

INCIDENT

Aircraft Type and Registration:	DC-9-15, G-BMAB	
No & Type of Engines:	2 Pratt & Whitney JT8D-7 turbofan engines	
Year of Manufacture:	1966	
Date & Time (UTC):	14 May 1994 at 1953 hrs	
Location:	London Heathrow Airport	
Type of Flight:	Public Transport	
Persons on Board:	Crew - 6	Passengers - 59
Injuries:	Crew - None	Passengers - 2 Minor
Nature of Damage:	Foreign object damage to right engine and main landing gear door and flap	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	49 years	
Commander's Flying Experience:	11,235 hours (of which 3,720 were on type) Last 90 days - 142 hours Last 28 days - 51 hours	
Information Source:	AAIB Field Investigation	

History of flight

At 1952 hrs, the aircraft started the take-off roll from Block 81 on Runway 09R, on a scheduled flight from London Heathrow Airport to Leeds Bradford Airport with the commander acting as the handling pilot. At an indicated airspeed of about 120 kt an airframe vibration occurred and shortly afterwards, at 126 kt, the first officer called V₁. The severity of the vibration increased and, shortly after the aircraft became airborne, two very loud bangs were heard. The Engine Pressure Ratio (EPR) reading on the right engine fluctuated rapidly and the aircraft yawed in response to the power fluctuations. The commander told the first officer to reduce power on the right engine. The vibration combined with a smell of burning rubber led the commander to believe that there was a problem with the landing gear, consequently he decided to leave it down and the flap was left at the take-off setting of 10°. Even with the power reduced the EPR fluctuations continued and so, at about 400 feet, he told the first officer to

shut down the right engine. Shortly after 1953 hrs, the first officer transmitted "MAYDAY MAYDAY ENGINE FAILURE" on the Heathrow Tower frequency, 118.7 MHz and this was acknowledged by the controller. About a minute later, he told ATC that it was suspected that they had "LOST ONE OF THE TYRES ON THE RIGHT SIDE WHICH HAS BLOWN AND TAKEN OUT THE RIGHT ENGINE". The controller replied that he had seen "A LOT OF SPARKS AND FLAMES FROM THE NUMBER TWO SIDE". The aircraft was cleared to climb to 3,000 feet and to turn left onto a heading of 340°.

A flight supervisor trainer, travelling in uniform as a passenger, noticed a bright orange glow from the front of the right engine. She immediately reported, what appeared to her to be an engine fire, to the senior cabin attendant (SCA) who relayed the information to the commander. Although there was no fire warning evident on the flight deck, the commander ordered the first officer to carry out the fire drill on the right engine and one extinguisher charge was used.

The flight services manager, who was carrying out a spot check on the cabin crew, and the SCA were apprised of the situation and were briefed to prepare for an emergency landing and evacuation. This was done in a comprehensive and professional manner. The time available was used to ensure that both the cabin staff and the passengers were fully aware of what to expect and what their actions should be. Both front exits and the left overwing exit were to be used for the evacuation. The atmosphere in the cabin was generally calm and the cabin staff were able to give special attention to those who needed it. A cabin attendant from another airline who was travelling in uniform, was instructed to exit first through the overwing exit to assist passengers as they emerged from the exit. The commander also spoke to the passengers using the public address (PA) system.

At 1955 hrs, the aircraft was transferred to Heathrow Approach on frequency 119.725 MHz when the controller ascertained that the commander wished to make an approach to Runway 09L and confirmed the heading of 340°. At 2000 hrs, when the aircraft was on a downwind heading of 270°, the controller indicated that he would position it for an "EIGHT TO TEN MILE FINAL" if that was acceptable and the commander confirmed that it was. At 2002 hrs, the controller advised that "TYRE AND METAL DEBRIS HAS BEEN FOUND ON NINE RIGHT". The aircraft was given a base leg heading of 190° and, at 2005 hrs, clearance was given to descend to 2,500 feet. With the acknowledgement the controller was advised of the intention to "STOP ON THE RUNWAY AND EVACUATE IMMEDIATELY". The final approach intercept heading was 120° and the aircraft established on the localiser at 2006 hrs.

The aircraft was transferred back to Heathrow Tower and clearance to land was given. The first officer made a "ONE MINUTE TO LANDING" call on the PA and, at 300 feet he called "BRACE BRACE". Touchdown was at 2009 hrs and there was severe vibration which made it difficult to keep the aircraft straight; the vibration stopped when the speed had reduced to about 50 kt. The commander decided that the safest option was to go ahead with the evacuation drill as planned and, once the aircraft had stopped, this was initiated.

Despite the darkness and heavy rain the evacuation went smoothly, with only minor injury to a passenger who suffered a cut hand caused by the vortex generators on the left wing. The cabin was checked clear and the commander was the last to leave the aircraft. The emergency services were on the scene almost immediately and rendered valuable assistance to escaping personnel. A head count was made soon after the evacuation and all passengers and crew were accounted for. The aircraft crew dispersed themselves among the passengers and remained with them as they were taken to an assembly area in the terminal building. The area used was specially designated and ground personnel were present to comfort and process the crew and passengers.

Runway 09R was swept of debris and reopened at 2013 hrs; the aircraft was towed clear of Runway 09L at 2057 hrs and the runway was handed back to ATC at 2103 hrs.

The weather over the period of the incident was:

Surface wind	190°/6 kt
Visibility	5,000 metres
Weather	Moderate rain
Cloud	4 oktas base 400 feet
	6 oktas base 900 feet
	7 oktas base 1,800 feet
Temperature/dewpoint	14°C/13°C

Human factors

It is the policy of the company concerned for the flight safety manager to bring together all the personnel involved in events such as this, for a group discussion. The participants are encouraged to express their opinions about the incident itself and the interaction of those involved. The group are encouraged to suggest improvements at both operational and management levels. The AAIB previously attended such a forum after an incident to the company's DC-9, G-PKBM, on 16 November 1993 (see Bulletin 4/94). It was noted that the action taken to rectify some of the shortcomings identified at that time, had been successful. It is reiterated that this appeared to be a very worthwhile exercise which contributed not only to air safety, but also helped those involved to come to terms with the psychological trauma which exists in the aftermath of any incident or accident.

Although some shortcomings were identified, these were minor and did not detract from the fact that the successful conclusion of this incident was due not only to the skill of the individual units involved, both in the air and subsequently on the ground, but also to the high level of co-operation between those units.

Engineering

Significant damage had been caused to the fan on the right engine by tyre tread debris, a piece of which was found jammed between the fan and the shroud. One outer segment of a fan blade had broken off and had gone down the by-pass duct after damaging the remainder of the fan.

The No 4 tyre had failed on takeoff and tyre debris recovered from both the takeoff and landing runways had been collected, representing the failure on takeoff, and additional damage which took place on the landing. These items were examined by the AAIB and a representative of the tyre manufacturer. The tyre carcass was scuffed well around the shoulder indicating that it had either been run whilst in an under-inflated condition, or that it had been overloaded. There were signs of heating and slight rubber reversion at the retread/carcass bond, again indicating under-inflation. Cracking on the rubber surface on the inside of the carcass confirmed that it had been overstressed at some time. The evidence supported a conclusion that the No 4 tyre tread failed because it had been run in an under-inflated condition. The tyre was on its fourth retread (a total of five retreads are allowed) and had failed at 374 landings; the average landings achieved by the operator from his DC-9 mainwheel tyres is 500.

Tyre No 3 also showed signs of overloading and imminent failure, but not of overheating. Its condition suggested that it had taken the load shed by the No 4 tyre when it was under-inflated.

The history of the last two sectors, reported by the flight crew, indicated that the No 4 tyre had been found to be deflated by an estimated 10% on see-off, and the flight crew had inspected it carefully on both turnarounds before the incident flight.

Tyre pressures are checked at each night stop and the operator had a technical instruction requiring the entering of tyre pressures, before re-inflation, in the technical log to give evidence of a pressure leak. However the practice had developed of entering the pressure that the tyre had been inflated to 125 psi. This provided insufficient evidence to determine the serviceability of the tyre. The operator has now taken action to record pre-inflation pressures in the technical log