

**AAIB Bulletin No: 3/94**      **Ref: EW/C93/10/5**      **Category: 1.1**

**Aircraft Type and Registration:** BAC/SNIAS Concorde 102, G-BOAB  
**No & Type of Engines:** 4 Rolls-Royce Olympus 593/610 turbojet engines  
**Year of Manufacture:** 1976  
**Date & Time (UTC):** 25 October 1993 at 1800 hrs  
**Location:** London Heathrow Airport  
**Type of Flight:** Public Transport  
**Persons on Board:** Crew - 9      Passengers - 70  
**Injuries:** Crew - None      Passengers - None  
**Nature of Damage:** No 2 tyre burst, approximately 1 inch diameter hole in  
wing fuel tank, minor damage to wiring  
**Commander's Licence:** Airline Transport Pilot's Licence  
**Commander's Age:** 49 years  
**Commander's Flying Experience:** 11,575 hours (of which 5,250 were on type)  
Last 90 days - 94 hours  
Last 28 days - 39 hours  
**Information Source:** AAIB Field Investigation

The aircraft was pushed back from Stand V15 at Terminal 4 for a departure from Runway 09R. After starting the engines but before the aircraft moved, the commander applied the toe brakes and checked the wheelbrake pressure with the brake control lever at the emergency setting. He then returned the brake control lever to the normal position, released the toe brakes and commenced taxiing.

The wheelbrakes were not used as the aircraft taxied along the southern taxiway which was dry. With the engines at idle power the aircraft accelerated very slowly. As it approached a bend at the end of Block 108 at a ground speed of 29 kt the commander applied the toe brakes. As he did so, he felt the aircraft lurch slightly so he released the brakes and re-applied them gently. Again the brakes snatched and a bang was heard. The commander selected emergency brakes and brought the aircraft to a halt with gentle brake application. At this stage the flight crew then observed warnings of brake torque overload, a flashing tyre warning light, a wheelbrake overheat light and the No 1 forward wheelbrake temperature indicated 700°C. The aircraft was held stationary by application of the co-pilot's right wheelbrake toe pedal whilst the commander opened the direct-vision window on his side of the flight deck. On looking out of the window, the commander saw a substantial quantity of fluid leaking from

the left wing so he shut down engines 1 and 2 and asked ATC to send the fire services to attend the aircraft as a precaution. Next he warned the cabin crew of a possible passenger evacuation and of the potential fire hazard on the left side of the aircraft. When the fire services arrived they chocked the nosewheel and informed the commander that fuel was leaking from the left wing and recommended that he shut down the remaining two engines. This he did and the fire crews covered the fuel spillage with foam before the passengers disembarked through the right-hand forward service door using mobile steps.

Upon examination of the aircraft it was found that the lower wing skin had been punctured releasing fuel from the No 1 tank. The No 2 tyre (left-hand bogie, forward inboard wheel) had burst damaging some wiring and approximately 50% of the water deflector was missing. It is considered to be almost certain that energy released by the burst tyre had broken the deflector and flung the debris against the underside of the wing causing the puncture. The tyre showed clear indications of gross abrasion of the tread due to a locked brake followed by an X-shaped burst. A long skid mark was found commencing in taxiway Block 106 and terminating in Block 105.

In the Concorde aircraft, normal braking action is achieved using green hydraulic system pressure. The pilots' pedal demands are transmitted electronically to servo valves associated with each wheel which modulate the hydraulic pressure to the brake units accordingly. Anti-skid and torque protection systems also control the action of the servo valves, although anti-skid protection would normally be disabled automatically at taxi speeds. Emergency braking pressure is provided by yellow system pressure which is modulated hydraulically directly from the pilots' pedal master cylinder pressures. Although progressive and differential brake pressure is thus maintained, anti-skid and torque protection is not available when emergency braking operates.

The sequence of events suggested that full brake pressure had been applied to No 2 wheelbrake whilst only light braking action was being demanded. Therefore a comprehensive series of tests was performed on the braking system before any components were disturbed. These revealed no anomalies and so individual components were removed for testing by the manufacturers. Again, no fault was found with these units except for the No 2 brake servo valve which showed abnormal results during its first test cycle. Unfortunately, subsequent test cycles could not replicate this behaviour and, at the time of preparation of this Bulletin, any fault remains unconfirmed although the airline is proposing a precautionary campaign of servo valve removal and overhaul.

The airline is also asking the manufacturer to review the design of the water deflector which it and the AAIB consider responsible for penetration of the fuel tank despite assurances from the manufacturers that it was one of the design objectives of this component that it should not be capable of so doing.