

Aircraft type and registration: Boeing 747-123 N741 (Multi-jet public transport aircraft)

Year of Manufacture:

Date and time (GMT): 17 April 1984 at approximately 1105 hrs

Location: Hurst, nr Reading

Type of flight: Public Transport

Persons on board: Crew — 4 + 13 Passengers — 268

Injuries: Crew — Nil Passengers — Nil

Nature of damage: No 1 engine accessory cowling lost in flight; vibration damage to cabin furnishings on landing

Commander's Licence: Air Transport Pilot's Licence

Commander's Age: 53 years

Commander's total flying experience: Approximately 18000 hrs (of which approximately 4000 were on type)

Information Source: AIB Field Investigation

History of the flight

The aircraft took off from Heathrow at 1059 hrs on a scheduled flight to Washington. During the initial climb after take-off, the commander heard a thump that sounded to him like an engine stall. No other crew member noticed this thump and, as all engine and other indications were normal, no reason was found for the noise. At about this time large pieces of engine cowling fell from the aircraft at a point some 12 miles west of Heathrow.

At about 15000 feet in the climb, the flight engineer noted that the No 1 hydraulic system contents gauge showed a loss of fluid. Shortly afterwards, he saw that the No 1 engine breather temperature gauge was reading full scale. He carried out certain checks and, in the absence of any other abnormal indications, concluded that the excessive temperature indication appeared to be an indicator or sensor fault. After following the appropriate procedures in the operating manual and discussing the condition of the aircraft by radio with the company maintenance base at Heathrow, the commander decided to continue the flight with the No 1 hydraulic system shut down.

At this stage the flight engineer went aft to inspect the No 1 engine visually. He discovered that a large part of the cowling of the main body of the engine behind the fan was missing. The commander then decided to return to Heathrow. By this time, the aircraft was level at FL310 and in the Shannon FIR. At 1134 hrs, the aircraft was given air traffic clearance for the return route and turned back to Heathrow. The No 1 engine appeared to be operating normally so the commander decided to keep it running but he did not dump fuel because he considered that there might be some risk of fire from the uncowed engine.

The return flight was uneventful until just after touchdown at 1217 hrs. When the nose-wheel was lowered at 75 kt, very severe vibration occurred, which caused extensive minor damage to the cabin furnishings. The commander quickly brought the aircraft to rest and shut down the engines. The crew of an airfield fire service vehicle, who had followed the aircraft during its landing roll, reported to the commander that they had seen the nose-wheel shimmy violently on contact with the runway but that there were no exterior signs of fire. Accordingly, the commander decided not to order an emergency evacuation of the aircraft, which was then towed to the departure gate where the passengers disembarked normally.

In the 20 minutes or so between the loss of part of the cowling and the flight engineer's visual inspection of the engine, no passenger brought the damage to the notice of the cabin staff and, as far as can be ascertained, the damage was not noticed by any passenger until it was discovered by the flight engineer.

The Boeing 747 engine aft cowls have a split line running fore and aft along bottom dead centre. This permits the cowls to be opened, hinging about the engine to pylon joint lines. The two cowls are held together when closed by six latches spaced along the split line, the front two being close together at the forward corners.

On examination of the aircraft only a small section of each aft cowl of the No 1 engine had stayed attached along the hinge lines. The remains of both cowls were collected from around the village of Hurst, where they had fallen as numerous pieces damaging a house and a car. Close examination of the cowls revealed this damage to be consistent with the forward pair of latches opening in flight, allowing air loads to progressively rip off sections whilst failing the remaining four latches. Detailed examination of the forward two latches revealed evidence of a lack of correct engagement over some period of time.

The cowlings had not been opened nor the latches undone during the London turn round.

The No 1 engine was removed from the aircraft and it was noted that a connection to the No 1 hydraulic pump had fractured and some of the breather pipes had been distorted as a result of the cowl failures, explaining the loss of No 1 hydraulic system fluid and the excessive engine breather temperature. Subsequent ground running of the engine failed to identify any faults and it was returned to service.

A failure of the nose wheel steering metering valve, which would remain dormant in the presence of No 1 hydraulic system pressure, was discovered. In the absence of No 1 hydraulic system pressure this failure would have resulted in a loss of nose wheel shimmy damping, leading to the violent vibration experienced on nose wheel touch down.