Transportation Safety Board of Canada | Bureau de la sécurité des transports du Canada

REASSESSMENT OF RESPONSES TO AVIATION SAFETY RECOMMENDATION A00-01

OXYGEN 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 A00-01 (24 March 2000)

The requirement for pressurized aircraft to carry a supplemental oxygen supply is set out in *Canadian Aviation Regulations* (CARs) 605.31. The CARs requires a 10 minute minimum supply of oxygen for passengers and crew, or an amount sufficient to allow an emergency descent to below 13 000 feet, whichever is greater. The standard oxygen system on board the Pilatus PC-12 meets the requirements set out in the CARs (10 minutes). The single-engine instrument flight rules (SEIFR) does not stipulate any additional oxygen equipment requirements.

According to the *Pilot Operating Handbook* (POH), the standard PC-12 oxygen system is "for use by crew and passengers in the event of contaminated air being introduced into the cabin or a loss of pressurization with a rapid descent to lower altitudes." The system "will supply two crew and nine passengers for a minimum of 10 minutes in which time a descent from 30 000 feet to 10 000 feet is performed." A rapid descent is the best course of action for air contamination or depressurization while under power; however, if the aircraft loses pressurization due to engine failure, a rapid descent would compromise the aircraft's glide profile and lessen the chances of reaching a suitable aerodrome.

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Maintaining the aircraft's optimal glide profile is a fundamental aspect of coping with a total power loss. However, in a high-altitude engine failure scenario, the need to maintain optimal glide speed is at odds with the requirement to descend rapidly to below 13 000 feet due to depressurization and limited supplemental oxygen reserves. The PC-12 POH states that at the PC-12's optimum engine-out glide configuration, it would take 16 minutes to descend from 30 000 feet (the maximum altitude for PC-12 dual-pilot operations) to 13 000 feet. In a descent from 30 000 feet, supplemental oxygen would have been depleted 6 minutes prior to reaching 13 000 feet; from 25 000 feet (the maximum altitude for single-pilot operations), it would take about 11.5 minutes for the descent. Although the PC-12 meets CARs requirements for oxygen equipment, the standard oxygen supply carried is insufficient to allow engine-out let-down using the optimal glide profile while at the same time maintaining oxygen reserves.

The oxygen equipment and supply regulation predates SEIFR operations and has not been amended since the implementation of the SEIFR policy. The rule does not reflect the requirement for single-engine aircraft to maintain an optimal glide profile throughout the entirety of an engine-out descent. Other regulatory authorities have recognized the need for a specific oxygen equipment rule for SEIFR operations. The Australian Civil Aviation Safety Authority SEIFR rule requires that pressurized SEIFR aeroplanes be equipped with "sufficient additional oxygen for all occupants to allow the descent from cruising level following engine failure to be made at the best range gliding speed and in the best gliding configuration, assuming the maximum cabin leak rate, until a cabin altitude of 13 000 feet is reached." European Joint Aviation Requirement – Operations (JAR–OPS) SEIFR draft regulations propose the same oxygen rule.

Although oxygen supply was not a factor in this occurrence, it has been demonstrated that pressurized SEIFR aircraft operating in Canada may have insufficient oxygen reserves to allow for an optimal engine-out descent from maximum operating level. Therefore, the Board recommends that:

> The Department of Transport require that pressurized SEIFR aircraft have sufficient supplemental oxygen to allow for an optimal glide profile during an engine-out let-down from the aircraft's maximum operating level until a cabin altitude of 13 000 feet is attained.
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> A00–01

Transport Canada's Response to A00-01 (21 June 2000)

In its response, Transport Canada (TC) indicated that it concurred with the recommendation on additional oxygen supply for pressurized SEIFR aircraft and, subject to the Canadian Aviation Regulation Advisory Council (CARAC) consultation process, will develop Notices of Proposed Amendment (NPA) for the 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 A00-01 (13 September 2000)

In its response, TC indicated that it concurred with the recommendation on additional oxygen supply for pressurized SEIFR aircraft and, subject to the CARAC consultation process, will develop NPA for the 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 A00-01 (09 June 2004)

Commercial Air Services Standard 723.22 has been amended to include subsection 2 (g) requiring ''sufficient supplemental oxygen for an optimal glide profile during an engine out let-down from 25 000 ft until a cabin altitude of 13 000 ft.''

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

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