BAe ATP, G-MANH

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Aircraft Type and Registration:	BAe ATP, G-MANH
No & Type of Engines:	2 Pratt & Whitney PW-126 turboprop engines
Year of Manufacture:	1988
Date & Time (UTC):	17 November 1999 at 1034 hrs
Location:	Manchester Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 5 - Passengers - 47
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Right main landing gear torque links apex pin separated. Damage to brake units
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	11,310 hours (of which 1,300 were on type) Last 90 days - 178 hours Last 28 days - 65 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and telephone enquiries

History of the event

The aircraft was pushed back from the stand after start-up and was taxied, without incident to the holding point of Runway 06. As the aircraft approached the holding point, it was cleared by ATC to taxi straight onto the runway to line up for take off. As the pilot started to turn the aircraft onto the runway centreline, it began to oscillate violently from left to right. The pilot brought the aircraft to a stop and the aircrew checked both main landing gears through the windows. Although they could see nothing wrong they asked ATC to give them permission to taxy clear of the runway and then called their company engineering for advice. They noticed, during subsequent taxiing that the oscillations did not occur whilst they were taxiing straight ahead but started again immediately they

turned. The aircraft was taxied clear of the runway, the passengers disembarked into buses and the company engineers were requested to inspect the aircraft on the taxiway.

When the engineers inspected the aircraft on the taxiway, they found that the apex pin from the right main landing gear torque links was missing. The pin was subsequently found on the runway close to its centreline and the nut was found between the holding point and the runway. Neither the locking bolt nor its nut was found. Subsequent engineering examination showed that the threads of the apex pin were very severely worn and distorted in shear towards the free end of the pin (see Figure 1). The shear distortion was evidence that the nut had been stripped off the threads.

This was the second incident involving loss of the apex pin which this operator had experienced. They had already sought the advice of the landing gear manufacturer and had subsequently instituted a fleet-wide inspection to check the end float of all Main Landing Gear (MLG) apex joints and to replace the apex pin assemblies if necessary. During this fleet inspection, one apex pin had been found which had very severely worn threads and four others which were worn to an unacceptable degree.

Service history of the main landing gears of G-MANH

Both main landing gears had been fitted to G-MANH in June 1995 and had done 8,200 landings since overhaul at the time of this incident. The Apex Bolt which failed had last been checked for end float on 28 May 1999 and had not reached the 1800 hr repeat inspection threshold, in force, at the date of the incident.

Operator's response to apex pin failures

As a result of the apex pin loss incident, involving G-MANM, on 13 May 1999, the operator issued a fleet-wide inspection to check for the presence and security of the apex link hardware of all their ATPs, on 14 May 1999. Five days later their Engineering Department requested that, as an inspection sample, the main landing gear apex pins and nuts were removed from an aircraft which was in scheduled maintenance, for condition assessment. On examination, one of these pin and nut sets was found to have very severely worn threads and, as a result, on 19 May 1999, the operator instituted a further inspection requirement to establish the end float of the apex joint on all main landing gears in their fleet before 27 June 1999 and at every subsequent 'C' Check. A further instruction, issued on 19 July 1999, reduced the repetition interval of this end float inspection to 1,800 hours.

The operator's Engineering Department was aware that the landing gear manufacturer was formulating an inspection procedure for determining thread wear and drafting a Service Bulletin to address the thread wear problem. Without a set procedure, determination of the degree of wear on the threads of the apex pin and nut combination was necessarily subjective. This incident, to G-MANH occurred before the manufacturer's Service Bulletin had been fully developed and so, as an interim measure, the operator further reduced the interval between the inspections to establish the end float of the apex pins to 300 hours.

Manufacturer's response to apex pin failures

As a result of the apex pin loss incident, involving G-MANM, the landing gear manufacturer instituted a programme to establish the wear state of apex pins in service and review the maintenance requirements for the apex joint. A need to assess thread wear accurately was

established and the development of suitable tooling and a procedure was undertaken. (Illustrations of the worn threads identified during the two investigations appear at Figures 2, 3a, b & c.)

This development of this tooling had not been completed by the time that the second incident, to G-MANH, occurred. Since this second occurrence, however, the landing gear manufacturer has completed the trialling of the tooling needed to establish thread wear. This gauge allows the operative to measure the wear of both the pin thread and the nut thread, individually, when engaged on known good threads.

The aircraft manufacturer, British Aerospace, has now issued a CAA Mandatory Service Bulletin, ATP-32-99 which incorporates Messier-Dowty Service Bulletin 200-32-263. This details the inspection procedure, using the above tooling, and lays down wear limits for both the pin and nut threads.

The Bulletin called for an initial inspection to be carried out within 800 landings or 16 weeks of its date of issue, with repeat inspections at intervals of not more than 1,000 landings. The inspection frequency of the apex joint is now consistent with that required for this application in which critical, non-preloaded, threaded components are present, by design, in a hostile, high vibration, environment.