

Boeing 747-436, VB-HOZ

AAIB Bulletin No: 11/2000 **Ref: EW/G2000/02/06** **Category: 1.1**

Aircraft Type and Registration: Boeing 747-436, VB-HOZ

No & Type of Engines: 4 Rolls-Royce RB211-524GH turbofan engines

Year of Manufacture: 1992

Date & Time (UTC): 12 February 2000 at 1805 hrs

Location: Stand K17, London Heathrow Airport

Type of Flight: Public Transport

Persons on Board: Crew - 21 - Passengers - None

Injuries: Crew - None - Passengers - N/A

Nature of Damage: Ripped top of L1 door, left side

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 46 years

Commander's Flying Experience: 13,000 hours (of which 3,800 were on type)

Last 90 days - 50 hours

Last 28 days - 25 hours

Information Source: Aircraft Accident Report Form submitted by the pilot and Bridge normal function and defect investigation reports

This incident involved an Airbridge at London Heathrow, Terminal 3. When up against the aircraft at the L1 door position, Bridge K17B dropped about one metre damaging the aircraft door. On examination a number of faults were detected associated with the Bridge automatic height adjustment function.

Normal operation of the Bridge requires the keyswitch to be selected to the Manual position, when the warning horn will sound. The operator then picks up the portable control unit and depresses the deadman's button, silencing the horn. The operator then selects the forward button and steers the Bridge towards the aircraft door; initially positioning the Bridge floor bumper parallel to the fuselage, about 15 to 20 cms below the door sill and about one metre away, with the right hand side of the canopy aligned 20 cms from the edge of the door. The Bridge is then moved towards the aircraft until the bumper makes contact with the aircraft, when the keyswitch is selected to Auto.

The automatic height adjustment device is located on the right hand side of the Bridgehead and is designed to keep the Bridge floor, level with the aircraft door sill during loading and unloading of the aircraft. A drum on the end of an arm contacts the aircraft fuselage when Auto is selected; if the

aircraft rises or falls the drum rotates and reed switches are used to signal the Bridge hydraulic systems to respond. After approximately 2 cms of aircraft movement the first line reed switch will signal the Bridge to raise or lower, the movement of the Bridge rotates the drum and re-opens the reed switch when the Bridge has reached the desired height.

Safety features incorporated into the design of the Bridge include:-

1 The alarm horn will sound and the Bridge should stop moving if either:-

a The Bridge is still moving six seconds after the first line reed switch has closed, which limits movement to about 12 cms.

or

b The Drum moves out of contact with the aircraft

2 The alarm horn will sound but the Bridge movement will continue if:-

The drum activates the second line reed switches which are a back up to the first line reed switches and activate after about 3.5 cms of aircraft movement.

On investigation the first and second line reed switches were found to have their contacts 'welded' together, causing the horn to sound and the Bridge to move down. These switches were thought to have been damaged following the installation of a new, relatively high current klaxon style horn. On previous occasions when new klaxons had been fitted to older bridges a relay was installed in the circuit to protect the reed switches from over current damage. Subsequent to this event, a relay was fitted and the reed switches were repaired, following which checks on the systems continued.

Up and down movements of the Bridge were achieved using Manual control with no faults recorded. In Automatic, the Bridge functioned correctly in the Up sense; it stopped and the horn sounded after six seconds. In the Down direction however, the timer timed out, the alarm activated but the Bridge continued to descend even though the hydraulic dump valve was de-energised, and so signalled to close. This should have stopped the bridge. The dump valve was replaced because the valve travels to the Closed position under the influence of a spring which, on other units, had been found to be broken in the past. However, further testing demonstrated that the fault was still present.

Electrical checks identified that when in automatic with the horn sounding and the dump valve de-energised the down valve incorrectly remained energised. Whereas, when in manual when the dump valve was de-energised, no other valves were energised. A modification was incorporated, routing the up valve and down valve wiring through a secondary relay, linked with the dump valve relay. The effect of this modification in automatic mode ensures that when the timer times out the dump valve is signalled to Close and both the up valve and down valve are de-energised. Following modification the Bridge functioned correctly.

There are eight bridges at Heathrow of the same 'old' design as the K17B Bridge and all have now been similarly modified. These bridges are all to be fully refurbished during 2000/2001.