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## Gear deployment problems, McDonnell Douglas MD-88, TC-ONM

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**Micro-summary:** The main landing gear of this McDonnell Douglas MD-88 failed to stay in a down and locked position despite many efforts to secure them.

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**Event Date:** 1997-07-23 at 1130 UTC

**Investigative Body:** Aircraft Accident Investigation Board (AAIB), United Kingdom

**Investigative Body's Web Site:** <http://www.aaib.dft.gov/uk/>

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### Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
  2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
  3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.
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# McDonnell Douglas MD-88, TC-ONM

## AAIB Bulletin No: 3/98 Ref: EW/C97/7/10 Category: 1.1

<b>Aircraft Type and Registration:</b>	McDonnell Douglas MD-88, TC-ONM
<b>No &amp; Type of Engines:</b>	2 Pratt & Whitney JT8D-219 turbofan engines
<b>Year of Manufacture:</b>	1997
<b>Date &amp; Time (UTC):</b>	23 July 1997 at 1130 hrs
<b>Location:</b>	London Gatwick Airport
<b>Type of Flight:</b>	Public Transport
<b>Persons on Board:</b>	Crew - 6 - Passengers - 157
<b>Injuries:</b>	Crew - None - Passengers - None
<b>Nature of Damage:</b>	Minor damage to main landing gear doors and damage to the No 2 engine
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence
<b>Commander's Age:</b>	50 years
<b>Commander's Flying Experience:</b>	5,300 hours (of which 240 were on type) Last 90 days - 240 hours Last 28 days - 85 hours
<b>Information Source:</b>	AAIB Field Investigation

Following selection of landing gear down during an approach to Runway 26L at Gatwick Airport, the nose landing gear indicator displayed a red unsafe indication. The main landing gears both showed green 'down-and-locked' indications. At 2,000 ft and 160 kt the landing gear was cycled again; the nose gear indicator continued to show red, with the two main gear indications showing green. A fly past of the Control Tower was made, during which it was visually confirmed that the nose gear was retracted, with both mains extended. Despite further cycling of the landing gear, the nose gear failed to extend. The emergency landing gear extension system was therefore activated, and the landing gear then extended fully with three greens being displayed. However, during the subsequent landing roll, following an uneventful approach and touchdown, the main landing gear doors were damaged by contact with the runway surface, and associated debris was ingested by the N° 2 engine causing minor damage.

The main landing gear doors are sequenced to close automatically following main gear extension, but this cannot take place when the landing gear hydraulic system is not pressurised. Consequently, the main landing gear doors remain open following an emergency gear extension. The lower edges of the opened doors hang low enough to contact the runway, and the relevant parts of the doors are therefore fitted with steel buffer-blocks, secured by bolts, to minimise damage to the doors. In this case, the block on the right hand door had torn away and associated debris, including one of the securing bolts (but not the block itself), had entered the N° 2 engine resulting in damage to three fan blades, and a small puncture in the acoustic lining. One of the damaged blades (and its opposing matching blade) was replaced, the damage to the remaining two blades being dressed out in accordance with Maintenance Manual procedures, and the acoustic lining was patch-repaired. The damaged landing gear door was also replaced.

The aircraft had accumulated only 1,300 hours from new, and was in very good condition. Detailed visual inspection of the landing gear and related hydraulic systems revealed no evidence of any defect which could account for the malfunction, and the landing gear operated normally during subsequent extension and retraction checks.

It was reported that ground engineers saw both 'HYD' switches selected to LOW when they first entered the flight deck shortly after the incident. The check list for the aircraft includes the following items:

After take off : "HYD PUMPS..... .LOW/OFF",

Approach: "HYD PUMPS .....HI/ON/CHECKED".

The Maintenance Manual draws attention to the fact that a hydraulic supply pressure of less than 2,000 psi at the sequencing (landing gear control) valve can inhibit operation. During normal landing gear extension, the main gears unlock and deploy slightly before the nose landing gear. It is likely, therefore, that extension of the nose gear will be affected to a greater degree by reduced hydraulic pressure than will the main landing gears. If the HYD switches on the flight deck had been set to LOW when the landing gear was initially selected down, both hydraulic systems would have been pressured at 1,500 psi, compared to 3,000 psi when selected to 'HI'. A failure of the nose landing gear to extend would be the expected outcome in such circumstances.

It was not possible to establish positively whether the HYD switches had been set to LOW when the landing gear down selections were made. The flight data recorder parameter list did not include hydraulic pressure, just a discreet parameter signalling low (ie failed) pressure for each system. Replay of the recorder showed these parameters to have been normal throughout the incident flight, and during the preceding and subsequent flights.