

Boeing 737-400, PH-BDU, 27 January 1996

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Aircraft Type and Registration: Boeing 737-400, PH-BDU

No & Type of Engines: 2 CFM 56-3C1 turbofan engines

Year of Manufacture: 1990

Date & Time (UTC): 27 January 1996 at 1315 hrs

Location: Block 106, London Heathrow Airport

Type of Flight: Public Transport (scheduled)

Persons on Board: Crew - 8 Passengers - 68

Injuries: Crew - None Passengers - None

Nature of Damage: Left outer mainwheel disintegrated, damage to wing leading edge slat

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 33 years

Commander's Flying Experience: 5,918 hours (of which 1,175 were on type)

Last 90 days - N/K

Last 28 days - 65 hours

Information Source: Aircraft Accident Report Form submitted by the pilot and metallurgical report submitted by airline through the Netherlands Accident and Incident Investigation Bureau

While the aircraft was taxiing out for take off the crew heard a "bang" and felt a "minor bump". Shortly afterwards a cabin attendant informed the flight crew that a passenger had reported rubber coming off the left main landing gear. The crew stopped the aircraft and asked for an inspection. A ground engineer found that the left outer wheel had failed and debris had damaged a leading edge slat. Passengers and crew were disembarked using the airstairs and transported to the terminal by bus. Debris was recovered from the taxiway and a technical investigation of the wheel failure was carried out by the airline's engineering department.

When the wheel was examined it was found that the complete outer rim had detached and 5 of the 16 clamping bolts were missing. The 5 bolts were amongst debris recovered from the taxiway but their threaded ends and nuts were not found. No pre-existing defect was found in the wheel itself but all 5 bolts showed indications of fatigue initiating in the thread roots at the thread's

first engagement in the nut. One bolt showed penetration by fatigue across 60% of its cross-section and was heavily corroded. It was considered that the fatigue in this bolt had progressed under relatively low loading and that this was the first bolt to fail. The other bolts showed signs of there having been a sequence of failure evidenced by less corrosion and more rapid fatigue development and it was thought that the failure of the first bolt had increased loads on the adjacent bolts and accelerated their failure. The wheel had completed 3,473 cycles since new and 490 since inspection.

The bolts were made of a low alloy steel and hardness measurements showed that their material was within specification. They were of a standard which had been used on the 737-300 but some cracking had been experienced on the -400 aircraft and the airline had already initiated the incorporation of a modification (B F Goodrich Service Bulletin 3-1439-32-13) to replace these bolts with an Inconel 718 type of increased strength. Following the accident a weekly inspection was implemented and the replacement program was accelerated. The airline's Quality Assurance Department also undertook to investigate the bolt inspection process in the Overhaul Shop.