

AVIATION INVESTIGATION REPORT

A00P0184

COLLISION WITH TERRAIN

SEAIR SERVICES 1990 LTD.

DE HAVILLAND DHC-2T BEAVER C-FOES
CLEARWATER, BRITISH COLUMBIA, 18 NM NW

22 SEPTEMBER 2000

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

The de Havilland DHC-2T Beaver floatplane, serial number 1673TB43, was engaged in aerial application of fish fry to several lakes near Clearwater, British Columbia. The pilot and one other person were on board. The aircraft took off from Clearwater at about 1230 Pacific daylight time (PDT) to begin a planned series of drops to nearby lakes. The aircraft had dropped fish in four lakes before proceeding to Broken Hook Lake. When the aircraft was on approach to the northwestern end of Broken Hook Lake, the pilot reportedly advanced the power lever, but the engine did not respond. At this time, the aircraft was about 100 feet above ground level and struck several treetops. Within seconds, the aircraft descended, struck the terrain, and crashed into trees. The two occupants were seriously injured, and the aircraft was destroyed. There was no fire. The accident occurred at 1320 PDT.

Ce rapport est également disponible en français.

Other Factual Information

After impact, the pilot could not escape from the cockpit because of the severity of his injuries. The passenger was thrown against the back of the pilot's seat at impact but crawled out from the wreckage through the right-hand pilot door.¹ He then used a satellite telephone to notify authorities of the accident and their location. About an hour and a half later, search-and-rescue personnel were on scene and transported the pilot and the passenger to hospital in Kamloops.

The accident occurred in bright daylight, and the weather was suitable for flight in visual meteorological conditions. The wind was light, and there were no reports of local turbulence or downdrafts. Weather is not considered to have been a factor in this accident.

A pre-flight weight and balance calculation for the aircraft could not be found. The pilot estimated that the weight of the aircraft at take-off for the accident flight was about 5000 pounds, about 1000 pounds below the maximum take-off weight of 6000 pounds. A TSB review of the weight and balance calculations using data obtained after the accident corroborates this estimate. Consequently, aircraft loading is not considered to have been a factor in this accident.

The pilot was the company's chief pilot and held a Canadian commercial pilot licence—airplane (CPL-A), with a seaplane rating and a valid medical certificate. He had accumulated a total of about 5000 flight hours, of which about 600 hours were on the DHC-2 Beaver and about 300 hours on the DHC-2T Beaver. A review of the pilot's flight and duty times revealed that they were within the prescribed limits.

The accident aircraft had been modified to accept the specialized equipment to drop the fish while in flight. The fish hopper assembly—which included two oxygen bottles, regulators, and tubing—had been recently installed in this airframe and was attached to the central cabin floor at the camera hatch location. The hopper outlet tube protruded through the airframe belly and emptied into the airstream. The release mechanism was a simple, mechanical, hand-operated plunger. To dump buckets of fish into the hopper and operate the plunger, the passenger had to be within arm's length of the hopper.

Since the fish hopper equipment was permanently attached to the cabin floor, it is considered "fixed equipment". Such a modification to an aircraft in Canada requires an assessment of its effects on the aircraft in-flight handling characteristics. This modification also requires an approval from Transport Canada (TC) in the form of a supplemental type certificate (STC). No record was found of either an STC or an application for an STC for this modification and this aircraft. Furthermore, TC requires that an amended weight and balance report be prepared for an aircraft whenever fixed equipment is installed. No record of an amendment to the weight and balance report was produced or found. Accordingly, the accident aircraft was not in conformance with the TC-approved type certificate.

The fish to be delivered were carried in eight 55-litre plastic tubs, which were open and carried unrestrained in the cabin behind the pilot seats. For the accident flight, the eight tubs each contained about 40 litres of water and fish at take-off. At the time of the accident, the contents of two of the tubs had been emptied into the hopper and dispensed into the previous four lakes.

¹ The passenger was an employee of BC Fisheries. He had been trained by BC Fisheries to operate the fish hopper assembly and the associated equipment.

On-board equipment and cargo are required to be restrained to safeguard against the load shifting during take-off, in flight, and when landing. This is to prevent damage or upset to aircraft and injury to aircraft occupants. During the accident, most of the plastic tubs and their contents were ejected from the cabin by impact forces. The hopper and the oxygen bottles were damaged and distorted at impact, but the assembly remained attached to the floor.

When the aircraft contacted the ground, it was on a heading of about 115° magnetic, in a left-bank, nose-down attitude. The left wing tip first struck the ground, followed by the left float, the right float, and the fuselage. The left wing and the floats absorbed much of the initial impact force. The left wing separated from the aircraft shortly after the first impact. The aircraft slid upright for about 50 feet, along the ground and into the trees, and stopped on a heading of about 095° magnetic.

Post-crash examinations of the airframe did not reveal any significant anomalies. With the exception of the elevator damage caused by the initial tree strike, no other malfunctions were found that would have caused the aircraft to depart from controlled flight.

The aircraft engine, a Pratt & Whitney Canada PT6A-20 turboprop, serial number PCE21710, was examined at an approved maintenance facility under TSB supervision. This examination revealed that the engine was operating at significant power at impact. All the engine damage resulted from impact forces while operating at high rpm. A review of the engine trend monitoring records, regularly carried out by the operator, revealed no indication of degraded engine performance. Damage to the propeller assembly was consistent with the engine producing significant power at impact.

Seair Services held air operating certificate (AOC) number 6310, issued by the Minister of Transport, through TC, on 05 April 2000. Part 1—Specific Conditions of the AOC specifies, in part, the types of aerial work service that the operator has been approved to carry out. Dropping fish fry in flight is not specifically considered in the *Canadian Aviation Regulations* (CARs). However, the category “aerial application” is defined as the seeding from an aircraft, the spraying or dusting of chemicals from an aircraft, or any other operation of a similar nature.² Aerial application was not in the list of approved services in the approved AOC. The company had been carrying out fish-dropping operations for about 13 years, using the DHC-2 Beaver and, more recently, the DHC-2T Beaver.

Section 6—Training Program of the TC-approved³ Seair Services company operations manual states on page 6-9 (dated 30 March 2000), Paragraph 11—Aerial Work:

Prior to commencement of operations under CARs Part VII, Subsection 2— “Aerial Work”, flight crew member(s) shall receive initial and recurrent training related to the specific operations to be carried out in the following:

- (a) flight manual supplements
- (b) airworthiness approvals
- (c) pre-flight inspection of aerial work equipment and supplies
- (d) malfunction and emergency equipment procedures

² CAR 600.01—Interpretation.

³ In accordance with CAR 722.76(6)—Aerial Work Training.

- (e) operational restrictions
- (f) flight training and practice in required maneuvers.

No record could be found of any such company training related to the specific operations.

The aircraft journey log contained no record of any flights for the three days before the accident. The company president, who was also the operations manager, reported that on 19 and 20 September 2000 he had personally trained the accident pilot in fish-dropping at Clearwater during three operational revenue flights in the accident aircraft. The operations manager did not hold a valid Canadian pilot licence. Anecdotal information pertaining to the operational flying during that period suggests that the pilot and the aircraft had flown about 12 hours in the previous three days.

The aircraft had only the two pilot seats installed for this mission. Each seat had a three-point seat restraint consisting of a lap belt and a diagonal shoulder harness. To provide a minimum level of protection for an occupant in the event of a collision or an in-flight upset, an aircraft conducting aerial application below 500 feet above ground level must be equipped with a seat and a safety belt, which includes a shoulder harness, for each person on board.⁴ The persons on board are required to fasten their seat belts only in three circumstances: when the aircraft is manoeuvring on the surface, during take-off and landing, and when the pilot-in-command considers it necessary.⁵ The pilot gave the passenger a pre-flight briefing.

Information from the accident site indicates that the passenger was not seated or secured in the available seat at the time of the accident. The passenger was sitting, unrestrained, on the cabin floor behind the front seats so as to load the fish hopper and operate the release mechanism. Wreckage information reveals that the floor attachment fittings for the pilot's seat broke in overload, likely because of the forces of the combined mass of the pilot and the passenger at impact.

TC was not advised of the fish-dropping operations and was unaware that the passenger in the cabin was unrestrained during high-risk operations.

It was reported that a third seat for the passenger (fish loader) had been installed in the cabin near the fish hopper during the three on-the-job training sessions, but that the seat had been removed when the training ceased.

Analysis

The reason for the aircraft initially striking the treetops was not determined. Once the aircraft was damaged from striking the treetops, the pilot's ability to control the aircraft was seriously eroded, to the point where recovery to an overshoot was not possible, and the aircraft crashed into the terrain and trees.

The aircraft's floats and the trees absorbed a large portion of the impact forces. The cabin and the cockpit were not deformed to any extent. It is highly likely that had the passenger been secured in the cabin, the injuries to both the passenger and the pilot would have been lessened.

⁴ CAR 605.24(5)(c).

⁵ CAR 605.25(1).

Personnel not wearing restraints during high-risk, aerial work operations is of concern. Although the regulations attempt to provide a reasonable level of safety by mandating the fitment of seats and seat restraints, the regulation is not as effective when specifying the use of these safety systems. Furthermore, the operator's broad interpretation of the regulations diminished their underlying safety benefits. The operator's application of the training requirements was particularly casual; there was no record of any training, and the training, if given, likely did not provide the pilot with an effective or in-depth knowledge of fish-dropping operations.

The fish hopper equipment in the cabin and the missing approvals for aircraft modification did not directly contribute to this accident. It is unlikely that the airworthiness of the aircraft had any effect on the causal elements. Nonetheless, there were serious anomalies in the areas of maintenance, certification, and documentation.

Findings as to Causes and Contributing Factors

1. The pilot did not avoid the trees that obstructed his immediate flight path on descent to the lake.
2. The damage to the aircraft from the tree-strike seriously compromised the pilot's ability to control the aircraft, to the point where continued flight was impossible.
3. The pilot and the passenger suffered serious injuries. It is highly likely that proper use of a passenger restraint system would have lessened the injuries to both persons.

Findings as to Risk

1. Canadian regulations regarding the use of seats and seat restraint systems are not sufficiently clear about high-risk, aerial work operations, such as aerial application.
2. Transport Canada was not advised of the fish-dropping operations and was unaware that the passenger in the cabin was unrestrained during high-risk operations.
3. Canadian regulations do not require specific training in aerial application techniques, such as fish-dropping.
4. The installation of the fish-hopper equipment constituted an aircraft modification, which had not been approved by Transport Canada.

Other Findings

1. The operator did not maintain a proper logbook.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 10 January 2002.