

AVIATION INVESTIGATION REPORT

A00A0110

LOSS OF CONTROL - SPIN

SHEARWATER FLYING CLUB

CESSNA 150M C-GLJK

PORTER'S LAKE, NOVA SCOTIA

19 JULY 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

Around 1840 Atlantic daylight time, a Cessna 150M, serial number 15078283, belonging to the Shearwater Flying Club, took off from Runway 34 at Shearwater, Nova Scotia, for a designated training area northeast of Shearwater. A student pilot and his instructor were on board. The instructor had filed a visual flight rules flight plan for a local night rating and type-check flight. The flight was in contact with air traffic control and was tracked by radar as it progressed. At about 1922, the aircraft disappeared from radar in a vertical descent; at the same time, the aircraft was seen spinning toward the ground. The impact damage was consistent with a spin to the left. The aircraft was destroyed, and both occupants were fatally injured. No fire occurred.

Other Factual Information

The instructor pilot had 745 hours total flying time, 485 of which were instructional. He had been employed by the Shearwater Flying Club for four months. The student had 83 hours' total flying time, 13.9 of which were completed toward his night rating, which included dual, solo, and cross-country flying. Except the accident flight, all of his flying had been on the Cessna 172.

Weather reported at Shearwater, Nova Scotia, at 1900 Atlantic daylight time¹ was as follows: winds 270° at 7 knots with gusts to 16 knots; visibility 15 statute miles; a few clouds at 4500 feet above ground level, a few clouds at 12 000 feet, and broken clouds at 25 000 feet; temperature 22°C; and dew point 13°C.

The accident aircraft had been flown four previous times on the day of the accident: the instructor had flown three of these flights and the chief flying instructor, one flight. The chief flying instructor and students who had flown in the aircraft did not observe anything abnormal with its operation. Students also found the instructor to be his normal, professional self.

The occurrence flight was to include training exercises toward the student's night rating and for a type checkout on the Cessna 150M. The type checkout required slow-flight, stall, and spin exercises. The Cessna 150M is considered to be a good aircraft for spin training because of its relative ease of spin entry and recovery.

The instructor's communications with the Flight Information Centre before the flight and with air traffic control during the flight were considered normal. The last communication with the aircraft was 13 minutes before loss of radar contact; this is not considered abnormal for a local training flight at the flight's location.

Recorded radar information showed that at 1917, about four minutes before the final descent to impact, the aircraft slowed down and entered a vertical descent from an initial altitude of 3600 feet above sea level (asl). The aircraft descended vertically to 2600 feet asl in about 10 seconds, then climbed back to 3800 feet asl. The vertical descent was consistent with a spin; however, the direction of rotation could not be established from radar tapes. At about 1921, radar information showed that the aircraft, at 3800 feet asl, slowed down, turned abruptly to the left, and again descended almost vertically. The descent rate was 6000 feet per minute, identical to the previous rapid descent rate. Radar contact was lost at 1400 feet asl. Eyewitnesses described the aircraft descent as a constant downward spiral. The terrain height in the area of the occurrence is approximately 300 feet above sea level.

Examination of the wreckage at the accident site showed that damage was consistent with an aircraft in a spin to the left. Flight control continuity and freedom of movement were established, except that elevator movement was restricted because of impact damage to the horizontal stabilizer. The wreckage was moved to the TSB regional wreckage examination facility for further examination and analysis, and selected components were forwarded to the TSB Engineering Laboratory for detailed examination. No pre-existing mechanical condition

¹ All times are Atlantic daylight time (Coordinated Universal Time minus three hours).

was found that would have prevented the aircraft from recovering from a spin. After exhaustive testing, it was determined that the rudder had not jammed. The aircraft weight and balance were found to be within prescribed limits; there should not have been adverse spin characteristics or difficulty recovering.

Post-mortem examinations and a review of the medical history of the pilots did not reveal any condition that might have affected their performance. The pilots' injuries suggest that the instructor might not have been at the controls at impact; this information can only be assessed for the impact and not for what might have preceded. The pilots' footwear was also examined to determine if there was any indication that one of the pilot's feet could have jammed in the rudder pedals; nothing abnormal was found.

A recent UK Air Accidents Investigation Branch (AAIB) report of a Cessna 152 spin accident in which the pilot had difficulty recovering noted that:

Experience with the Cessna 152 aircraft has shown that it will normally recover readily from a spin when the correct technique is used. Factors that may delay or prevent the recovery are: a lateral imbalance, an adverse C of G position, power remaining on, an incorrect recovery technique or recovering from a spin after a large number of turns.

The Cessna 150M aircraft would be expected to behave like the Cessna 152.

The accident aircraft was manufactured in 1976. The following are excerpts regarding intentional spin entry and recovery from the 1976 Cessna 150M *Pilot's Operating Handbook* on board the aircraft:

It is recommended that, where feasible, entries be accomplished at high enough altitude that recoveries are completed 4000 feet or more above ground level. At least 1000 feet of altitude loss should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require somewhat more than twice that amount. For example, the recommended entry altitude for a 6-turn spin would be 6000 feet above ground level. In any case, entries should be planned so that recoveries are completed well above the minimum 1500 feet above ground level required by FAR 91.71.²

[. . .] If the spin is continued beyond the 2- to 3-turn range, some change in character of the spin may be noted. Rotation rates may vary and some additional sideslip may be felt. Normal recoveries from such extended spins may take up to a full turn or more.

At the time of the accident, the commonly-used, generic reference at the club for Cessna 150M ground school training was a reproduction of the 1974 *Cessna Model 150 Owner's Manual*. This manual did not include information regarding spin entry or recovery altitudes or aircraft spin characteristics. However, each club aircraft did have the correct manual or operating handbook on board, and club policy was that for flight planning purposes, pilots were to use the manual for the model of aircraft being flown. Cessna also provides guidance in the form of a supplementary booklet called *Spin Characteristics of Cessna Models 150, A150, 152, A152, 172, R172 & 177 Aircraft*. This booklet, which was available at the club, contains the same spin information that is in the 1976 model POH, but it does not discriminate by year of manufacture.

² Transport Canada's *Flight Training Manual* states that, "all practice spin recoveries should be completed no less than 2000 feet above ground, or a height recommended by the manufacturer, whichever is the greater".

At the time of the accident only two of the club's 11 Cessna spin-approved aircraft were manufactured after 1975; only those two aircraft had POHs that contained the recommended higher spin recovery altitude. For the older aircraft, the minimum recovery altitude used was 2000 feet agl, consistent with a Transport Canada (TC) flight training manual recommendation (see footnote 2). It is likely that this led to the common club spin entry altitude of around 4000 feet asl. It was also established that some other flight training units in the region commonly entered spins in Cessna spin-approved aircraft at 3500 to 4000 feet asl.

TC requires that operators adhere to the POH and also “recommends that the manufacturer’s recommendations be followed”. The spin entry altitudes during the accident flight were not in accordance with the POH, and spin training in the pre-1976 model club aircraft was not in accordance with the recommendations in the Spin Characteristics booklet.

The TSB reviewed several Cessna 150-series loss-of-control spin accidents—where recovery after an intentional spin entry was not successful in time to prevent an accident—to determine if there might have been similar circumstances to those in this accident flight. In almost all of the accidents reviewed, the pilots did not survive and no mechanical discrepancy was found. In three of the accidents, at least one pilot survived. No physiological impairments were found with the pilots, and the spin had been entered below the recommended entry altitude:

- A UK-registered Cessna 152 entered a spin at 1600 feet agl. The instructor took control after the student froze, but the aircraft did not respond to recovery actions. No mechanical discrepancy was found (15 May 2000).
- A Cessna 152 was intentionally spun from 3600 feet agl and did not respond to recovery actions of the student pilot or the instructor. The rudder was found jammed and could not be released in the air (18 July 1998, TSB Report No. A98Q0114).
- A Cessna 152 was intentionally spun from 3500 feet agl. No mechanical discrepancy was found, and the aircraft did not respond to the pilot’s recovery actions (21 June 1996, TSB Report No. A96O0106).

In summary, a review of previous similar spin accidents did not reveal a condition or causal element that might apply to this investigation.

Analysis

The aircraft twice entered what appeared to be deliberate spins. The first spin recovery was successful, the second was not. On both exercises, spin entry was below the minimum spin-recovery altitude recommended by Transport Canada and the manufacturer. Entering a spin at a lower altitude reduced the time available for pilots to recover the aircraft when the first attempt(s) was unsuccessful.

It was established that the common practice spin entry altitude for the club was around 4000 feet asl. Entry at this altitude, under normal circumstances, allowed ample altitude for a one-turn spin and recovery by 2000 feet agl in most of the local flying area. However, this entry altitude was below the minimum recovery altitude recommended by the manufacturer in the Spin Characteristics booklet and later model Cessna POHs. This suggests that instructors and students were not using the most current applicable references for spin training. Also, TC's safety oversight activities did not ensure that the club was following the recommendations and guidance in the applicable POHs and Cessna Spin Characteristics booklet.

The successful recovery from the first spin indicates that the aircraft and the pilots were capable of effective spin recovery. This recovery, and post-accident investigation, suggests that there were no pre-existing physiological conditions or mechanical discrepancies that would have prevented a recovery from a spin. Consequently, the inability for the aircraft to recover from the second spin cannot be explained.

Findings as to Causes and Contributing Factors

1. For undetermined reasons, the aircraft entered a spin from which the pilots did not recover.

Findings as to Risk

1. The spin entry altitude was below that recommended by Transport Canada and the manufacturer.
2. The generic, commonly-used reference for the Cessna 150 at the Shearwater Flying Club did not include the most current information on spin entry altitudes.
3. Other pilots in the Shearwater Flying Club were known to enter practice spins below the recommended altitude.
4. Transport Canada's safety personnel did not ensure that Shearwater Flying Club instructors were entering spins at or above the recommended entry altitude.

Safety Action

After the accident the Shearwater Flying Club raised the minimum spin recovery altitude for all models of Cessna spin-approved aircraft to 4000 feet above ground level.

Transport Canada regional staff, before and after the accident, have had regular informal contact with the company and have made presentations to company staff on various safety awareness topics: Human factors in aviation; airport operations; stress/fatigue; procedures at uncontrolled aerodromes; effective communications and aerodrome procedures; and, winter operations, survival, and destinations.

On 25 September 2002, the Transportation Safety Board sent to Transport Canada a Safety Advisory (A020027-1) regarding inconsistency in the application of minimum recovery altitudes for all spin-approved Cessna aircraft.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 07 October 2002.