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

# AVIATION INVESTIGATION REPORT
# A06O0180

## COLLISION WITH WATER

## CESSNA 172M C-FKWP
## WILCOX LAKE, RICHMOND HILL, ONTARIO
## 16 JULY 2006

Canada

# Aviation Investigation Report

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## *Summary*

At approximately 1720 eastern daylight time, the float-equipped Cessna 172M aircraft (registration C-FKWP, serial number 17261897) was departing Wilcox Lake, Ontario, for a flight to Manitoulin Island, Ontario, in visual meteorological conditions. Because of the confined area of the lake, the pilot performed a figure-eight manoeuvre while step-taxiing to increase speed for the final take-off run. This manoeuvre entailed two 180-degree turns at opposite ends of the lake. After the aircraft became airborne, a steep, low-altitude turn to the left was initiated to avoid obstacles on the shoreline. As the bank angle increased, the aircraft stalled, struck the water in a nose-down attitude with the left float, and flipped over. The aircraft came to rest inverted in shallow water near the shoreline. The pilot and two passengers escaped without injury.

*Ce rapport est également disponible en français.*

# *Other Factual Information*

The nearest weather reporting station is located at the Toronto/Buttonville Airport, Ontario, approximately six nautical miles to the south. The Buttonville aviation routine weather report (METAR) at 1700 eastern daylight time[1] was reported as follows: winds 270°T at 9 knots, visibility 15 statute miles, ceiling 28 000 feet, temperature 35°C. Similar conditions were present at Wilcox Lake; however, the wind was reported as being from the northwest at 10 knots, and the wave height was approximately one foot. Weather was not a factor in the accident.

The pilot obtained a private pilot licence and a seaplane rating in June 2003, and he held a valid Category 3 medical certificate. He had accumulated approximately 340 hours of total flight time, including 260 hours on seaplanes, 170 hours of which were on the occurrence aircraft. He flew regularly; however, investigators could find no documentation to indicate that the pilot complied with any of the recency requirements under Paragraph 401.05 (2) (a) of the *Canadian Aviation Regulations* (CARs).

The aircraft was manufactured in 1973 and was equipped with Canadian Aircraft Products (CAP) model 67 2000 floats, as approved by supplemental type certificate (STC) SA62 7. The aircraft's certificate of airworthiness was valid, and the aircraft had accumulated 17 685 hours of total air time since manufacture. The occurrence pilot had been the registered owner since February 2003. The last annual inspection was performed on 28 June 2006. There were no abnormalities or defects reported in the aircraft log books, and there were no reported mechanical problems with the aircraft during the occurrence flight. The engine, a 150-horsepower Avco Lycoming O 320 E2D, was modified with RAM Aircraft Corporation STC SE3692SW, which increased the five-minute take-off maximum power rating to 160 horsepower. There were no published performance figures or amendments to the Cessna Pilot Operating Handbook for the STC, and none were required. The increase in engine power was not a factor in the occurrence because it was determined that the aircraft systems were functioning correctly, and the engine was producing the requested power during take-off.

To reduce stall speed and improve handling characteristics at slower airspeeds, vortex generators are often installed on aircraft. There is an STC available for the installation of vortex generators on the Cessna 172M. STC SA00831SE calls for the installation of 40 vortex generators just aft of the leading edge of each wing, 40 on the underside of the horizontal stabilizer, and 40 on the vertical stabilizer. The occurrence aircraft had 40 vortex generators installed on each wing, 36 on the underside of the horizontal stabilizer, and none on the vertical stabilizer. Section 605.85 of the CARs requires the signing of a maintenance release before operation of an aircraft that has undergone maintenance; there was no documentation in any of the log books to support this partial installation. There were no data to indicate that the missing vortex generators on the horizontal and vertical stabilizers contributed to the occurrence.

Although a weight and balance had reportedly been completed since the aircraft was equipped with floats, no weight and balance amendment reflecting this configuration could be found. The last Annual Airworthiness Information Report (AAIR) for the occurrence aircraft on file with Transport Canada was for the 2004 calendar year, and it indicated an aircraft empty weight of

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1 All times are eastern daylight time (Coordinated Universal Time minus four hours).

1470 pounds. However, this did not reflect the actual weight of the aircraft when equipped with floats. According to STC SA62 7, the approximate empty weight of the aircraft equipped with CAP 67 2000 floats would have been 1625 pounds. The estimated weight of the aircraft during the occurrence take-off was 2220 pounds, which equals the maximum certified take-off weight. The centre of gravity was within limits for a Cessna 172M equipped with floats.

Wilcox Lake is a small lake in a residential area of Richmond Hill. The shoreline is surrounded by residential buildings, and beyond that, numerous subdivisions. The lake is popular for recreational activities such as swimming, boating, and canoeing; during the occurrence, it was being used extensively. The longest section of the lake is approximately 3500 feet in an east-west direction. The direction the aircraft was traveling during the final take-off run was northwest. The total distance available from the southeast shoreline to the northwest shoreline for the take-off run was about 2500 feet. (See Figure 1)

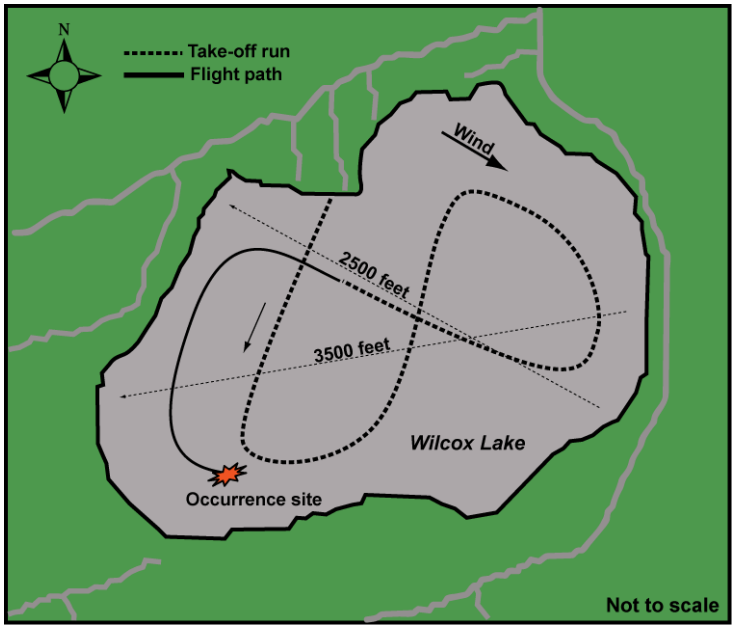


**Figure 1.** Wilcox Lake take-off diagram

The Cessna 172M Pilot Operating Handbook only publishes take-off performance figures for aircraft equipped with EDO model 2000 floats. Although there are some minor operational variances compared with CAP model 2000 floats, the difference in take-off performance for the occurrence day was considered inconsequential. The aircraft was configured with 10° of flaps for take-off. Using the atmospheric conditions on the day of the occurrence, the required take-off distance for a Cessna 172M equipped with EDO model 2000 floats was calculated. The calculations were based on using the maximum performance technique, which entails using 10° of flap and an obstacle clearance speed of 58 knots indicated airspeed (KIAS). The distance required for the take-off run into a 10-knot headwind (in this case, toward the northwest) was approximately 2100 feet, while the total distance required to clear a 50-foot obstacle was approximately 3000 feet. Using the entire length of the lake for take-off would require a departure in a westerly direction and would entail a crosswind of approximately 60°, resulting in a headwind component of 7 knots. The distance required for this take-off run was calculated to be approximately 2150 feet, while the distance required to clear a 50-foot obstacle was approximately 3100 feet.

The stall speed for a Cessna 172M at maximum certified take-off weight configured with 10° of flaps and wings level is approximately 42 KIAS. This stall speed increases to 50 KIAS with 45° of bank and to 59 KIAS with 60° of bank. The airspeed of the aircraft during the occurrence could not be determined; however, because of the limited distance available after lift-off, the aircraft did not have sufficient distance to accelerate out of slow flight. The angle of bank used as the aircraft turned to avoid the obstacles was approximately 45°.

During the take-off of a floatplane, it is necessary to get the floats in a planing condition so the aircraft can accelerate. This is commonly referred to as getting the aircraft "on step." When there is sufficient room for take-off and the lake is free of obstacles, this procedure is normally executed straight ahead. If it is necessary for the aircraft to change direction while on step (step taxiing), it requires a larger turning radius than while taxiing at a slow speed. The figure-eight manoeuvre that was used during the take-off entailed changing direction twice and, because of the speed of the aircraft, a large radius turn could be expected. The aircraft was approximately 200 feet from the east-southeast shoreline before turning to a northwest direction for the final take-off run.

There is an inherent risk related with changing directions while step taxiing, depending on the associated wind and wave conditions. During a step taxi turn from a tailwind to a headwind, the wind acts on the underside of the inboard wing, causing it to rise. This, combined with upward movement caused by wave action and pressure from centrifugal forces acting on the aircraft during the turn, can lead to the aircraft capsizing.

The occurrence take-off procedure was self taught and was not published in the Cessna Pilot Operating Handbook as a normal or amplified procedure. According to the CARs, the manoeuvre was not a required procedure to learn or demonstrate for a seaplane rating.

The distance available for take-off into wind, in a northwest direction, was insufficient. While there was enough distance to get airborne, the aircraft would not have been able to climb safely to an obstacle clearance altitude of 50 feet. However, even with the 60° crosswind, the lake was long enough in an east–west direction for a take-off and climb to an obstacle clearance altitude of 50 feet. Although taking off directly into a headwind is the preferred procedure for optimal performance, in this instance, the performance degradation from the crosswind component would have been minor. The pilot elected to use a step-taxi turn in an attempt to shorten the take-off run. However, this had a negligible effect because the turn radius of the aircraft was increased during the final turn, thereby shortening the into-wind take-off distance available. After lift-off, the slow speed of the aircraft did not provide much margin above the stall speed for manoeuvring. As the aircraft banked to avoid obstacles, the stall speed increased, and the aircraft stalled.

The wind and wave conditions at the lake during the occurrence presented a risk of capsizing the aircraft during the step-taxi, figure-eight manoeuvre. The manoeuvre also introduced a potential conflict with watercraft and other persons using the lake for recreational purposes. A take-off conducted in a fixed direction would have reduced the risk of collision.

## *Findings as to Causes and Contributing Factors*

1. The pilot attempted to take off into wind in a northwesterly direction, although the distance available to take off and clear a 50-foot obstacle was insufficient.

2. After becoming airborne with insufficient distance remaining to clear the obstacles ahead, the pilot attempted a steep turn at low altitude, resulting in a stall and impact with the water.

## *Findings as to Risk*

1. During the step-taxi, figure-eight manoeuvre, because of the associated wind and wave conditions, the aircraft was at risk of capsizing.

2. The aircraft was step-taxied in a manner that introduced a potential risk of collision with watercraft and other people using the lake.

3. The figure-eight, take-off manoeuvre employed by the pilot further decreased the into-wind take-off distance available because of the large radius turn of the aircraft while on step.

4. There is no indication that any of the pilot recency requirements under Paragraph 401.05 (2) (a) of the *Canadian Aviation Regulations* (CARs) were complied with.

## *Other Finding*

1. Due to the absence of a maintenance release for the vortex generator installation, the aircraft was not being operated in accordance with Section 605.85 of the CARs.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 30 May 2007.*