

AIRCRAFT ACCIDENT REPORT NO. 3/91

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REPORT ON THE ACCIDENT TO LOCKHEED L1011-385-3 TRISTAR, C-GAGI, 1NM SOUTH EAST OF MANCHESTER ON 11 DECEMBER 1990

SUMMARY

This aircraft was preparing to descend from flight level 370 during the final stage of a scheduled passenger flight from Montreal to London Heathrow, with 10 crew and 104 passengers (including two infants) onboard, when cabin depressurisation suddenly occurred at a position 1 nm south-east of Manchester. The first officer immediately transmitted a request for descent clearance and donned his oxygen mask as the commander disengaged the autopilot. The commander momentarily passed control of the aircraft to his first officer whilst he also donned his oxygen mask, before resuming control and initiating an emergency descent in accordance with the emergency descent checklist. As the commander closed the throttles, extended the speed brakes and accelerated to the maximum operating speed (V_{MO}) in the descent, the first officer completed his essential communications with ATC and made a PA announcement directing that oxygen masks should be put on immediately.

In the passenger cabin, subsequent to the sounds of a loud 'boom' and the rushing of air from the aft left toilet which were heard by two aft flight attendants, the passenger oxygen masks had deployed. The flight attendants sat down and donned oxygen masks. The purser then made a PA announcement in English and French reminding passengers of the actions required to initiate their oxygen supply and directing them to apply masks to sleeping infants.

After the aircraft had levelled at 10,000 feet the commander called the flight attendant-in-charge to the flight deck to inform him that oxygen was no longer required. The flight attendant informed the commander of the noise associated with the aft toilet and commander advised him not to attempt opening of the toilet door.

The aircraft subsequently landed without further incident at Heathrow Airport, where it was met by medical personnel who attended to the passengers, three of whom had experienced severe headache and earache.

The sudden cabin depressurisation was caused by a localised rupture of the rear pressure bulkhead, behind the aft/left toilet compartment, which occurred as a result of fatigue cracking which had initiated due to the following factors:

1. The presence of a score defect on the bulkhead diaphragm aft surface which had been inadvertently introduced during the manufacturing process.
2. The localised intensification of the bulkhead pressurisation stresses by a bonded doubler butt-joint discontinuity, which was co-linear with the score defect.

Five Safety Recommendations were made during the course of this investigation:

1. The Civil Aviation Authority and the Federal Aviation Administration, in conjunction with Lockheed, instigate an in-service inspection of L1011 aircraft aft pressure bulkheads, capable of reliably detecting:

1. Fatigue cracking on the bulkhead structure.
2. Scoring on the bulkhead gore-diaphragm. (Made 21 December 1990)

2. The 'worst case' failure mode of the L1011 aft pressure bulkhead used for the original certification testing be reviewed in the light of this failure, and the findings from the recommended in-service inspections, and modified to take account of the maximum anticipated failure which could occur, based on these findings. The Civil Aviation Authority and the Federal Aviation Administration expedite, in conjunction with Lockheed, an assessment of the venting capability of the (normally unpressured) aft fuselage to dissipate the maximum anticipated overpressurisation of this zone, following a 'worst case' major failure of the aft pressure bulkhead, without incurring structural damage to the empennage. (Made 21 December 1990)

3. Airlines should review their procedures for cabin attendants in the event of rapid cabin depressurisation with a view towards ensuring a degree of flexibility, appropriate to the equipment in their aircraft, that would provide some continuing assistance to passengers during such an emergency. (Made 16 August 1991)

4. Lockheed should devise and introduce specific NDT procedures to detect the presence of scores in those areas of the L1011 rear pressure bulkhead which contain butt-joints between gore panel doublers. (Made 16 August 1991)

5. The CAA ensure that the standards of the European Joint Airworthiness Requirements for large public transport aircraft, JAR25, are raised at the earliest opportunity to the level of the proposed FAA regulations concerning the fail-safe design of pressure cabins. (Made 16 August 1991)

Subsequent to an early Safety Recommendation arising from this investigation and resultant in-service inspections initiated by the manufacturer, one further instance of a cracked rear pressure bulkhead was detected on a US registered L1011, which was also found to be associated with a score at this location.

The Civil Aviation Authority's response to these Safety Recommendations is contained in CAA Follow-up Action on Accidents Reports (FACTAR) No 3/91, published coincident with the Report.