping from the centre wing tank through the open purge door.

2. The flight crew correctly diagnosed and handled the fuel leak incident.

3. The aircraft manufacturer determined that the fuel leakage resulted in the potential for a wheel well fire.

4. In this incident there was little risk of an in-flight fire because there were no ignition sources in the vicinity of the fuel leak.

5. By jettisoning fuel to land at maximum landing weight, the flight crew were able to reduce the brake energy required and thus reduce the risk of fire immediately after landing.

6. The purge door was removed from G-YMME during base maintenance, between 2 May and 10 May 2004, and not re-installed prior to departure.

7. The open purge door was not detected between the aircraft's return to service and the incident flight on 10 June 2004 because the open door was not visible from the ground with the left inboard main gear door closed and the aircraft's fuel loads had been insufficient to create a leak.

8. Contrary to the maintenance organisation's procedures, the removal of the purge door was not recorded on a defect job card.

9. No person came forward stating that they were involved with the purge door removal.

10. A potential opportunity to detect the open purge door was lost when the rear spar inspection was carried out in the wrong location because of an error in a diagram in the Aircraft Maintenance Manual (AMM).

11. The maintenance organisation was aware of the error in the AMM diagram and had notified the

aircraft manufacturer, but no action was taken to communicate this fact to production staff.

12. The Licensed Aircraft Engineer (LAE) and Technician who closed the centre wing tank access panels did not check that the purge door was in place because they were not aware that the purge door existed and because there was no paperwork recording its removal.

13. The absence of cross references in the AMM between the fuel tank purging procedure and the purge door removal procedure, and between the fuel tank leak detection procedure and the purge door leak check procedure, contributed to the lack of awareness of the purge door's existence.

14. The fuel quantity stated in the AMM as being required to leak-check the purge door was incorrect and insufficient to detect a leak from the purge door.

15. The centre wing fuel tank leak check did not reveal the open purge door because the specified fuel quantity used was incorrect and no visual check of the purge door was made.

16. No routine job card calling for a specific purge door leak check had been generated because there was no routine card for the purge door to be removed. A defect card calling for a purge door leak check should have been raised when the purge door was removed.

17. The aircraft maintenance manual did not mention or depict the centre wing tank baffle doors in any procedure.

18. The maintenance organisation had been aware of the missing baffle door reference for two years before the G-YMME incident but no action had been taken to create routine baffle door removal cards.

19. During the period leading up to and shortly after the incident, a shortage of planning resources had led to priority being given to the development of the EWS database, at the expense of job card engineering and responding to PQF queries.

20. There was a perception among some engineers that PQFs were not being answered and so these engineers had stopped raising them.

21. The maintenance organisation's Technical Services group did not formally track long-term unresolved QEANs which resulted in the 'missing baffle door' query being unresolved more than two years after it was reported.

22. The maintenance organisation did not have a procedure in place for handling removable panels, such as the purge door, which can be left tethered to the aircraft.

23. In February 2004 another Boeing 777 undergoing a 2C check at the maintenance organisation had its purge door removed without the removal being recorded. In that case an experienced engineer noticed the open purge door before the aircraft left the facility and raised a job card to have the panel refitted but he did not raise an occurrence or discrepancy report.

24. Maintenance errors identified before an aircraft left the maintenance organisation's facility were not being routinely reported.

25. For some staff at the maintenance organisation it was not clear where the blame boundary lay and the perception among them varied from the company having a good safety culture to the company having "very much a blame culture".

26. The maintenance organisation's disciplinary policy did not address what disciplinary action might be taken if an engineer self-reported a maintenance error and this may have discouraged maintenance error reporting.

27. The maintenance organisation had a Maintenance Error Management System (MEMS) in place but it did not adequately meet all the elements of the MEMS guidance contained in CAA Airworthiness Notice 71 (Issue 2).

28. The maintenance organisation had no process in place for ensuring that Technical Team Leaders were adequately disseminating information from Technical Team Leader meetings to the Technicians and Mechanics in their team.

29. Some of the production staff working on the G-YMME centre wing tank were more experienced on the Boeing 747 aircraft and had not recently worked on a Boeing 777 aircraft.

30. The purge door was routinely removed on the Boeing 747 aircraft to assist with purging, and was left hanging on its lanyard in accordance with the 747 AMM.

31. The routine removal of the Boeing 747 purge door could have contributed to an experienced 747 engineer removing the purge door on the 777 without realising that its removal was not required on the 777.

Safety Recommendations

The following safety recommendations were made as a result of this investigation:

Safety Recommendation 2006-097

British Airways Maintenance Cardiff should actively encourage staff to raise problems with procedures in job cards and in the Aircraft Maintenance Manuals, take prompt action to remedy the problems and provide subsequent feedback.

Safety Recommendation 2006-098

British Airways Maintenance Cardiff should identify and publish clear disciplinary policies and boundaries relating to maintenance errors to encourage uninhibited internal reporting of maintenance errors.

Safety Recommendation 2006-099

British Airways Maintenance Cardiff should ensure that its Maintenance Error Management System fulfils all the elements recommended in the Civil Aviation Authority's Airworthiness Notice 71.

Safety Recommendation 2006-100

British Airways Maintenance Cardiff should ensure that its Technical Team Leaders are adequately disseminating information from Technical Team Leader meetings to the Technicians and Mechanics in their team.

Safety Recommendation 2006-125

When British Airways Maintenance Cardiff has addressed safety recommendations 2006-097 to 2006-100, British Airways should carry out a safety audit at British Airways Maintenance Cardiff.