



REASSESSMENT OF RESPONSES TO AVIATION SAFETY RECOMMENDATION A00-02

ELECTRICAL SYSTEM 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 A00-02 (24 March 2000)

The single-engine instrument flight rules (SEIFR) requirement for electrical power is for 2 independent power generating sources, either of which is capable of sustaining essential flight instruments and electrical equipment. The PC-12 meets this requirement with 2 generators. According to the PC-12 Pilot Operating Handbook (POH), the battery provides power for engine starting, and can also provide power to essential electrical systems for 20 minutes in the event of a dual generator or engine failure if the electrical load is less than 60 amps. If the load is reduced to below 50 amps, the battery should last for 30 minutes. Maintaining optimal glide performance after an engine failure is fundamental and, during the glide, the aircraft battery is the sole source of electrical power. Instrument meteorological conditions may exist during the descent and, therefore, it is crucial that the battery be capable of powering the flight instruments until landing.

At the PC-12's optimal glide speed and configuration, it would take about 32 minutes to descend from 30 000 feet to sea level; a glide from 25 000 feet would take about 28 minutes. The typical electrical load from essential equipment on the PC-12 is about 50 amps, and according to the aircraft manufacturer, a 70% capacity battery with a rated battery power of 40 amp hours can supply this load for 31 minutes. Powering only the essential instruments and lights, battery power might be nearly or completely spent prior to touchdown. It may also be necessary to power other electrical systems, further reducing battery life. An attempted engine re-light or the use of a landing light at night would both place a large draw on a battery. Electric windshield

heat may also be required. With the pilot windshield heat continuously on light mode, the estimated battery life is 24 minutes; on heavy mode, the estimated life is only 22.5 minutes, which is below the optimal gliding time from the maximum operating altitude.

Other rule-making authorities have recognized that standard battery supplies are inadequate for emergency SEIFR purposes. The Australian SEIFR requirement for emergency electrical supply is for a system of sufficient capacity and duration that is capable of providing power following the failure of all generated power, for those loads essential for:

- i. one attempt at engine restart; and
- ii. descent from maximum operating altitude to be made at the best range gliding speed and in the best gliding configuration, or for a minimum of 1 hour, whichever is greater; and
- iii. continued safe landing; and
- iv. if appropriate, the extension of landing gear and flaps.

European Joint Aviation Requirement - Operations (JAR-OPS) SEIFR draft regulations have proposed a similar requirement.

The standard emergency power supply (battery) on SEIFR aircraft may be insufficient to power essential aircraft electrical systems throughout an engine-out descent from maximum operating altitudes at the optimal glide configuration and speed, and there is no *Canadian Aviation Regulations* (CAR) requirement that such a system be required. Therefore, the Board recommends that:

The Department of Transport require that SEIFR aircraft have a sufficient emergency electrical supply to power essential electrical systems following engine failure throughout the entirety of a descent, at optimal glide speed and configuration, from the aircraft's maximum operating level to ground level.

A00-02

Transport Canada's Response to A00-02 (21 June 2000)

In its response, Transport Canada (TC) indicated that it concurred with the recommendation and, subject to the Canadian Aviation Regulation Advisory Council (CARAC) consultation process, will develop Notices of Proposed Amendment (NPA) for applicable areas of the CARs and associated standards. TC is anticipating submitting these documents to the December 2000 meeting of the CARAC's Commercial Air Services Operations Technical Committee.

Board Assessment of Transport Canada's Response to A00-02 (13 September 2000)

In its response, TC indicated that it concurred with the recommendation and, subject to the CARAC consultation process, will develop NPAs for applicable areas of the CARs and associated standards. TC is anticipating submitting these documents to the December 2000 meeting of the CARAC's Commercial Air Services Operations Technical Committee.

Given that safety action will not take place until after the consultative process with CARAC, the response is considered "**Satisfactory Intent**".

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 A00-02 (09 June 2004)

The Commercial Air Services Standard 723.22 has been amended to include subsection 2 (i) requiring "sufficient emergency electrical supply to power essential electrical systems, autopilot flight instruments and navigation systems following engine failure throughout the entirety of a descent at optimal glide speed configuration from the aeroplane's operating level to mean sea level."

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

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