

## ACCIDENT

<b>Aircraft Type and Registration:</b>	Hawker Hunter T7, G-BVGH	
<b>No &amp; Type of Engines:</b>	1 Rolls Royce Avon MK 122 turbojet engine	
<b>Year of Manufacture:</b>	1958	
<b>Date &amp; Time (UTC):</b>	22 May 2007 at 1300 hrs	
<b>Location:</b>	Exeter Airport	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 2	Passengers - None
<b>Injuries:</b>	Crew - None	Passengers - N/A
<b>Nature of Damage:</b>	Right main landing gear leg failed, damage to right wing and rear fuselage	
<b>Commander's Licence:</b>	Private Pilot's Licence	
<b>Commander's Age:</b>	51 years	
<b>Commander's Flying Experience:</b>	2,350 hours (of which 35 were on type) Last 90 days - 19 hours Last 28 days - 5 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and AAIB examination of the aircraft	

## Synopsis

During the latter stages of takeoff from Exeter Airport, the aircraft swung sharply to the right. Application of left brake and rudder failed to correct the swing; the takeoff was aborted but the aircraft departed the runway to the right. During the deceleration, the right main landing gear failed, which allowed the right external fuel tank to hit the ground and burst. The pilot shut down the engine before the aircraft came to a halt. There was no fire and both the pilot and the passenger escaped unhurt. The cause of the accident was traced to a failure within the wheel brakes selector unit which allowed pressure to be applied continuously to the right brake unit during the takeoff run. The heat consequently

generated, resulted in the right brake unit's seizure, causing the aircraft to swing uncontrollably.

## History of the flight

The aircraft had taxied to Runway 26 from its parking place on the north side of the airport. The initial takeoff run was described by the pilot as normal, with no directional control problems. In the later stages of the takeoff run, as the nosewheel lifted from the ground and with the rudder pedals central, the right main wheel brake appeared to operate, with no pilot input, and the aircraft swung to the right. Despite the use of full left rudder and left wheel braking, the pilot could not bring the aircraft

back onto the runway heading, so he aborted the takeoff. As the aircraft left the paved surface, the pilot deployed the brake parachute. During the deceleration, the right main landing gear collapsed, causing the right underwing fuel drop tank to hit the ground and rupture, spraying the fuselage with fuel. The engine was shut down and the aircraft came to rest on its two remaining landing gear legs, the right wing and rear fuselage. Despite the significant fuel spillage, there was no fire and the two crew members, who were uninjured, evacuated the aircraft prior to the arrival of the Airport Fire Service. Some witnesses reported seeing smoke streaming from the right wheel immediately prior to the loss of control.

### Brake system description

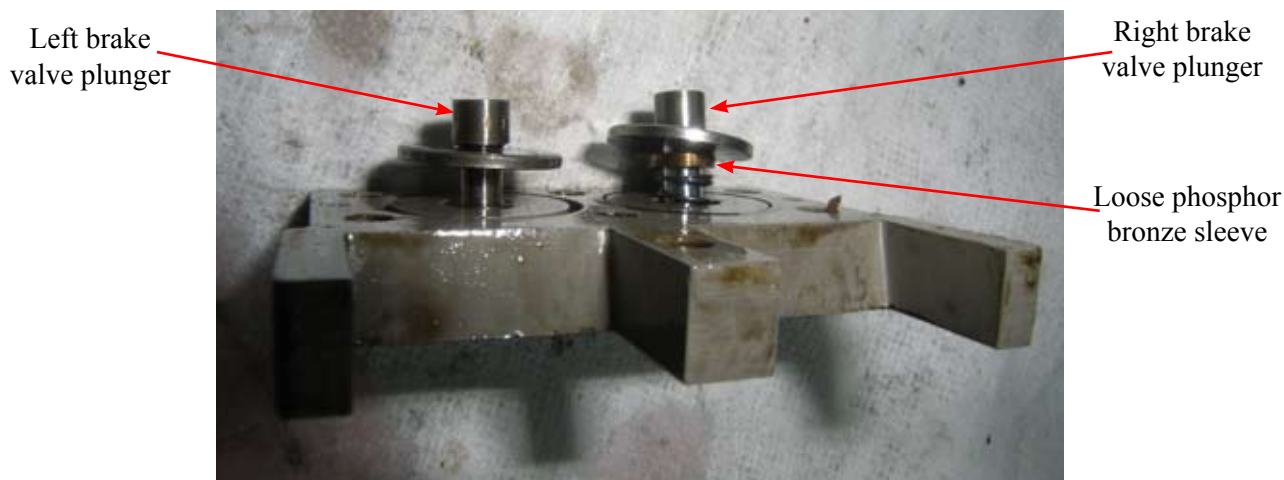
The Hawker Hunter is fitted with a castoring nosewheel, differential main wheel braking being used to maintain directional control. Wheel braking is controlled by the brake selector unit which is operated through a series of levers and cams by a lever mounted on the forward face of the control column. The selector unit consists of two valves, one for each main wheel brake unit. Pulling the brake lever progressively opens both valves, allowing both main wheel brake units to be progressively pressurised. If the rudder pedals are moved during braking, a cam

within the selector unit alters the position of each brake valve, thereby varying the pressure to each brake unit to provide differential braking. The aircraft was also fitted with a 'Maxaret' system (an early form of anti-lock braking) to prevent wheel lock-up under extreme braking or during operation on slippery surfaces.

### Investigation

After recovery, an initial investigation was carried out by the aircraft's maintenance organisation. The right brake unit showed evidence of overheating so the brake selector unit and the right main landing gear Maxaret unit were removed for detailed examination at the AAIB. The Maxaret unit was tested and found to operate normally. Disassembly of the brake selector valve showed that the plunger which operated the right brake valve had become stuck in position 1.8 mm further 'extended' than the plunger of the left brake valve. In such a position, the right brake valve would remain partially open and hydraulic pressure would be applied to the right brake unit regardless of the position of the brake lever on the control column and/or rudder pedals.

Each plunger passes through a spring-loaded phosphor bronze sleeve within the unit, (Figure 1). The sleeve



**Figure 1**

Brake valve plungers showing loose support sleeve on the right valve

for the left brake valve was secure within its housing, while the right valve sleeve sprang from the unit during disassembly. The right brake valve plunger exhibited witness marks on its shaft, and these appeared to have been caused by contact with the sleeve during operation; the left valve plunger was undamaged. Measurement of the right valve sleeve showed that a clearance of 0.06 mm existed between the outer diameter of the sleeve and the hole in the housing in which it had been mounted. This clearance would have allowed a small degree of 'rocking' movement of the sleeve which, over time, produced the witness marks on the plunger shaft and, on this occasion led to it becoming jammed.

### **Conclusions**

It is considered that as the aircraft completed its right turn onto Runway 26, the right brake valve plunger within the selector unit became jammed, resulting in

a degree of pressure being continually applied to the right wheel brake. Given that the pilot did not have any directional control issues until the nosewheel left the ground, the level of braking to the right main wheel must have been low. As the aircraft accelerated down the runway, the heat build-up within the right brake unit would have been rapid and it is likely that it was sufficient to cause the brake unit to 'seize', just as the nosewheel lifted from the ground.

### **Safety action**

The brake selector unit is not subject to a fixed life and it was not determined when this unit had been fitted to the aircraft. As a result of this event, the maintenance organisation has introduced routine spectrographic oil analysis of the hydraulic fluid within the brake system to allow early identification of component deterioration.