



# Air Transportation Safety Investigation Report A18W0111

## COLLISION WITH OBSTACLE ON TAKEOFF

Piper PA-28-161 Warrior II, C-GVZJ  
Black Diamond, Alberta  
29 July 2018

### About the investigation

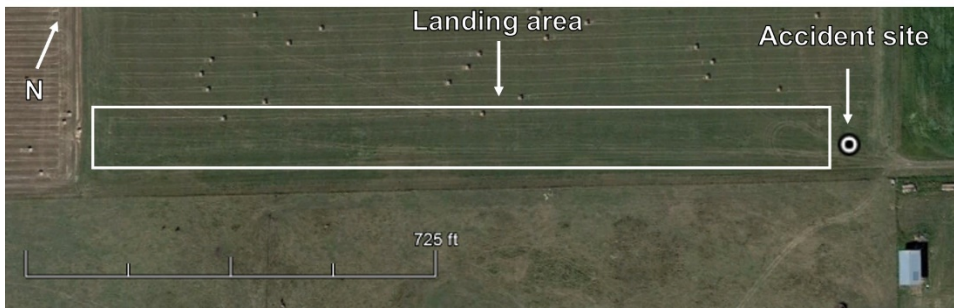
The Transportation Safety Board of Canada (TSB) conducted a limited-scope, fact-gathering investigation into this occurrence to advance transportation safety through greater awareness of potential safety issues. It is not the function of the Board to assign fault or determine civil or criminal liability.

### History of the flight

At approximately 1300<sup>1</sup> on 29 July 2018, the Piper PA-28-161 Warrior II aircraft (registration C-GVZJ, serial number 28-8316092) departed from Claresholm Industrial Airport (CEJ4), Alberta, on a visual flight rules flight with 2 people on board, both of whom were licensed pilots. The aircraft was bound for a mixed-hay field approximately 2 nautical miles (nm) east of Black Diamond, Alberta. At approximately 1330, the aircraft landed along the southern edge of the hay field, which was normally used as the landing area.<sup>2</sup> The aircraft occupants proceeded to work in the field for the rest of the afternoon. At 1900, they prepared to depart for the return trip to Claresholm. At approximately 1915, the take-off run was conducted heading east, beginning from the southwest corner of the field (Figure 1).

<sup>1</sup> All times are Mountain Daylight Time (Coordinated Universal Time minus 6 hours).

<sup>2</sup> The landing area refers to the area of the field used for takeoff and landing.

**Figure 1. View of hay field and landing area (Source: Google Earth, with TSB annotations)**

The aircraft failed to climb sufficiently to clear some hay bales that had been stacked in the southeast corner of the field, and struck them. The left-wing fuel tank ruptured on impact, and the resulting post-impact fire destroyed the aircraft (Figure 2).

The investigation determined that neither occupant was wearing the available shoulder harness; however, both occupants were wearing their lap belts. Both occupants received head injuries. One managed to escape the aircraft, but the other did not and was fatally injured. No emergency locator transmitter (ELT) signal was detected, and the ELT was destroyed in the post-impact fire.

**Figure 2. Accident site, looking west**

### **Personnel information**

The investigation was unable to determine who was acting as pilot-in-command on the occurrence flight; however, both occupants were licensed pilots and had acted as pilot-in-command on previous flights.

Records indicate that, at the time of the occurrence, one of the occupants was not certified to act as pilot-in-command of an aircraft in accordance with existing regulations. His private pilot licence was invalid because his Category 3 medical certificate had expired. Based on a review of that occupant's work and rest schedule, fatigue was not considered a factor.

The other occupant held a valid private pilot licence, with a current Category 3 medical certificate. The investigation was unable to determine whether fatigue was a factor for him.

### **Aircraft information**

The Piper PA-28-161 Warrior II is a low-wing, all-aluminum, single-engine, fixed landing gear, 4-seat aircraft. It is powered by a 160 hp Lycoming O-320-D3G direct-drive reciprocating engine and a fixed-pitch aluminum propeller. The occurrence aircraft was manufactured in 1983. At the last annual inspection (May 2018), it was reported as having accumulated 8421.5 hours total time airframe. The engine had 250.1 hours time since overhaul. Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The aircraft was registered to the current owner in February 2014 and had been used for both recreational and business purposes by the registered owner and his family.

The aircraft was being operated within its weight-and-balance and centre-of-gravity limits.

### Weather information

There is no aviation weather information specific to the accident location. The closest airport is the Calgary International Airport (CYYC), Alberta, which is approximately 27 nm northeast. The aviation routine weather report (METAR) at the time of the occurrence for CYYC was as follows:

- winds: 140° true (T), varying from 020°T to 170°T, at 3 knots
- visibility: 10 statute miles
- clouds: few at 21 000 feet
- temperature: 27 °C
- dew point: 4 °C

An Environment and Climate Change Canada weather reporting station is located in Black Diamond. The temperature reported there at the time of the occurrence was 23 °C. Density altitude at the location and time of the occurrence was then calculated at 5285 feet above sea level (ASL). Weather was not considered a factor in this occurrence.

### Aircraft performance

The aircraft's journey logbook was in the aircraft at the time of the occurrence and was destroyed in the post-impact fire; therefore, a precise empty weight for the aircraft was not available to the investigation. However, an approximate take-off weight for the aircraft was calculated to be 2059 pounds and, based on the performance charts published in the *Warrior II PA-28-161 Pilot's Operating Handbook* (POH),<sup>3</sup> ground roll distance calculations were completed (Table 1). The calculations were made using a take-off weight of 2050 pounds, an outside air temperature of 23 °C, and a headwind component of 3 knots, on a paved, level, dry runway. The POH states in part, "Effects of conditions not considered on the charts must be evaluated by the pilot, such as the effect of soft or grass runway surface on takeoff and landing performance [...]".<sup>4</sup>

Table 1. Ground roll distance calculations for the occurrence aircraft

Flaps	Ground roll (feet)	Lift-off speed (knots indicated airspeed)
0°	1350	47
25°	1200	47

<sup>3</sup> Piper Aircraft Corporation, *Warrior II PA-28-161 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual* (13 August 1982).

<sup>4</sup> *Ibid.*, Section 5, p. 5-1.

In section 4 of the aircraft’s POH, the soft field, obstacle clearance take-off procedure states the following:

Flaps.....25° (second notch)

Accelerate and lift off nose gear as soon as possible. Lift off at lowest possible airspeed. Accelerate just above ground to 52 KIAS [knots indicated airspeed] to climb past obstacle height. Continue climbing while accelerating to best rate of climb speed, 79 KIAS.

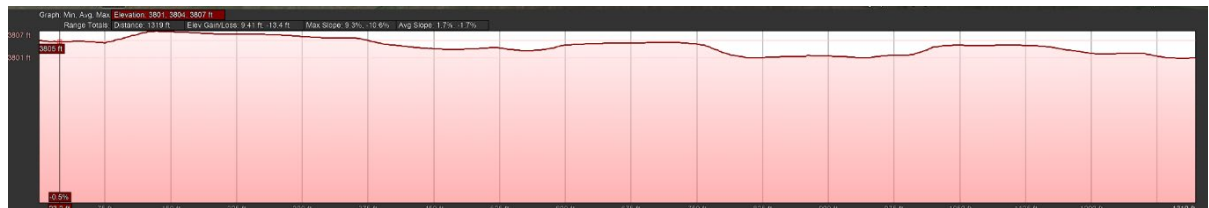
Flaps.....retract slowly<sup>5</sup>

The occurrence pilots typically selected the flaps in the first notch (10°) on takeoff, because they felt it helped the aircraft get out of the grass more easily. The target airspeed for rotation was 55 KIAS. There is no procedure or performance chart in the aircraft’s POH for flaps placed in the first notch. No performance calculations had been completed before takeoff.

### Accident location

The accident occurred in the southeast corner of a mixed-hay field located approximately 2 nm east of the town of Black Diamond. The rectangular field—approximately 2350 feet long and 1440 feet wide—is at an elevation of approximately 3820 feet ASL. The long side of the field is oriented in a north-south direction. The southern edge of the field was used as the landing area, and the elevation there varied between 3801 feet ASL and 3807 feet ASL (Figure 3).

Figure 3. Elevation variations on the landing area (Source: Google Earth)



The portion of the field being used as the landing area was not a prepared surface; however, at the time of the occurrence, the field had been cut and the remaining hay was approximately 3 to 4 inches high. A field-boundary fence (wood posts and wire) ran the width of the southern edge of the field, and a windsock had been installed at the approximate mid-field position. The available length for takeoff or landing was approximately 1320 feet in an east–west direction.

The aircraft had been flown into and out of this particular field for approximately 2 years. Due to the location and nature of the field, no radar, communications, or air traffic control services were available.

As there had been strong winds in the area, 4 hay bales<sup>6</sup> had been stacked, 2 wide by 2 high, in the southeast corner of the field to protect the aircraft from being damaged by the winds while it was parked. The bales had been in position for approximately 7 to 10 days and the pilots had flown into and out of the field with the hay bales in position approximately 5 times. Because the aircraft’s journey logbook was destroyed in the post-impact fire, the precise number and dates of previous flights could not be definitively determined.

<sup>5</sup> Ibid, Section 4, p. 4-9.

<sup>6</sup> Each hay bale was 4 feet wide, 8 feet long, and 3 feet high.

## **Aircraft examination**

The aircraft was examined at the accident site. The left-wing fuel tank was found ruptured. The right-wing fuel tank was found intact and still containing approximately 10 U.S. gallons of avgas. The flap handle was found in the flaps-retracted position. Because the aircraft had been almost completely destroyed by the crash and post-impact fire, it could not be determined whether any pre-impact failure or system malfunction contributed to this accident. The aircraft systems were examined to the degree possible, and no indication of a malfunction was found.

The engine was transported to the TSB regional facility in Edmonton, Alberta, for examination. No anomalies were found that would have inhibited the engine from being able to produce full power. As a result of the post-impact fire, some components were destroyed and could not be tested or verified. A review of the aircraft's historical maintenance records was completed. No discrepancies were noted that could have contributed to the accident.

## **Safety messages**

Operating recommendations issued by the aircraft manufacturer ensure that optimum aircraft performance is achieved and that the aircraft is operated within acceptable safety margins.

Aircraft performance calculations should be completed before flight to ensure that the actual or anticipated aircraft performance is at the level expected by the flight crew.

Shoulder harnesses are an important part of the safety equipment installed in the aircraft that, when worn, can reduce the risk of injury or death in an accident.

*This concludes the TSB's limited-scope investigation into this occurrence. The Board authorized the release of this investigation report on 12 December 2018. It was officially released on 04 January 2019.*

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*Le présent rapport est également disponible en français.*