

**INCIDENT**

<b>Aircraft Type and Registration:</b>	Boeing 777-21H, A6-EMF	
<b>No &amp; Type of Engines:</b>	2 Rolls-Royce Trent 877 turbofan engines	
<b>Year of Manufacture:</b>	1996	
<b>Date &amp; Time (UTC):</b>	19 February 2005 at 1415 hrs	
<b>Location:</b>	Birmingham Airport, West Midlands	
<b>Type of Flight:</b>	Public Transport (Passenger)	
<b>Persons on Board:</b>	Crew - 14	Passengers - 294
<b>Injuries:</b>	Crew - None	Passengers - None
<b>Nature of Damage:</b>	Right-hand engine pylon panel 427AL delaminated	
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence	
<b>Commander's Age:</b>	44 years	
<b>Commander's Flying Experience:</b>	10,684 hours (of which 1,920 were on type) Last 90 days - 186 hours Last 28 days - 34 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and enquiries by the AAIB	

**Synopsis**

On takeoff, the outer skin of panel 427AL on the inboard side of the right engine pylon, separated, falling onto the runway. The part of the panel remaining on the aircraft exhibited signs of heat damage to its forward edge.

There have been two other failures of a similar pylon panel 418AR, on the inboard side of the left engine pylon, one in 2003 and another more recently on 3 June 2005. These panels also showed evidence of heat damage at their forward edge. The aircraft manufacturer, Boeing, is examining the panel from the most recent event to try to determine the cause of the delamination.

The operator has introduced a repetitive inspection of the pylon panels on this particular aircraft (A6-EMF), until the cause of the panel failures has been identified. The aircraft manufacturer is not aware of any reports of problems with these panels on any other Boeing 777 aircraft.

## **History of the flight**

Prior to departing on a scheduled passenger flight from Birmingham to Dubai, a routine inspection of the runway for debris was under way at Birmingham prior to A6-EMF's ('MF') departure. The inspection began at the 'A1' hold at the far end of the runway, with the 'checker' vehicle progressing towards the threshold of the active Runway 33. Prior to completing this inspection, the driver was instructed to leave the runway at holding point 'F1' to allow 'MF' to be cleared for takeoff. The next aircraft was given conditional clearance by ATC to line up after 'MF's departure but was brought to a halt short of the runway, as the crew could see a large piece of debris on the runway itself, which they thought might have fallen from the departing Boeing 777. The debris was recovered and confirmed as being a metallic part from an aircraft (Figure 1).

After being appraised by ATC of the situation, the crew decided that they would continue the flight at a reduced speed until it could be verified that the debris had come from their aircraft. However, when climbing through FL260, with an airspeed of 260 kt, a vibration developed that grew progressively worse with increasing altitude. The climb was stopped at FL280 and a diversion was made to London Gatwick, which required the jettisoning of 20 tons of fuel to avoid exceeding the maximum allowable landing weight. The landing was completed uneventfully and, on inspecting the aircraft, it was observed that panel 427AL on the left side of the right engine pylon was missing its outer skin (Figure 2). There was no other damage to the aircraft.

## **Panel 427AL construction**

The construction of the panel is typical of many on the Boeing 777 aircraft, comprising an aluminium honeycomb core sandwiched between skins of 2024 T81 aluminium. The skins are bonded using BMS 5-137 primer and BMS 5-90 adhesive, which have a curing temperature of 340-360°F (171-182°C) and a design service temperature of up to 350°F (177°C). The panel is attached to the pylon by 40 screws around its periphery. The area of the pylon in which the panel is located was designed to be exposed to a maximum temperature of 300°F (149°C).

## **Further investigation**

The damaged panel 427AL was returned to the operator immediately for repair, and thus could not be examined by the AAIB, but photographs showed evidence of apparent heat damage to its forward edge (Figure 2). The aircraft manufacturer believed the most likely source of heat to be a leak of core air from the engine.

In early 2003 there was a report of this aircraft having experienced delamination of a similar panel, 418AR, on the inboard side of the left engine pylon. The panel also exhibited evidence of heat

damage to its forward edge. On examining the panel, the aircraft manufacturer concluded that it had been exposed to temperatures of up to 350°F (177°C). Whilst this is within the acceptable service temperature range for the adhesive, exposure of the panel to such temperatures would cause some reduction in the strength of the adhesive bonds which, combined with the harsh environment of aerodynamic loads, high sonic vibration loads, and cyclic thermal stresses, would have increased the likelihood of the panel delaminating.

The operator conducted an inspection of its Boeing 777 fleet after this more recent occurrence, but no other aircraft were found with evidence of heat damage or delamination of the pylon panels.

### **Further panel delamination event**

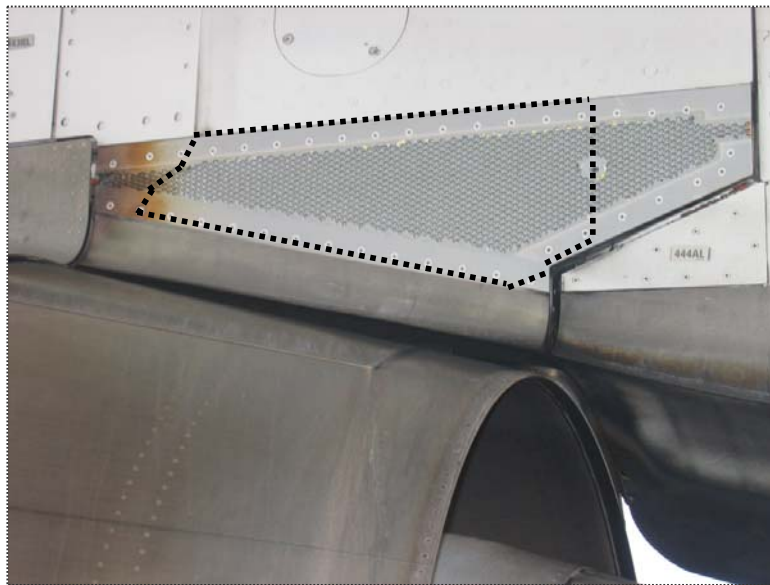
On 03 June 2005, 'MF experienced another occurrence of a pylon panel delaminating during takeoff at Islamabad in Pakistan. This latest event involved another failure of panel 418AR, similar to the event in 2003, and this panel was sent to the aircraft manufacturer for examination. The operator has since introduced a repetitive inspection of the pylon panels on this aircraft, until the cause of the panel failures has been identified. The aircraft manufacturer is not aware of any reports of problems with these panels on any other Boeing 777 aircraft.

Should any further relevant information become available, it will be included in an addendum to this Bulletin.



Section of outer skin of right engine pylon panel 427AL found on the runway

**Figure 1**



Delaminated panel 427AL showing heat damage at forward edge.  
Recovered section indicated

**Figure 2**