

AVIATION INVESTIGATION REPORT

A00P0197

COLLISION WITH TERRAIN ON TAKE-OFF

PIPER AIRCRAFT PA-24-250 COMANCHE N6917P
RENDELL CREEK AIRSTRIP, BRITISH COLUMBIA
12 OCTOBER 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

On the morning of 12 October 2000, the Piper Comanche, serial number 24-2051, departed the Rendell Creek airstrip, 30 nautical miles southeast of Kelowna, British Columbia, for a visual flight rules (VFR) flight to Colorado, USA. The pilot and three passengers were on board. The en route weather became unsuitable for VFR flight, and the aeroplane returned to Kelowna. In Kelowna, the pilot refuelled the aeroplane and departed for the Rendell Creek airstrip. At the airstrip, the three passengers exited the aircraft with their baggage, and three other passengers boarded for a local sightseeing flight. After the pilot checked that the passengers had their seat belts and their headsets on, he started the engine, carried out checklist items, and taxied along the airstrip. At the end of the airstrip, he turned the aeroplane around into wind and, at about 1740 Pacific daylight time, began a take-off run.

As the aeroplane approached the end of the airstrip, it abruptly became airborne. The aeroplane reached about 20 feet above ground level and flew in a noticeable nose-up attitude. During this short flight, the pilot moved the stabilator to a full nose-up position and reduced engine power seconds before initial impact. The Piper Comanche then snapped forward and landed heavily, sliding along felled trees for a short distance before striking tree stumps and stopping 450 feet off the end of the runway. The stumps penetrated the fuselage floor, causing massive damage and disruption to the airframe. No fire occurred. The pilot and the front passenger were fatally injured at impact. The two rear passengers received serious injuries and were removed from the wreckage and transported to hospital in Kelowna. Later that night, one of them succumbed to injuries in hospital.

Ce rapport est également disponible en français.

Other Factual Information

An examination of the wreckage revealed no pre-existing anomalies or deficiencies with the engine, propeller, airframe, flight controls, or ancillary systems that would have caused or contributed to the accident. All damage was assessed to have been caused by the impact forces. An examination of the maintenance documentation and records also revealed no pre-existing anomalies or deficiencies. The mixture and the throttle controls were found in the “off” and “closed” positions, respectively. The wing flaps were found in the retracted (0 degrees) position.

According to the standard take-off performance graph in the Piper Comanche PA-24-250 *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual* (AFM), with 0 degrees of flap, the same atmospheric conditions, and an aircraft weight similar to the accident flight, the aeroplane would require more than 2500 feet to become airborne.

According to the short field take-off performance graph in the AFM, with 18 degrees of flap extended, the same atmospheric conditions, and an aircraft weight similar to the accident flight, the aeroplane would require about 1200 feet of paved runway to become airborne. The AFM advises that an additional 20 per cent of ground roll is required when the take-off surface is dry, short grass. The performance section of the AFM cautions: “the ground run distance can be expected to be approximately twice the distance shown when taking off without flaps extended.”

The private airstrip is a hard surface about 1750 feet long and 120 feet wide and is comprised of gravel and short grass. The surface condition was sound and in good repair. Each end of the airstrip is delineated with orange markers, and the airstrip is completely surrounded by a four-foot-high wire fence.

The Piper Comanche had first flown into the airstrip four days before the accident and had taken off from the airstrip at least five times since then. On each of these previous take-offs, the pilot had set the wing flaps at an estimated setting of 18 degrees and became airborne between 1200 and 1300 feet down the runway. Each time, the aircraft would climb away without difficulty.

The 37-year-old pilot held a private pilot certificate issued by the US Federal Aviation Administration (FAA), with an airplane single-engine land rating, and a Class 2 medical certificate. He was required to wear corrective lenses (glasses) while flying. A pair of glasses was found smashed against the dash of the aircraft, indicating that the glasses were being worn at the time of the accident. Since starting flying in June 1980, the pilot had accumulated a total of about 500 flight hours, of which 220 hours were on the accident aircraft. He had carried out the mandatory biennial flight review on 10 August 2000.

The pilot was said to have been meticulous in his flying duties. He used a printed checklist for all his flight operations and would read the items aloud on the intercom for his passengers to hear. A review of the pilot's flying experience reveals that the bulk of his operational background was gained at larger, paved airports. Furthermore, it had been the pilot's recent habit, during the operations out of the Rendell Creek airstrip, to not extend the flaps until he had turned the aeroplane around at the end of the runway. He reportedly employed this procedure to prevent stone damage to the flaps during taxiing at the airstrip. The pilot followed this practice during the taxiing to the end of the airstrip immediately before the accident flight.

The printed checklist that the pilot assiduously used is a plastic-laminated card, made specifically for this aircraft; its origin is unknown. This checklist is remarkably different from the checklists in the AFM. The

checklist in the Piper Comanche AFM, Normal Procedures section, includes three references to flap settings during the take-off phase:

BEFORE TAXIING	Flaps - Retract
BEFORE TAKE-OFF	Flaps - Set for Takeoff (Zero, 9 or 18 Degrees as Desired)
SHORT FIELD TAKE-OFF	Flaps - 18 Degrees (Second Notch)

The laminated checklist used by the pilot includes only one reference to flap settings during the take-off phase:

RUN-UP	Flaps - UP
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The laminated checklist does not mention the flaps in the take-off check. A take-off checklist placard on the instrument panel of the aircraft requires the flaps to be "SET".

The weather at the time of the accident exceeded the visual meteorological condition criteria and was suitable for visual flight rules flight. The wind was light, and there were no reports of local turbulence or downdrafts. The lighting at the time of the accident was bright and sufficient to provide good visual depth perception and visibility.

The Piper Comanche has a maximum certificated take-off weight of 2800 pounds. It was estimated that the aeroplane weight at the time of the accident was about 2750 pounds and that its centre of gravity was 88.6 inches. The certificated centre of gravity range for flight at this weight is from 87.2 to 93 inches.

A safety information brochure from the US Department of Transportation emphasizes that shoulder harnesses are effective in reducing injury and death in light aircraft mishaps.¹ Studies of serious accidents have shown that proper use of shoulder harnesses would reduce major injuries by 88 per cent and fatalities by 20 per cent.

Results of an autopsy and toxicology tests gave no indication that incapacitation or physiological factors would have affected the pilot's performance. It is likely that the level of injury to the occupants in this accident would have been lessened had they been wearing shoulder harnesses. Shoulder harnesses, however, were not fitted to this aeroplane, nor were they required by regulation. Shoulder harnesses have been required for all seats in small aeroplanes manufactured since 12 December 1986, but this aeroplane was manufactured in 1960, and accordingly, it was exempt.

Shoulder harness installation kits for the Piper Comanche are available from Piper Aircraft and have been the subject of two Piper Aircraft notifications: *Piper Service Letter*, number 953 (28 July 1983), and *Piper Service Bulletin*, number 980 (18 January 1995). Although the bulletin is not mandatory by FAA regulation, Piper Aircraft considers compliance with the service bulletin mandatory.

Analysis

¹ United States, Department of Transportation, Federal Aviation Administration, *Smart Protection in Small Airplanes*, AM-400-91/2, 1991.

This investigation included an examination of environmental, technical, and operational factors, as well as mechanical aspects of this aircraft and its component parts, and service history. No indication was found of any malfunction or pre-existing mechanical defect with the aeroplane, its engine, or its systems that could have caused or contributed to the accident. Similarly, weather conditions and lighting were judged not to have been contributing factors. As a result, this analysis focuses on selected operational aspects of the accident.

According to the aircraft performance graphs for the environmental conditions at the time of the accident, the aeroplane required more than 2500 feet to become airborne from the airstrip without flaps extended. This was at least 750 feet more than available. It is most likely that during take-off, when the pilot approached the end of the airstrip and realized the aeroplane was not becoming airborne, he forced it off the ground to clear the fence. The airspeed and the aerodynamic performance were insufficient to sustain flight and climb away, and the aircraft settled back to the ground. The pilot's awareness of the situation is demonstrated by his attempt to keep the aeroplane airborne with his application of full up stabilator and his action of shutting the engine down seconds before impact.

It could not be determined why the pilot did not extend the flaps for take-off as he had on the five previous take-offs from the airstrip. It is most likely that the pilot inadvertently did not set take-off flap. It is possible that he was distracted during his routine of taxiing with the flaps retracted and selecting them when the aircraft was turned around. Nonetheless, the checklist he regularly used was designed specifically for the zero-degree flap take-off profile and did not include the requirement to check or review the flap setting before beginning the take-off roll.

Findings as to Causes and Contributing Factors

1. The pilot attempted a take-off with the flaps retracted on a runway of 1750 feet. At least 2500 feet of runway is required for an aircraft in this configuration.

Findings as to Risk

1. The checklist that the pilot regularly used did not include any requirement to check or review the flap setting before beginning the take-off roll.
2. The checklist that the pilot regularly used was remarkably different from the checklist approved by the Federal Aviation Administration in the aircraft flight manual.
3. The injuries to the occupants likely would have been lessened had they been wearing shoulder harnesses. Shoulder harnesses were not installed in this aeroplane, nor were they required by regulation.

Other Findings

1. On five previous occasions, the aeroplane had lifted off from the airstrip at about the 1300-foot point, with the flaps extended, then climbed away normally.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 03 July 2001.