

AVIATION OCCURRENCE REPORT

A9800190

STALL/COLLISION WITH TREES ON TAKE-OFF

PIPER PA 28-151 C-GDVL
ESPANOLA WEST, ONTARIO

27 JULY 1998

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 pilot and three passengers were departing in the Piper PA 28, serial No. 28-7615332, on a visual flight rules (VFR) flight from Espanola West to Ottawa, Ontario. The runway surface was grass on uneven, sandy soil, made soft from recent rain. The pilot made two excursions down the runway before the aircraft became airborne on the third excursion. After the aircraft got airborne, it struck trees to the left of the departure path and crashed into a wooded area. An intense, post-crash, fuel-fed fire immediately broke out which consumed the cabin of the aircraft. One passenger, an infant, perished in the aircraft fire. The pilot and the other two passengers escaped the burning aircraft and were found about 40 feet from the wreckage by ambulance and fire-fighting personnel. They were transported to hospital where they died later from burns.

Ce rapport est également disponible en français.

Other Factual Information

The pilot held a valid Private Pilot - Aeroplanes licence and was qualified to conduct the flight. He had accumulated approximately 350 hours of total flying time.

Visual meteorological weather conditions (VMC) existed in the area at the time of the occurrence, and the temperature was 23 degrees Celsius. It had been raining earlier in the day, and the pilot had delayed his departure until the weather improved. Hourly weather observations for the airport were not available; however, the 2300Z hourly weather observation for Elliot Lake, 33 miles to the northwest, recorded the winds from 300 degrees at 15 with gusts to 25 knots. The reported winds at Sudbury, 54 miles to the northeast, at 2200Z, were variably from 270 to 330 degrees at 17 knots; at 2300Z, the winds were from 270 degrees at 14 knots. The winds at Sault Ste. Marie, 115 miles to the west, at 2300Z, were reported from 290 degrees at 10 knots with gusts to 21 knots.

The runway, approximately 250 feet wide and 2 900 feet long, was surrounded by trees and was oriented on a heading of 283 degrees magnetic. There were patches of ground on the runway surface where the soil was very soft. The grass had been cut recently and was two to three inches long. It was learned from an operator familiar with the airport that their tricycle-equipped aircraft were not permitted to use the airstrip after rain had fallen because the soil becomes very soft when wet. Higher ground is located at the end of the departure runway and to the west. (See Appendix A.)

There were two witnesses to the occurrence; an aural witness near the runway threshold and an eyewitness about 200 feet off the threshold of the runway. They reported that the aircraft's engine, based on the noise it produced, seemed to be developing considerable power and that they did not note any change in the sound of the engine until after the aircraft struck the trees. The aircraft's flight after lift-off was described as floating and hovering. The nose of the aircraft was then observed to lower, and the aircraft started to bank to the left just before it struck the first tree.

Information gathered at the scene indicated that the aircraft, while flying straight ahead, first struck two trees with the left wing, which yawed the aircraft to the left, then it struck more trees while travelling sideways from left to right. The aircraft struck the ground still travelling from left to right and came to rest in an upright position with the right wing failed at the root and supported by a tree trunk. An intense fuel-fed fire erupted on or immediately after impact. The most intense fire was in the cabin of the aircraft and broke out before the occupants exited the aircraft.

The wreckage was examined at the site. The engine still rotated easily by hand. The propeller had struck some trees, and the marks on the trees and the condition of the propeller showed that the engine was producing high power. Although much of the aircraft was burned away, durable materials such as hinges, steel cables, and heavy metal remained. All of the aircraft flight control surfaces were accounted for, and the control cables were intact at the time of the crash. The flaps were completely burned away; however, the flap control handle was found locked in the 40-degree position. There are four flap settings: retracted, 10 degrees, 25 degrees, and 40 degrees (full flaps). The flap handle is located between the pilot seats and is mechanically connected to the flaps by a torque tube. The handle is flush with the floor of the aircraft, when the flaps are retracted, and near vertical with full flap selected. It was determined that the three adults were probably wearing the available seat belts; the infant was strapped into a forward facing car seat.

The maximum allowable take-off weight for the aircraft was 2 325 pounds. It was not possible to determine the exact weight of the aircraft at take-off because the baggage, which was loaded on board the aircraft, was never weighed and the exact fuel quantity is not known. However, the weight of the aircraft at take-off was estimated to be between 2 300 and 2 400 pounds.

The *Pilot's Operating Manual* for the aircraft contains performance figures for take-off from a paved, level, dry runway at the maximum gross take-off weight of 2 325 pounds. Using a temperature of 23 degrees Celsius and the preceding conditions, the take-off run was calculated to be 1 255 feet using no flaps and 965 feet using 25 degrees of flap. The take-off distance to clear a 50-foot obstacle at the end of the runway, using 25 degrees of flap, was 1 760 feet. A Transport Canada publication, entitled *Light Aircraft Operating Tips - Rules of Thumb for Operations at Unimproved Strips*, provides supplementary information to a manufacturer's approved take-off performance charts for conditions not covered by the manufacturer's tests. The publication suggests that, for a runway surface that is rough, rocky, or covered with short grass (up to four inches), the take-off ground roll should be increased by 10 per cent. It further suggests that, for a runway with a soft surface (mud, snow, etc.), the ground roll should be increased by 75 per cent or more. With the flaps set at 25 degrees, the combined penalties would result in a required take-off ground roll of at least 1 858 feet and, to clear a 50-foot obstacle, at least 2 653 feet. There are no take-off/performance charts available for the aircraft if it is operated above the maximum gross take-off weight.

The *Pilot's Operating Manual* for the aircraft notes that take-offs are normally made with the flaps up; however, for short field take-offs and for take-offs under difficult conditions, such as deep grass or a soft surface, take-off distances can be reduced appreciably by lowering the flaps to 25 degrees and rotating at lower airspeeds. However, the *Pilot's Operating Manual* for the aircraft does not recommend nor contain any performance charts for take-offs with full flaps extended. Extending some flap during take-off will generally result in a shorter take-off run and a better angle of climb; however, using full flaps results in a low lift-to-induced-drag ratio, and the climb angle is reduced. When effectively performed, the soft field take-off technique will result in a shorter take-off ground roll; however, any attempt to force the aircraft into the air prematurely results in an increased take-off distance and degraded climb performance.

The aircraft battery is located beneath the floorboards in the area of the right, rear-seat passenger. Large gauge electrical cables connect the battery to the aircraft's electrical system, with current flowing to and from the battery through these cables.

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

Analysis

Based on the wind information obtained, it is likely that the wind at Espanola was from 270 to 300 degrees at 10 to 15 knots with gusts. As the runway take-off direction was 283 degrees, it is unlikely that the aircraft was greatly affected by the wind conditions and the local topography, except that a headwind would have increased aircraft take-off performance.

Based on the three excursions down the runway, witness description of the engine noise, and the examination of the engine, it was concluded that the engine was producing the required power. A complete examination of the aircraft was not possible because of the substantial fire damage. However, there was nothing found to indicate that there was any aircraft structural failure or system malfunction before the crash.

The aircraft was at or near the maximum allowable weight and would, therefore, require the maximum calculated take-off distance and possibly more. The runway surface conditions and the fully extended flaps further increased the take-off distance and the distance required to climb to an altitude to safely pass over the trees. It is possible that the first excursion down the runway may have been made by the pilot in an attempt to establish runway surface conditions and that the second and third excursions were take-off attempts. Based on witness accounts and the fact that a pilot would normally change some parameter of the aircraft configuration after experiencing a failed take-off attempt, if the first excursion down the runway was a take-off attempt, it is probable that the first attempt was conducted without any flaps extended and the second attempt with the flaps extended to 25 degrees, the manufacturer's recommended flap extension for a soft-field take-off. It was concluded that the flaps were set at 40 degrees during the last take-off attempt because of the manner in which the flaps are operated and the lever locked in position. Take-offs with flaps extended fully are not a recommended practice, but the aircraft did become airborne. However, with the flaps fully extended, the high drag resulted in a loss of climb performance, which made it impossible for the aircraft to climb fast enough to clear the trees off the end of the runway. In an attempt to clear the trees, the pilot probably raised the nose of the aircraft, but because of the low speed and high drag, the aircraft stalled.

Corrections can be made to published take-off distance estimates using published information; however, there is no manufacturer's published take-off/performance information available for the conditions of the occurrence flight. It is not possible, therefore, to estimate the take-off run required or the distance required to reach 50 feet above ground at the end of the runway for an aircraft above the maximum certificated take-off weight with full flaps extended. The distance to clear a 50-foot obstacle at the end of the runway would undoubtedly be more than with the flaps set to 25 degrees.

The impact was survivable, most probably because the impacts with the trees and the angles at which they were struck absorbed most of the aircraft's momentum and because the passengers were wearing their restraints; however, the fire that followed the impact led to the fatalities. The likely source for the fire would have been an electrical short in the area of the battery causing arcing in the presence of gasoline vapours from the ruptured fuel system.

Findings

1. Records show that the aircraft was maintained in accordance with existing regulations.
2. There was no indication of any pre-impact damage to the engine which would have prevented it from developing rated power.
3. There was no indication of malfunction or component failure of the aircraft that would contribute to the accident.
4. Records show that the pilot was licenced and certified to conduct the flight.
5. There was no indication that incapacitation or physiological factors affected the pilot's performance.
6. The estimated weight of the aircraft at take-off was at or near the maximum allowable gross take-off weight.
7. It is possible that the pilot may have made the first excursion down the runway in an attempt to establish the runway surface conditions and that the second and third excursions were take-off attempts.
8. The occurrence take-off was conducted with full flaps extended.
9. A combination of the runway surface condition, aircraft weight, and pilot take-off technique, in that he used full flaps, combined to extend the distance required to pass safely over obstacles in the departure path after take-off.
10. Based on the wind direction, runway orientation, and the local topography, it is unlikely that the aircraft encountered adverse wind conditions on take-off.
11. The aircraft struck trees in its departure path.
12. An intense, fuel-fed fire erupted at or immediately after impact, before the occupants exited the aircraft.

Causes and Contributing Factors

The pilot attempted to take off in conditions where a successful take-off could not be made; the conditions being the high aircraft weight and the soft, grassy runway. The fully extended flaps contributed to the occurrence when they prevented the aircraft from climbing quickly enough to safely pass above trees at the end of the runway after the aircraft became airborne.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Jonathan Seymour, Charles Simpson, W.A. Tadros and Henry Wright, authorized the release of this report on 17 November 1999.

Appendix A - Runway and Crash Site

