

AVIATION OCCURRENCE REPORT

RUNWAY EXCURSION

**PIPER PA 23-250 AZTEC C-GIFD
CHILLIWACK, BRITISH COLUMBIA
11 SEPTEMBER 1991**

REPORT NUMBER A91P0194

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.



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

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Chilliwack, British Columbia
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Synopsis

After carrying out a series of practice circuits and landings, the pilot returned to the airport for a full-stop landing. Shortly after touchdown, the aircraft veered off the runway and ran into a creek. The aircraft was substantially damaged and the pilot was seriously injured.

The Board determined that the pilot lost control of the aircraft on landing; the reason for the loss of control could not be determined. The severity of the pilot's injuries and the damage to the aircraft were attributed to the aircraft's collision with the bank of the creek.

Contributing to the accident was the hazard presented by the uncovered watercourse's orientation to the runway, its presence within the boundary of the strip, and its proximity to the threshold of runway 24.

Ce rapport est également disponible en français.

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Excerpts from TP 312, *Aerodrome Standards and Recommended Practices*, 01 March 1993 edition 21

OCCURRENCE NUMBER: A91P0194
 TYPE OF OCCURRENCE: Runway Excursion
 (Accident)
 DATE OF OCCURRENCE: 11 September 1991
 LOCAL TIME: 1215 PDT
 LOCATION: Chilliwack, British Columbia
 TYPE OF AIRCRAFT: Piper PA 23-250 Aztec
 REGISTRATION: C-GIFD
 TYPE OF OPERATOR: Private Owner
 TYPE OF OPERATION: Pleasure/ Travel
 DAMAGE CATEGORY: Substantial
 PILOT LICENCE: Private - Aeroplane

PILOT-IN-COMMAND

PILOT HOURS:	Last 90 Days	Total
All Types:	15	499
On Type:	15	45

INJURIES:	Crew	Passengers
Fatal:	-	-
Serious:	1	-
Minor:	-	-
None:	-	-

1.0 Factual Information

1.1 History of the Flight

The pilot had been practising landings at the Chilliwack Municipal Airport, British Columbia. After completing a few circuits, he positioned the aircraft for a full flap, full-stop landing on runway 24. Just after touchdown, the left wing rose and the aircraft began to veer left. It continued to turn with only the nosewheel and right main wheel in contact with the ground until it ran off the left side of the runway about 900 feet from the threshold (see Appendix A). Once on the grass, the aircraft began to skid sideways and the left main wheel made contact with the ground. The aircraft was now yawed about 10 degrees to the left of its direction of travel, and its forward speed was about 40 knots.

The aircraft ran through the short grass, out of the pilot's control, for about 150 feet until it ran into a 10-foot deep creek oriented at a 90-degree angle to the runway. The aircraft's nosewheel entered the creek about 48 feet from the left edge of the paved runway. The aircraft became momentarily airborne until its nose crashed heavily into

the far bank of the creek. The aircraft then settled into the shallow water in the bottom of the creek.

1.2 Pilot Egress

The pilot was unrestrained by a shoulder harness, and was flung forward into the instrument panel when the aircraft struck the side of the creek. The force of the impact pushed the aircraft's nose back into the cabin and trapped the pilot in his seat. Rescue personnel used "the jaws of life" to extract him from the aircraft. He was seriously injured; the aircraft was substantially damaged.

1.3 Weather

The airport temperature was about 20 degrees Celsius, the sky was clear, and the visibility was unrestricted. The surface wind was less than 10 knots and from about 210 degrees magnetic. The crosswind component for runway 24 was about six knots.

1.4 The Pilot

The pilot was certified and qualified on the aircraft type.

1.5 The Aircraft

The maintenance log-books contained no evidence of uncorrected deficiencies relevant to the circumstances of the occurrence. An examination of the aircraft after the occurrence revealed no evidence of a malfunction that would cause the aircraft to veer to the left on landing.

The aircraft was serviced and maintained in accordance with existing directives. The weight and centre of gravity were within the prescribed limits. The aircraft was not equipped with a shoulder

harness, nor was one required by regulation.

1.6 The Landing

The pilot did not remember much about the landing. A witness said that the aircraft first touched down on its nosewheel and then bounced back into the air. Other witnesses saw the aircraft's wings rocking from side-to-side as it landed. Skid marks on the runway revealed that only the nose and right main wheels were on the runway as the aircraft began to veer to the left, and that the left main wheel did not touch the ground until the aircraft had run off the edge of the runway. The aircraft then began to skid sideways. Except for the creek, there were no other obstacles in the path of the aircraft.

1.7 Porpoising and Wheelbarrowing

Porpoising is oscillation about the aircraft's lateral axis in the manner of a porpoise. A landing porpoise is an oscillation (bouncing) set up between the aircraft's nose and main wheels, and can occur when the nosewheel contacts the runway first, either as a result of excessive landing speed or faulty pilot technique.

Wheelbarrowing is a condition that arises when the nosewheel rather than the main gear is forced to support an abnormal share of the aircraft's weight. Touching down on the nosewheel, excessive braking, or friction between the wheels and runway caused by a side-skid may cause wheelbarrowing. Wheelbarrowing can damage a nosewheel or cause an aircraft to yaw uncontrollably off its intended course.

1.8 TP 312 - Aerodrome Standards And Recommended Practices

The Chilliwack runway was certificated by Transport Canada (TC) as Category 2(B) non-instrument. As such, the airport's manoeuvring areas must comply with certain established parameters, as defined in TC publication TP 312 - *Aerodrome Standards and Recommended Practices* (See Appendix B).

The TP 312 in effect at the time of the occurrence (1991) was dated 06 February 1986. The current edition is dated 01 March 1993. Excerpts from both editions are found in Appendix B.

1.9 Strips - Definition

The current TP 312, at article 3.1.6.5, states that, "A strip including a non-instrument runway shall extend on each side of the centre line of the runway and its extended centre line through the length of the strip, to a distance of at least 30 meters (98.5 feet) where the code number is 1 or 2."

1.10 Category 2(B) Standards - Graded Areas - Definition

The current TP 312 requires a Category 2(B)¹ runway to be 75 feet wide and to have a 75-foot graded area on each side of the centre line extending along the full length of the runway and stopway where provided. The Chilliwack runway conforms to Category 2(B) standards.

1.11 Drainage Ditches

The TP 312 standard for drainage ditches in effect in 1991, the time of the occurrence, directed that drainage ditches located at the edge of the graded area adjacent to the runway be contoured in order to reduce structural damage should an aircraft inadvertently overrun the ditch. Open ditches "should have a side slope of 4 units of horizontal measure to 1 unit of vertical measure. The maximum side slope acceptable shall be 3 units of horizontal measure to 1 unit of vertical measure. Open

ditches shall be graded and sodded for erosion control and ease of maintenance." Drainage ditches were not to be located within the graded portion of the strip.

¹ Category 2 refers to an aeroplane reference field length of 2,650 feet up to but not including 4,000 feet.

The current TP 312, amended March 1993, also states at article 3.1.6.19 that, "Drainage ditches shall not be located within the graded portion of the strip. Where drainage ditches are located at the edge of the graded area, they shall be contoured in order to reduce structural damage in the event an aeroplane overruns the ditch." TP 312 further recommends at article 3.1.6.21 that: "Open ditches should have a side slope of 4 units of horizontal measure to 1 unit of vertical measure. Open ditches should be graded and sodded for erosion control and ease of maintenance."

1.12 The Chilliwack Airport

The north/ south creek was located in the undershoot area of runway 24 before that runway was extended. The course of the creek was altered when the runway was extended, and a culvert now runs under the 75-foot-wide and 3,900-foot-long runway about 1,250 feet from the threshold of runway 24. The culvert then empties into open ditches. The north ditch begins 79.5 feet from the runway centre line and the south ditch begins 77.5 feet from the runway centre line. Thus, the ditch begins beyond the graded portion of the strip.

The creek is about 52 feet wide on average and 10 to 15 feet deep, with a side slope steeper than 1:3. Its edges and steep rocky sides are covered with vegetation. At the time of the accident, three to four feet of water covered its bottom; the depth of water, however, varies with precipitation.

Both the north and south outlets of the under-runway culvert are located

within the confines of the aerodrome strip and at the edge of the graded area.

1.13 TC Interpretation of TP 312

TC does not consider the creek which the aircraft struck to be a drainage ditch, but rather a watercourse, or naturally occurring stream. TC cites runways built beside rivers and lakes as examples of similar naturally occurring hazards. TC contends that the TP 312 standard for drainage ditches normally refers to those that are parallel to runways; however, TP 312 does not specifically address orientation.

1.14 Previous Accident

An accident involving the same uncovered creek occurred during a runway excursion in 1988 (A88P0188). The pilot lost directional control of the aircraft during a rejected take-off, and the aircraft ran into the creek.

2.0 *Analysis*

2.1 *Introduction*

The analysis will consider the pilot's actions on landing, the location of the watercourse, and the risk the watercourse presents during a runway excursion.

2.2 *The Landing*

It is apparent from witness statements and marks on the runway that the pilot lost directional control of the aircraft shortly after touchdown, and that he was then unable to prevent the aircraft from running off the runway and into the creek. The evidence is consistent with the aircraft either porpoising or wheelbarrowing on landing, but there is insufficient evidence to determine the exact mechanism by which control was lost.

2.3 *Injury and Damage*

The creek was the only obstacle in the path of the aircraft as it ran off the runway. Except for the collision with this obstacle, it is probable that the pilot would have been uninjured and the aircraft relatively undamaged. Had the pilot been wearing a shoulder harness, the injuries he did suffer would have been less severe.

2.4 *The Watercourse*

TP 312, Aerodrome Standards, among other things, defines the strip widths required for instrument and non-instrument runways. The Chilliwack runway meets the current requirements (dated 01 March 1993) in that the watercourse lies immediately outside the defined graded area, within the confines of the strip. It also met the requirements of the edition of TP 312 in effect at the time (dated 06 February 1986). However, a drainage ditch lying just outside the graded area, oriented parallel to the strip, is currently required to be contoured and to

have a side slope of 4 units of horizontal measure to 1 unit of vertical measure. The standard in effect at the time recommended this same slope but permitted a maximum slope of 3 units of horizontal measure to 1 unit of vertical measure. This watercourse meets neither the 1986 nor the 1993 slope standards for drainage ditches. However, it is TC's opinion that it is a creek or a watercourse and not a drainage ditch. TC has, therefore, concluded that it need not meet the TP 312 slope standards for drainage ditches.

It is clear that a ditch, creek or natural watercourse, running perpendicular to the runway poses more of a hazard to aircraft exiting the runway than does one that runs parallel to it. The location of the Chilliwack watercourse, about 1,200 feet from the threshold of runway 24, places it in the path of aircraft departing the runway during the critical take-off and landing phases. Any aircraft departing the runway as the accident aircraft did would likely collide with the bank on the opposite slope, regardless of whether the slope were 1:3 or 1:4. Moreover, since there have been two occurrences of this nature in three years, it is clear that a real hazard exists.

3.0 Conclusions

3.1 Findings

1. The pilot was qualified on the aircraft type.
2. The aircraft was serviced and maintained in accordance with existing directives.
3. The aircraft was not equipped with a shoulder harness, nor was one required by regulation.
4. The weight and centre of gravity were within the prescribed limits.
5. The pilot lost control of the aircraft on landing.
6. There was no evidence of a malfunction that would cause the aircraft to veer on landing.
7. TP 312 requires a 75-foot graded area for Category 2 runways. Because the watercourse begins 77.5 feet from the runway centre line, it is not subject to the graded area requirements.
8. TP 312 requires that, where drainage ditches are located at the edge of the graded area, they shall be contoured in order to reduce structural damage in the event an aeroplane overruns the runway.
9. TC has determined that the Chilliwack watercourse need not conform to the TP 312 standard for drainage ditches because the watercourse is a naturally occurring creek.

10. TC considers the creek to be a naturally occurring watercourse, and, as such, it does not contravene TP 312 Category 2 runway certification criteria.

11. TP 312, *Aerodrome Standards and Recommended Practices*, fails to address the hazard presented by the uncovered portion of the watercourse located within the boundary of the strip.

3.2 Causes

The pilot lost control of the aircraft on landing; the reason for the loss of control could not be determined. The severity of the pilot's injuries and the damage to the aircraft were attributed to the aircraft's collision with the bank of the creek.

Contributing to the accident was the hazard presented by the uncovered watercourse's orientation to the runway, its presence within the boundary of the strip, and its proximity to the threshold of runway 24.

4.0 *Safety Action*

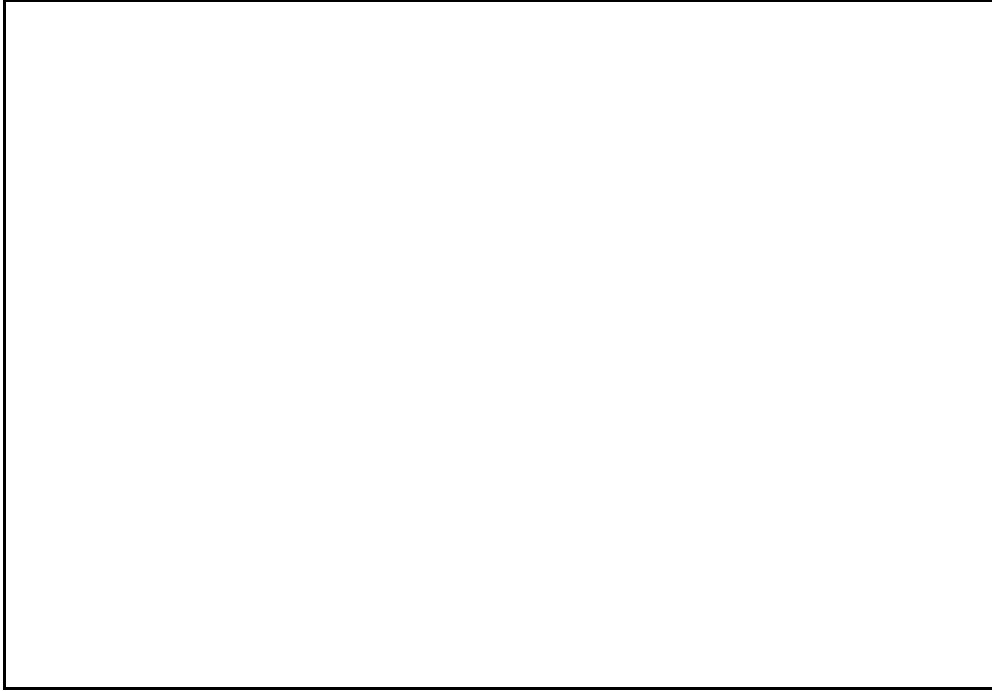
4.1 *Action Taken*

A TSB Aviation Safety Advisory was sent to Transport Canada (TC) in August 1993, indicating that TC might wish to review the adequacy of the Chilliwack Airport in meeting the certification criteria regarding drainage ditches contained in TP 312. TC responded that "Both the regional TC officials and the airport operator are aware of the risk that this watercourse represents but it remains the responsibility of the airport operator to take action to remove this hazard."

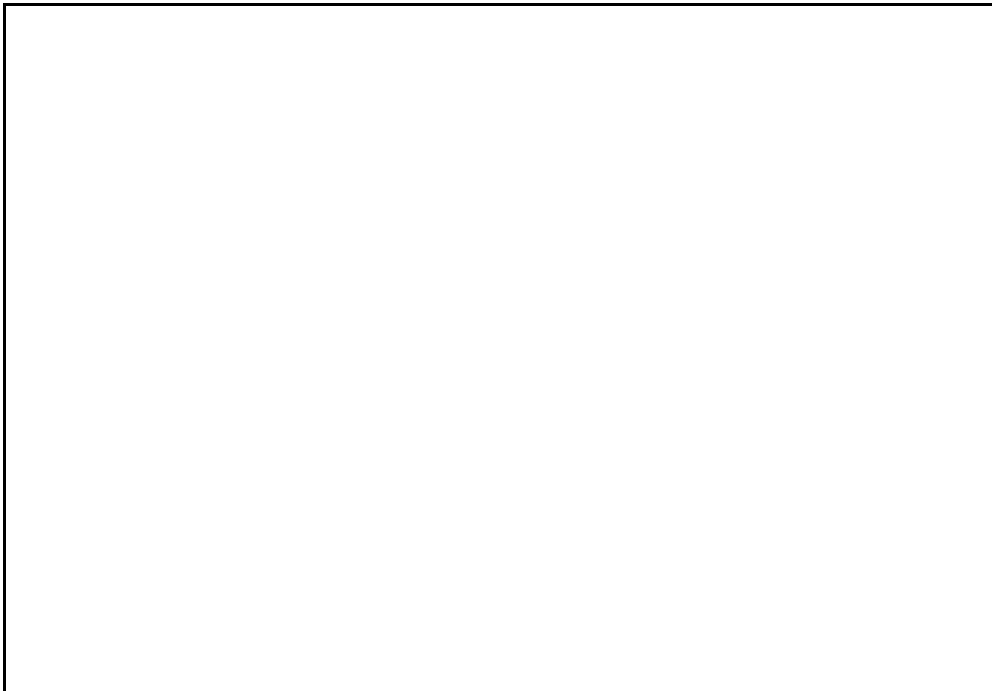
In November 1994, a supplemental Advisory was sent to the operators of the airport, the District of Chilliwack. This Advisory indicated that, given the bank condition of the drainage ditch, an excursion off the runway by an aircraft, even though remaining within the theoretical confines of the runway strip, could result in serious injury or damage. Therefore, the District may wish to consider contouring the drainage ditches located at the edge of the Chilliwack Airport graded area.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Gerald E. Bennett, Zita Brunet, the Hon. Wilfred R. DuPont and Hugh MacNeil, authorized the release of this report on 09 March 1995.

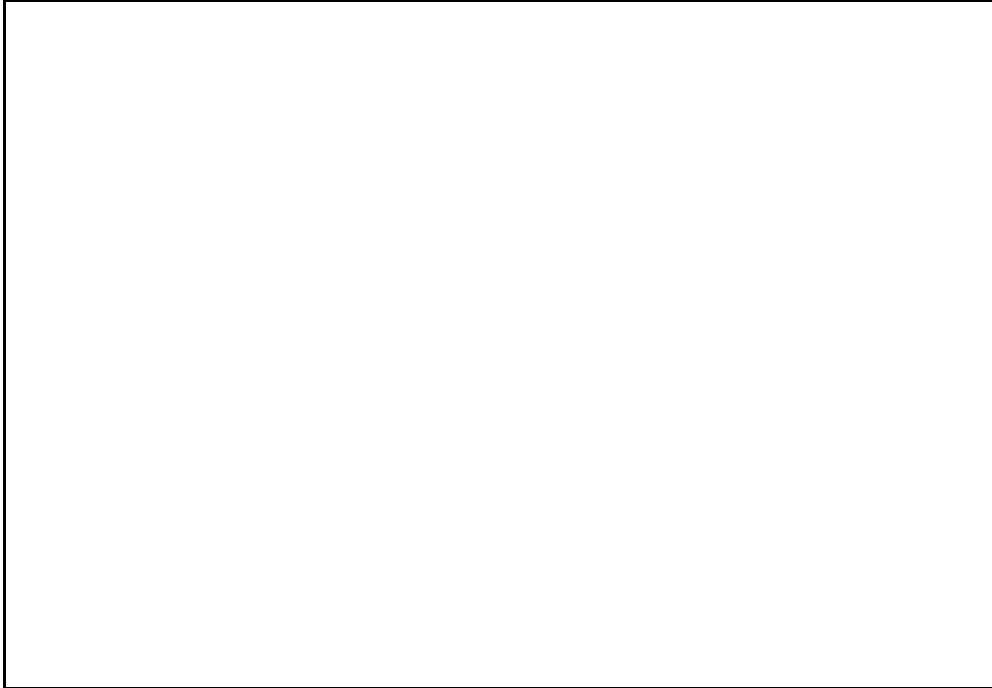
Appendix A - Accident Site



View
from Edge of Runway 24
(Note Tire Marks)



Wreck
age in Creek
(looking south-southwest)



Wreckage in Creek
(looking north-northeast)



Creek
Viewed Along Its Course

*Appendix B - Excerpts from TP 312, Aerodrome
Standards and Recommended Practices,
06 February 1986 edition*

*Excerpts from TP 312, Aerodrome Standards
and Recommended Practices,
01 March 1993 edition*

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