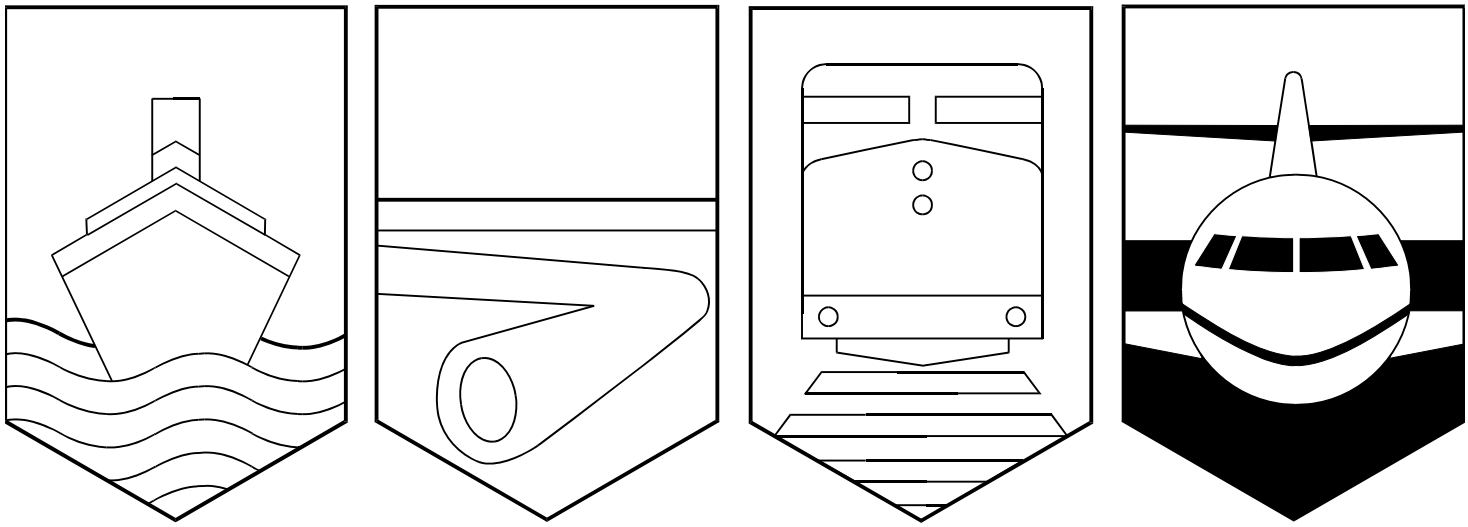
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada



AVIATION OCCURRENCE REPORT

LOSS OF CONTROL - STALL

CHAMPION 7GCB CITABRIA C-GGTD
BOILY LAKE, QUEBEC
24 JULY 1994

REPORT NUMBER A94Q0131

Canada

MANDATE OF THE TSB

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework governing the TSB's activities. Basically, the TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board must not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings.

INDEPENDENCE

To enable the public to have confidence in the transportation accident investigation process, it is essential that the investigating agency be, and be seen to be, independent and free from any conflicts of interest when it investigates accidents, identifies safety deficiencies, and makes safety recommendations. Independence is a key feature of the TSB. The Board reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations.

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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.

Aviation Occurrence Report

Loss of Control - Stall

Champion 7GCB Citabria C-GGTD
Boily Lake, Quebec
24 July 1994

Report Number A94Q0131

Synopsis

The pilot took off from Boily Lake, Quebec, with one passenger on board for a local flight in accordance with visual flight rules. After the take-off, the pilot realized that the aircraft was too low to clear a hill on the climb-out trajectory. He then decided to initiate a steep right turn at low altitude in order to return to the lake for a landing. During the turn, the aircraft's nose pitched downward, and the aircraft descended and struck the ground. The pilot sustained serious injuries, and the passenger was fatally injured; the aircraft was destroyed in the post-crash fire.

The Board determined that the floatplane did not achieve the usual take-off and climb performance because it was overloaded; the aircraft's performance was also diminished due to drag caused by the folding canoe attached to the right float and, possibly, due to downdrafts. The floatplane stalled during a steep turn at an altitude insufficient for a recovery.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 History of the Flight

On 24 July 1994, the pilot took off from Convent Lake, Quebec, on a visual flight rules (VFR)[1] flight to Dissimieux Lake, Quebec, with one passenger on board for a fishing trip to nearby lakes. Before departing, the pilot attached a folding canoe to the right float and loaded an outboard motor and a jerry can of fuel in the cabin.

Over Boily Lake, Quebec, the pilot saw some people fishing and decided to land and ask them about the fishing conditions. The water landing was completed with no problems. The people fishing came to meet them, and they had a brief discussion. The pilot checked the floats for water before taking off again. The pilot aligned the aircraft to take off in a westerly direction on the last 5,000 feet of Boily Lake.

The witnesses who observed the take-off stated that the take-off run seemed long. The pilot stated that, during the climb-out, he realized that the aircraft was not achieving its usual climb performance and that he would not be able to clear the hill on the climb-out trajectory. He then initiated a steep right turn at low altitude to return to the lake for a landing. During the turn, the aircraft's nose pitched downward, and the aircraft descended, struck some trees, then struck the ground in a steep nose-down, left-wing-low attitude. A fire broke out after the aircraft came to rest on the ground.

A few minutes later, the fishermen headed for the crash site to assist the occupants of the aircraft. The pilot was seriously injured; the passenger sustained fatal injuries. The aircraft was destroyed by the fire.

The accident occurred in daylight at latitude 49°58'N and longitude 069°35'W[2], in visual meteorological conditions, around 1230 eastern daylight saving time (EDT)[3].

1.2 Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	-	1	-	1
Serious	1	-	-	1
Minor/None	-	-	-	-
Total	1	1	-	2

1.3 Damage to Aircraft

The aircraft was destroyed by the impact forces and post-crash fire.

1.4 Pilot Information

	Pilot
Age	46
Pilot Licence	PPL
Medical Expiry Date	07-04-95
Total Flying Hours	380
Hours on Type	230
Hours Last 90 Days	12
Hours on Type Last 90 Days	12
Hours on Duty Prior to Occurrence	N/A
Hours off Duty Prior to Work Period	N/A

1 See Glossary for all abbreviations and acronyms.

2 Units are consistent with official manuals, documents, reports, and instructions used by or issued to the crew.

3 All times are EDT (Coordinated Universal Time [UTC] minus four hours) unless otherwise stated.

The pilot was certified and qualified for the flight in accordance with existing regulations.

1.5 *Aircraft Information*

Manufacturer	Champion Aircraft Corp.
Type and Model	Champion 7GCB
Year of Manufacture	1960
Serial Number	43
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	2,370 hr
Engine Type (number of)	Lycoming O-320-A2B (1)
Propeller/Rotor Type (number of)	McCauley 1A170 (1)
Maximum Allowable Take-off Weight	1,732 lb
Recommended Fuel Type(s)	Avgas 100 LL, Avgas 100/130
Fuel Type Used	Avgas 100 LL

. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

The aircraft was not equipped with a stall warning system.

1.5.1 Aircraft Weight and Balance

The maximum allowable weight for the float-equipped aircraft is 1,732 pounds.

The overall weight of the float-equipped aircraft on take-off was estimated to be about 73 pounds over the maximum allowable weight. The centre of gravity was at +19.16 inches, which is within the allowable range of +16.2 to +19.2 inches.

The Transport Canada *Flight Training Manual* states that weight and balance limitations are imposed for the following principal reasons:

- the effect of the disposition of weight (and subsequently balance) on the flight characteristics of the aircraft, particularly on stall and spin recoveries, slow flight, and stability;
- the effect of the weight on primary and secondary structures of the aircraft; and
- the effect of weight on take-off and landing performance.

1.6 *Meteorological Information*

Meteorological observations at 1200 at Baie-Comeau Airport, Quebec, about 65 miles southeast of the accident site, were as follows: broken cloud based at 3,000 feet, visibility 20 miles, winds 230 degrees at 15 knots, and temperature 21.8 degrees Celsius.

Witnesses stated that there were waves on the lake, especially in the areas most exposed to the wind. The pilot stated that he encountered downdrafts after take-off. Downdrafts sometimes occur on the leeward side of a hill and are often caused by winds blowing over the hill.

1.7 *Boily Lake*

Boily Lake is oriented east-to-west and is about three miles long. At the west end of the lake, there is a valley between two

hills. The valley curves to the left and eventually leads to another lake.

The pilot was not familiar with the terrain at the end of the lake and did not know that the valley led to another lake.

1.8 Wreckage and Impact Information

The aircraft came to rest on a heading of about 005 degrees magnetic. One propeller blade was fully embedded in the ground and covered with a thick layer of moss and lichen; the other blade was slightly bent. The engine and fuselage were lying on the left side at an angle of about 60 degrees. The rear fuselage section was bent to the left at the baggage compartment, and the tail structure was intact.

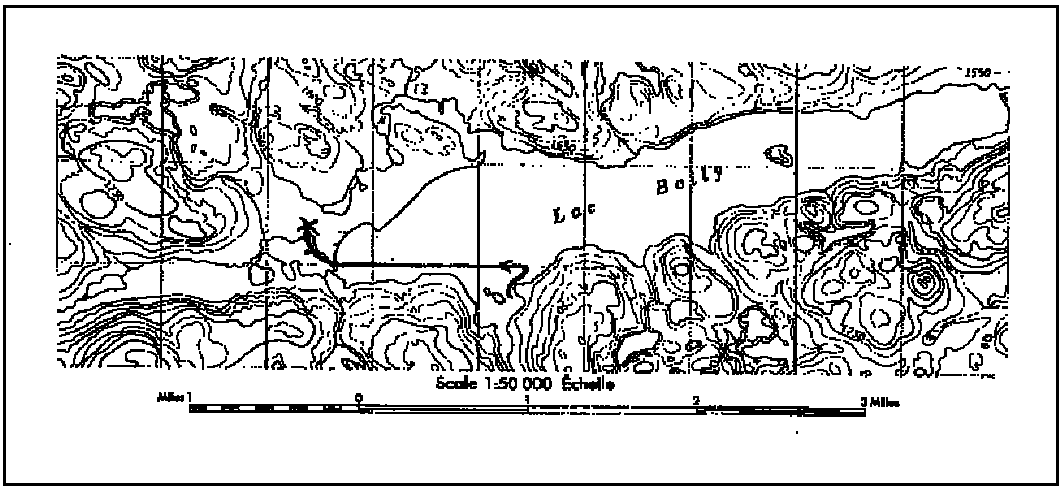

Figure 1 - Flight Path of C-GGTD

The outboard motor moved forward when the aircraft struck three spruce trees about 60 feet in height. The rear passenger seat was torn from its anchor points, and the seat back buckled at impact.

In the impact, the left wing broke into three sections, and the right wing separated from the fuselage just before the aircraft came to rest on the ground. The right wing was thrown forward and came to rest partly on the cockpit roof.

There was no evidence found of any mechanical deficiencies that could have affected the operation of the aircraft in flight.

1.9 Medical Information

There was no evidence that incapacitation or physiological factors affected the pilot's performance.

1.10 Fire

After the aircraft came to rest on the ground, fuel from the wing tank spilled into the cabin, and a fire ignited immediately. The right wing fuel tank was above the cockpit, and was probably the origin of the fire. The fire spread very rapidly and was also fed by the left wing fuel tank. The three spruce trees that had been struck by the aircraft were partly burned. All flammable components of the aircraft were destroyed; however, the metal components, which are more resistant to heat, sustained very little damage. There is reason to believe that the fire was not sufficiently intense or of sufficient duration to melt components like the aluminum alloy engine oil fan.

Fire destroyed most of the right wing and one-quarter of the front part of the left float. As there was minimal structural deformation to the two ends of the fuselage (cockpit/engine, tail) and the floats, there is reason to believe that the speed of the aircraft was relatively reduced when it struck the ground, and that the impact forces were absorbed primarily by the left wing when it struck the trees.

1.11 Survival Aspects

Despite his severe injuries, the pilot was able to exit the aircraft through the windshield; however, the injured passenger was unable to evacuate the aircraft, which caught fire immediately after coming to rest.

1.12 Illusions Created by Drift

Sometimes it is necessary to manoeuvre an aircraft relatively close to the ground. On these occasions it is very important that the pilot recognize and understand the illusions created by drift. Winds can create false impressions which, if misinterpreted, can lead to dangerous flight conditions.

When flying upwind, the reduction in ground speed is apparent. When flying downwind, the increase in ground speed is very noticeable, sometimes to the point that the pilot is tempted to reduce airspeed. Such an action could, if carried to extremes, lead to a stalled condition.

1.13 Aircraft Performance

No performance data are available for the Citabria fitted with floats, but a take-off run of 2,500 feet is normally sufficient under standard conditions.

When aircraft weight exceeds the maximum allowable weight, aircraft performance is reduced. Rate of climb is severely diminished, stalling speed is increased, and the distance required for take-off is increased.

Downdrafts decrease the rate of climb of an aircraft and can cause a loss of altitude. Downdrafts can also prevent an aircraft from gaining altitude.

The folding canoe on the right float of the aircraft created parasite drag, which reduced aircraft performance.

2.0 Analysis

2.1 Introduction

As no evidence was found of any mechanical deficiencies that could have contributed to the accident and the aircraft could have taken off easily in the distance used by the pilot, the analysis focused on the following: aircraft overloading, performance degradation, illusions created by drift, and occupant survival.

2.2 Aircraft Overloading

The aircraft weight on take-off was about 73 pounds over the maximum allowable weight, and this reduced the take-off and climb performance of the aircraft. As there is no performance table available for the Citabria, it was not possible to determine with precision the degradation in the aircraft performance. Nonetheless, there is reason to believe that overloading of the aircraft adversely affected the rate of climb and the distance required for take-off.

2.3 Degradation of Performance

With an available take-off distance of 5,000 feet and a 15-knot head wind, the aircraft should have been capable of easily clearing the hill. But overloading, downdrafts, and the drag caused by the folding canoe on the right float reduced the take-off and climb performance of the aircraft to the point where it was unable to clear the hill. The pilot then initiated a steep right turn at low altitude to return to the lake for a landing, but he did not maintain the required speed in the turn, and the aircraft stalled. In a level turn, stalling speed increases in proportion to the bank angle of the aircraft. The greater the angle of bank, the higher the stalling speed.

2.4 Illusions Created by Drift

When the pilot turned from upwind to cross-wind flight to return to the lake for a landing, he might have been influenced by the illusions created by drift, which could have given him the impression that the speed of the aircraft was sufficient for a low-altitude manoeuvre. The aircraft was not equipped with a stall warning system; such a system could have alerted the pilot that the angle of attack of the wing was too great and that the floatplane was about to stall. The low altitude from which the aircraft stalled precluded the pilot from effecting a stall recovery, and the floatplane crashed.

2.5 Survival Aspects

Based on the damage caused by the impact, it was determined that the impact forces did not exceed the limits of human tolerance, and that the passenger could have survived the accident if there had been no fire.

3.0 Conclusions

3.1 Findings

1. The floatplane was overloaded.

2. Aircraft performance was diminished by overloading, by the drag caused by the folding canoe attached to the right float, and possibly by downdrafts.

3. The aircraft was not equipped with a stall warning system.

4. During the climb-out and turn, the aircraft stalled and crashed.

5. The low altitude of the aircraft precluded the pilot from effecting a stall recovery.

3.2 Causes

The floatplane did not achieve the usual take-off and climb performance because it was overloaded; the aircraft's performance was also diminished due to drag caused by the folding canoe attached to the right float and, possibly, due to downdrafts. The floatplane stalled during a steep turn at an altitude insufficient for a recovery.

4.0 Safety Action

The Board has no aviation safety recommendations to issue at this time.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson John W. Stants, and members Zita Brunet and Hugh MacNeil, authorized the release of this report on 15 June 1995.

Appendix A - Glossary

EDT	eastern daylight saving time
hr	hour(s)
lb	pound(s)
LL	low lead
N	North
N/A	not available
PPL	private pilot licence
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VFR	visual flight rules
W	West
°	degrees
'	minutes

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