



REASSESSMENT OF RESPONSES TO AVIATION SAFETY RECOMMENDATION A00-03

ENGINE CHIP DETECTOR REQUIREMENTS

Background

On 18 May 1998, a Pilatus PC-12 aircraft, serial number 151, was on a scheduled domestic flight from St. John's, Newfoundland, to Goose Bay, Labrador, with the pilot, a company observer, and 8 passengers on board. Twenty-three minutes into the flight, the aircraft turned back towards St. John's because of a low oil pressure indication. Eight minutes later, the engine (Pratt & Whitney PT6A-67B) had to be shut down because of a severe vibration. The pilot then turned towards Clarenville Airport, but was unable to reach the airfield. The aircraft was destroyed during the forced landing in a bog 1.5 miles from the Clarenville Airport. The pilot, the company observer and a passenger sustained serious injuries.

The Board concluded its investigation and authorized the release of report A98A0067 on 04 February 2000.

Board Recommendation A00-03 (24 March 2000)

The single-engine instrument flight rules equipment standard requires a chip detector system to warn the pilot of excessive ferrous material in the engine lubrication system. The chip detector on the accident PC-12 was designed to be disabled in flight and did not meet the intent of the equipment standard. Transport Canada (TC) has since advised operators of the PC-12 to install an engine chip detector that functions in all regimes of flight.

The chip detector system on board the PC-12 is installed at the six o'clock position in the reduction gearbox (RGB). Only the oil lubricating the RGB and a portion of the lubricating oil from the number 3 and 4 engine bearings pass over the chip detector before returning to the scavenge oil pump. None of the lubricating oil from the number 1 and 2 engine bearings and none of the oil from the accessory gearbox (AGB) pass over a chip detector before returning to the scavenge oil pump. Oil from these areas goes first through the scavenge oil pump, then through the pressure pump and oil filter, before returning to lubricate the engine components. Therefore, metal generated in these areas would be filtered out prior to encountering the chip detector in the RGB. The chip detector system, as installed, is still not able to warn the pilot of ferrous material generated by all the engine components. Installation of a second chip detector, in the location of the AGB drain plug, would allow for the monitoring of all the unfiltered oil, and could also indicate the presence of ferrous particles if tied into the existing chip indicating system. The engine manufacturer has advised that this chip detecting configuration also exists on other aircraft types equipped with the PT-6 engine.

The engine chip detecting system, as it is presently configured on the PC-12, does not monitor the entire engine lubricating system for ferrous particles, and other aircraft types using the PT-6 may be similarly configured. Therefore, the Board recommends that:

The Department of Transport require that the magnetic chip detecting system on PT-6-equipped single-engine aircraft be modified to provide a warning to the pilot of excessive ferrous material in the entire engine oil lubricating system.

A00-03

Transport Canada's Response to A00-03 (21 June 2000)

In its response, TC indicated that it will review the consistency of certification and operational requirements of the chip detector system for single-engine aircraft. The results of this review will determine if any additional requirements need to be initiated.

Board Assessment of Transport Canada's Response to A00-03 (13 September 2000)

In its response, TC indicated that it will review the consistency of certification and operational requirements of the chip detector system for single-engine aircraft. The results of this review will determine if any additional requirements need to be initiated.

Given that it will not be known what/if any safety action TC intends to take, until after they complete their review, the response is assessed as "**Satisfactory in Part**".

Next TSB Action (13 September 2000)

The TSB staff will continue to monitor TC's future actions related to this recommendation, and will update this assessment if appropriate.

Board Reassessment of A00-03 (09 June 2004)

The Commercial Air Services Standard 723.22 has been amended to include subsection 2 (d) requiring a chip detector system to warn the pilot of excessive ferrous material in the entire engine lubrication system in all regimes of flight.

Consequently, this response is considered "**Fully Satisfactory**".

This deficiency file is assigned a "**Closed**" status.