AAIB Bulletin No: 7/94 **Ref: EW/C94/3/3** **Category: 1.1**

INCIDENT

Aircraft Type and Registration:	DC-9-83, G-GMJM
No & Type of Engines:	2 Pratt & Whitney JT8D-219 turbofan engines
Year of Manufacture:	1991
Date & Time (UTC):	23 March 1994 at 1310 hrs
Location:	London Gatwick Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 8 Passengers - 170
Injuries:	Crew - None Passengers - None
Nature of Damage:	Minor to main landing gear door and runway light on Runway 26L at London Gatwick Airport
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	27 years
Commander's Flying Experience:	5,150 hours (of which 2,350 were on type) Last 90 days - 142 hours Last 28 days - 64 hours
Information Source:	AAIB Field Investigation

History of the flight

The aircraft was operating a return sector from Fuerteventura in the Canary Islands to Manchester Airport. During the takeoff, after gear and flap retraction, the commander noticed the right hydraulic quantity amber caution light 'ON' and a quantity indication of 2 quarts. He continued the climb to a safe altitude and carried out the initial actions from the abnormal checklist, selecting the right engine driven hydraulic pump, auxiliary and transfer pumps 'OFF'. The slats were then retracted and the climb re-established. The abnormal checklist was continued and the checklists for 'HYDRAULIC QUANTITY LOW OR DROPPING' and 'RUDDER CONTROL MANUAL' were reviewed. After a discussion with the first officer and a junior supernumerary pilot seated on the 'jump seat' the commander decided, because the failure would only affect the landing procedures, to continue en route rather than carry out an overweight landing back at Fuerteventura.

With the loss of the right hydraulic system it was necessary to lower the landing gear using the emergency system. Once extended the gear could not be retracted. In the light of this increased drag penalty the commander re-assessed the fuel requirements. As the aircraft had only sufficient fuel for Manchester with Exeter as an en route alternate the commander decided to divert to London Gatwick Airport and use Stansted as an alternative. This would allow for the additional fuel required in the event of a diversion with the landing gear down and the gear doors open.

During the cruise the commander informed the cabin supervisor of the technical problem and his intentions and also sent the supernumerary pilot back to carry out a visual check for hydraulic leaks. The crew also contacted their company operations and engineers.

At 1620 hrs as the aircraft approached the London Flight Information Region (FIR), the commander forewarned London ATC of the problem and informed them that he would be diverting to London Gatwick Airport and declaring a state of urgency (PAN PAN). London Control cleared the aircraft direct to MAYFIELD VOR. At 1700 hrs, as the aircraft levelled at FL 080, the Gatwick Approach controller asked the commander if he was ready to copy a message from the Airport Authority. The message was as follows: "YOUR TECHNICAL PROBLEM COULD CAUSE THE RUNWAY TO BE BLOCKED, YOU ARE ADVISED TO CONSIDER AN ALTERNATIVE LESS BUSY AIRFIELD RATHER THAN CAUSE A MAJOR INCONVENIENCE TO THE OPERATIONS AT GATWICK". The commander replied that he was already diverting to Gatwick because of fuel contingencies and that the aircraft should not block the runway for more than ten minutes.

During the base leg turn the flaps were selected to 15° and because the right hydraulic quantity had now increased to 4 quarts the right engine driven and auxiliary hydraulic pumps were selected 'ON' and the landing gear selected 'DOWN' on the normal system. The main landing gear indicated 'DOWN' but the nose landing gear remained up and the gear doors remained open. Manual gear extension was then carried out and 'three greens' obtained.

The aircraft landed at 1718 hrs and was stopped on the runway since nosewheel steering was not available. The main landing gear doors are designed to close after the main landing gear has extended, to provide ground clearance. Emergency lowering of the gear, using free-fall, results in the main landing gear doors remaining in the open position and, to prevent damage to the doors on landing, the doors are fitted with rubbing blocks which contact the runway surface and hold the body of the doors just clear of the ground. During the landing at Gatwick, the rubbing pad on the left main landing gear door struck one or more of the runway centreline lights, causing damage to the pad and its associated

mounting. Fire service vehicles, which had been on readiness, and a tug attended the aircraft immediately. The aircraft was towed clear of the runway at 1728 hrs. The runway remained closed for a further five minutes whilst a runway inspection was carried out and repairs to the light fitting completed.

Engineering examination

Inspection of the aircraft hydraulic systems revealed that the braided flexible pressure pipe on the outlet from the right system AC pump was leaking fluid. Due to space restrictions, it was not possible to determine the precise location of the leak until after the pipe had been removed, whereupon it was found that the failure comprised a small hole approximately 20 mm from the outer end of the swaged-sleeve end-fitting, adjacent to the securing nut at the opposite end of the pipe from the pump. The plastic inner-pipe had ruptured over a small area (approximately 2 to 3 mm across) and the braiding above the hole had failed locally, being splayed out over the area immediately above the hole.

Subsequent detailed examination of the pipe revealed evidence of chafing against the braid which had substantially reduced the thickness of the steel strands over an area approximately 6 to 8 mm across in the vicinity of the failure. It was evident that the weakened strands had failed due to the hydraulic pressure load imposed by the plastic inner pipe, and this had then allowed the plastic inner pipe to rupture in the unsupported area. A check of the adjoining components revealed that the chafed pipe had been rubbing against a rigid hydraulic pipe, which had become polished, but was otherwise undamaged.

A check of the operator's fleet for other instances of chafing in the affected area, which was instituted in the light of the AAIB findings, revealed one instance of fouling which had affected a different pipe in the same general area.