

Boeing 747-436, G-CIVI, 25 April 1997

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Aircraft Type and Registration:	Boeing 747-436, G-CIVI
No & Type of Engines:	4 Rolls Royce RB211-524H2 turbofan engines
Year of Manufacture:	1996
Date & Time (UTC):	25 April 1997 at 1519 hrs
Location:	London Heathrow Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 17 - Passengers - 400
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Damage to No 4 Engine Integrated Nozzle Assembly and outboard right trailing edge flap
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	52 years
Commander's Flying Experience:	12,700 hours (of which approximately 4,000 were on type)
Information Source:	AAIB Field Investigation

The aircraft was departing from Heathrow for Boston when, during the take-off roll, a following aircraft reported that a panel had fallen from G-CIVI. Take off was continued but during the initial climb the cabin crew reported damage to the trailing edge flap in the region of No 4 engine. The Commander consulted with his company maintenance control who advised him (having identified the panel) to return with No 4 engine at idle and not to use reverse thrust. Fifteen tonnes of fuel was jettisoned and the aircraft landed back at Heathrow without further incident.

Upon inspection it was found that No 4 engine had lost one of its two combustion side fairings (see diagram) whilst the other was found still partially attached but badly distorted in the Integrated Nozzle Assembly (INA) which had suffered impact damage from the departing panel, as had the exhaust corona. The other side fairing was recovered from the runway. The right outboard trailing edge flap had lost a roughly triangular section of honeycomb structure, some 30 centimetre x 12 centimetre, and the entire trailing edge closing fillet, about 6 metres x 2 centimetre, had been knocked off. Both the damage to the engine and the flap necessitated their replacement before further flight.

Investigation revealed that the fairings had been refitted before the incident take off following a combustor borescope inspection. The operator's maintenance schedule also called for a duplicate inspection of the fairings due to the risk of fitting them incorrectly. The Boeing Maintenance Manual gave specific warnings about this possibility to the extent of illustrating two methods by which incorrect hook engagement at the top of the fairings can still allow the lower latches to be fastened (see diagram). The two fairings are not the same length, since the lower latches are not on the centreline of the engine but it should be noted that the illustration of the core taken from the Boeing manual appears to be incorrect, showing the latches to be on the lower right of the engine core. The actual hardware cannot be fitted in this way since the longer fairing can only be fitted on the right of the engine with the shorter on the left and hence the latches are on the lower left. However, for this reason the apparent illustration error cannot have been a factor because it would not have been possible to fit the fairings in the locations shown. The diagram also shows, for the sake of clarity, the engine with the INA removed. In reality, this is not practical for routine maintenance which has to be done with the INA in place and hence a technician needing to gain access to the engine core is required to crawl inside the INA and work in the very limited space between it and the core.

The fairing which had been ejected was the left (shorter) one. Both fairings showed that the bottom latches had been fastened - each had torn from the structure. The top hooks, however, showed twisting damage only to the front hook in each group of three. This suggested that only these had been engaged, although it is possible that all three hooks may have been engaged on one of the fairings and that distortion of an improperly fitted mating fairing allowed dis-engagement of the aft pair. It was not possible to determine which of the two incorrect fitting cases illustrated was applicable.

The operator has interviewed both the technician who re-fitted the panels and the one who signed for the duplicate inspection. A rough estimate of the total cost of this incident to the airline suggests that it has run to several hundreds of thousands of pounds.