Beagle B121 Pup Series 2, G-AXJJ

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Aircraft Type and Registration:	Beagle B121 Pup Series 2, G-AXJJ
No & Type of Engines:	1 Lycoming O-320-A2B piston engine
Year of Manufacture:	1969
Date & Time (UTC):	18 March 1999 at 1256 hrs
Location:	Huddersfield (Crosland Moor) Airfield, Yorkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - Minor - Passengers - N/A
Nature of Damage:	Aircraft damaged beyond economic repair
Commander's Licence:	Private Pilot's Licence with IMC Rating
Commander's Age:	45 years
Commander's Flying Experience:	405 hours (of which 192 were on type) Last 90 days - 10 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by AAIB

Runway 25 at Crosland Moor airfield has a tarmac surface and a 2.6% upslope. At the threshold end it is bounded on the right side by a quarry whilst the left side and the immediate undershoot slope down about 6 metres at an angle exceeding 45°.

The pilot of G-AXJJ was backtracking for take off on Runway 25. During the first part of the taxiing, he reports that the toe brakes were effective as he had to stop twice when the aircraft was being chased by a dog. However, as the aircraft began to gather speed on the sloping runway, he became aware of a loss of braking effectiveness, despite 'pumping' the brakes and applying the handbrake. By now the aircraft had entered the region where the runway was bounded by the quarry and slopes and the pilot felt he could not turn the aircraft using nosewheel steering alone without dropping off one side or the other. He therefore elected to run off the end of the runway at a speed of 5 kt. The aircraft dropped down the slope, coming to rest on its propeller and right wingtip. The pilot suffered minor whiplash and lower back injuries but evacuated the aircraft

normally. In addition to the major damage to the nose and right wing, further damage was inflicted on the rear fuselage during the recovery of the aircraft.

Description of the brakes

The original Dunlop brakes fitted to the B121 Pup aircraft employed a floating disc sandwiched between a fixed backplate and a fixed caliper containing front and rear pistons. Two cylindrical (moving) pads of friction material fitted within the piston housings and two corresponding static friction pads were fixed to the backplate. G-AXJJ still had the original brakes fitted although a modification is available to fit an improved Cleveland design to alleviate high brake wear and rectify a particular problem with friction pad retention within the piston housing. The Pup Service Manual specifies a defined dimension to be measured when checking Dunlop brake wear because, as the pads reduce in thickness, several cases have occurred where the friction material can drop out of the housing and lead to fluid loss as the piston overstrokes beyond its sealing area. It is understood that G-AXJJ had experienced just such a failure at Blackpool about nine months before this accident, but without any resultant damage. The owner reports that the aircraft did require a relatively high rate of brake pad replacement, approximately a change every 50 to 60 hours. This he attributed to the particular features of operating from Crosland Moor.

Examination of the aircraft

The aircraft was inspected by an engineer representing the insurers. He immediately noticed that fluid was leaking from the left brake forward piston area and that the left brake hydraulic fluid reservoir contents were much depleted. Upon disassembly, it was found that the forward piston had started to move out of its housing, causing the fluid leak, and there was no sign of the associated friction pad (subsequently recovered from the runway). The rear piston was still correctly located within its housing but the friction pad was worn. The two fixed pads were worn away flush to the metal surface of the backplate. The aircraft had flown about 17 hours since its last 50-hour check at a JAR 145-approved maintenance organisation, which had included numerous items of additional work, including removal of the mainwheels to replace the tyres. When questioned about his inspection of the brakes, the certifying engineer replied that they were "about one-third worn" and, in his opinion, the amount of wear present did not give him reason to believe that replacement was warranted at that time. The organisation has also subsequently stated that "the brakes were examined in accordance with the Service Manuals" but they were not made aware of the extremely high rate of friction material consumption.

Discussion

Several factors combined to cause this accident. The maintenance organisation was unfamiliar with this type of aircraft and brake assembly in general and it was the first time they had been tasked with performing maintenance on G-AXJJ in particular. The aircraft itself was experiencing high consumption of friction pads due to the nature of its home base, such that renewal at every 50-hour check was effectively appropriate, but the owner had not mentioned this to them. The dimensional check required by the Service Manual assumes that the complete set of pads were renewed as stipulated. If only the backplate pad material was renewed, for example, then the dimensional check would be misleading inasmuch as the moving pads could be approaching the critical

thickness at which they can drop out of the housing but the overall dimension would indicate that the assembly was within limits. In fact, the previous brake pad change had been in July 1998 following the incident of brake failure described above. The organisation responsible for this work had documentation showing that a full set of pads were procured and fitted to both brakes. The aircraft had flown 66 hours since that date.

The pilot candidly admits that, had he reacted more rapidly, he could probably have cut the engine and ground-looped the aircraft before it had reached the area where there was a danger of tumbling down either the quarry or the slope at the edges runway.