



**AVIATION INVESTIGATION REPORT**  
**A06P0036**



**RUNWAY OVERRUN – COLLISION WITH TERRAIN**

**ORCA AIRWAYS LTD.**  
**PIPER PA-31-350 CHIEFTAIN C-GNAY**  
**POWELL RIVER, BRITISH COLUMBIA**  
**08 MARCH 2006**

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 Investigation Report

### Runway Overrun – Collision with Terrain

Orca Airways Ltd.

Piper PA-31-350 Chieftain C-GNAY

Powell River, British Columbia

08 March 2006

Report Number A06P0036

### *Summary*

The Piper PA-31-350 Chieftain (registration C-GNAY, serial number 31-8052095) departed from its home base at Vancouver, British Columbia, with two crew members on board. The aircraft was being repositioned to Powell River (a 30-minute flight) to commence a freight collection route. On arriving at Powell River, the crew joined the circuit straight-in to a right downwind for a visual approach to Runway 09. A weather system was passing through the area at the same time and the actual local winds were shifting from light southwesterly to gusty conditions (11 to 37 knots) from the northwest. The aircraft was lower and faster than normal during final approach, and it was not aligned with the runway. The crew completed an overshoot and set up for a second approach to the same runway.

On the second approach, at about 1639 Pacific standard time, the aircraft touched down at least halfway down the wet runway and began to hydroplane. At some point after the touchdown, engine power was added in an unsuccessful attempt to abort the landing and carry out an overshoot. The aircraft overran the end of the runway and crashed into an unprepared area within the airport property. The pilot-in-command suffered serious injuries and the first officer was fatally injured. A local resident called 911 and reported the accident shortly after it occurred. The pilot-in-command was attended by paramedics and eventually removed from the wreckage with the assistance of local firefighters. The aircraft was destroyed, but there was no fire. The ELT (emergency locator transmitter) was automatically activated, but the signal was weak and was not detected by the search and rescue satellite.

*Ce rapport est également disponible en français.*

## *Other Factual Information*

### *Accident Site Examination*

During the crash sequence, the aircraft went beyond the runway end lights, across 54 m of asphalt surface and then 9 m of grass surface before going over the edge of a three-metre-high embankment. After overrunning the embankment, the aircraft contacted the upper portion of a deer fence that stood near the same height as the runway elevation. After hitting the fence, the aircraft contacted a dirt berm, bounced back into the air and came to rest in a flat field about 113 m from the runway end lights.

No tire marks were observed on the asphalt surface of the runway. However, both main landing gear tires exhibited damage consistent with rubber-reversion caused by hydroplaning. Tracks left on the grass by the main gear were consistent with initial braking action that later turned into a skid. No nose gear tracks were found from the point where the aircraft left the asphalt surface to the point where it overran the embankment.

Switch positions found in the cockpit were consistent with the crew having completed the pre-landing checklist, except that the engine power controls were set for take-off power and the landing gear selector was in the up position. The wing flap selector was found in the up position, and the position of the flap jack screws confirmed that the flaps were fully retracted at impact. Wing flaps are not required to be used for take-off or landing. The left main gear was found extended; however, the down-lock was not engaged, and the gear leg was free to swing freely into the retracted position. The right main gear had been extended at impact and had broken rearward.

Damage to the exterior of the nose wheel doors confirmed that the nose wheel was fully retracted and the nose gear doors were closed when the aircraft struck the berm. Both main gear wheel cover doors had been open at impact and were detached from the wings. Examination of the landing gear operating system confirmed that these doors are normally closed except when a gear selection has been made and the landing gear is in transition.

Safety features of the landing gear system require that a micro-switch on the left main gear be disengaged by oleo extension before a gear-up selection can be made, and the gear selection lever must be pulled to bypass a projecting safety arm to change positions. For the micro-switch on the left main gear to be disengaged, the aircraft had to be light on the wheels or bouncing when the selection was made.

The left-side airspeed indicator (ASI) showed about 74 knots and the right-side ASI showed about 67 knots. According to the speed range arcs on the ASIs, the aircraft stall speed is 71 knots with zero flaps and 67 knots with full flaps. According to the pilot operating handbook (POH), the approximate stall speed for the aircraft at its accident weight with a zero flap setting and idle power is 71 knots.

Scoring and abrasion to the propeller blades in the circumferential direction, as well as bending about the mid-length, were consistent with brief tip contact and a high power setting at impact. Subsequent disassembly and examination of the wheel brake assemblies did not reveal any anomalies.

During the wreckage examination, the emergency locator transmitter (ELT) was reconnected to the aircraft antenna and transmitted a strong signal.

## *Airport*

Runway 09 at the Powell River Airport is 1106 m (3627 feet) long and meets the design criteria specified in Transport Canada's publication TP 312 (*Aerodrome Standards and Recommended Practices*). The embankment, which lies 63 m beyond the end of Runway 09, is located outside the area of the runway strip-end (overrun area) and does not fall under any airport guidelines regarding surface preparation. A review of recent audits by Transport Canada did not reveal any outstanding issues with the airport that would have contributed to this accident.

Airport information published in both the *Canada Flight Supplement (CFS)* and *Canada Air Pilot (CAP)* indicates that the slope for Runway 09 is 2 per cent up. A NOTAM (notice to airmen) was issued on 10 November 2004 to advise that the slope is 1.5 per cent up.

Although the Powell River Airport has a published mandatory frequency, no ground station is in operation, and no airport advisory service is available. The recommended arrival procedure at uncontrolled airports without an advisory service is to overfly the airport before joining the circuit to determine the runway in use, runway condition and traffic.

## *Aircraft*

The aircraft was configured for cargo operations and was empty at the time of the accident. It was within its certificated weight limits. The aircraft was not equipped with a cockpit voice recorder or a flight data recorder. This equipment was not required by regulation. This particular aircraft was restricted to operating under visual flight rules (VFR) because of a deferred defect recorded in the aircraft journey log, which listed the automatic direction finder (ADF) as unreliable. This defect was noted on a placard mounted on the instrument panel. A review of the technical records and examination of the wreckage did not reveal any outstanding defects that could have contributed to this accident.

The aircraft was equipped with a panel-mounted global positioning system (GPS) navigation unit that was examined by the TSB Engineering Laboratory; no meaningful information was recovered.

According to the Piper PA-31-350 POH, under conditions of a level and dry asphalt runway, full flaps, approach speed of 95 knots, and a 10-knot tailwind, the aircraft should be capable of stopping in about 960 feet of ground roll with maximum braking. If an aircraft landed halfway down the runway, there would be about 1814 feet remaining plus an additional 207 feet before the embankment.

## *Flight Crew*

The pilots had worked together for the two days previous to the accident. The third day before the occurrence had been a day off for both. Records for the previous two days indicated that daily duty times were within accepted limits. Duty time for the last seven days was approximately 65 hours for both pilots. This was the third flight of the day.

The captain had been employed with Orca Airways Ltd. since November 2005. He held a Canadian commercial pilot licence with an aviation medical valid until 01 June 2006. He had completed a pilot proficiency check (PPC) on the Piper Chieftain aircraft and had a valid Group 1 instrument rating. During previous employment, he had flown this same route and aircraft as a first officer for another operator. He was upgraded to captain when he was hired by Orca Airways Ltd. His total flight time was 1200 hours. The captain had received training on pilot decision making, crew resource management and multi-crew operations.

The first officer had been employed with Orca Airways Ltd. since February 2006. He held a Canadian commercial pilot licence with an aviation medical valid until 01 July 2006, a Group 1 instrument rating and a PPC on the Piper Chieftain. He also had previous experience on the Piper Chieftain aircraft and a total flight time of 500 hours.

## *Meteorological Information*

The weather forecast for the region called for instrument or marginal visual meteorological conditions throughout the day. The main weather systems influencing the region included the passage of a warm front followed by a cold front, both approaching from the west. The winds ahead of the cold front were from the southeast at 30 knots and were expected to veer to the northwest at 25 knots with the passage of the cold front. Moderate to severe turbulence was expected in the area from the surface to 3000 feet above sea level (asl).

A pre-flight weather package, printed at about 0500 Pacific standard time,<sup>1</sup> was retrieved from the wreckage. This package included hourly reports (METARs), significant weather forecasts, terminal area forecasts (TAFs) where available, pilot reports, graphical area forecasts (GFAs), forecast upper winds, and NOTAMs (notices to airmen).

The GFA found in the wreckage was valid at 0400. Based on the 0400 information, the cold front was expected to be in the vicinity of Powell River by about 1400. An updated version of the GFA (valid at 1000) forecast the cold front to be in the vicinity of Comox (18 nm southwest of Powell River) by about 1300 and, at the speed it was moving, it was expected to pass Powell River in another hour. It is unknown whether the crew had received this information.

Communication records for the Kamloops Flight Information Centre (FIC) indicated that the crew had obtained weather updates by telephone throughout the day and had obtained their last weather briefing by telephone shortly after 1500 (about 45 minutes before departing Vancouver for Powell River). During that briefing, there were no specific questions asked about

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<sup>1</sup> All times are Pacific standard time (Coordinated Universal Time minus eight hours).

the location or speed of the approaching cold front, but, at that time, the TAF for Comox indicated that the change in wind direction associated with the cold front passage at Comox was forecast to occur between 1400 and 1600.

The 1500 METAR indicated that the wind in Comox had shifted to the southwest. Although not discussed by telephone, a significant weather report (Sigmet L6) had been issued at 1510 to advise of continued severe turbulence below 3000 feet asl due to a low-level jet stream. Communication records for all air traffic control (ATC) facilities involved with the flight, and any that may have been contacted en route, were reviewed and it was concluded that the crew neither requested nor received any updated weather information after their telephone briefing at 1513.

The weather observation station at the Powell River Airport is a contracted service and was staffed at the time of the accident. The weather station provided regular hourly reports, and special observations for limited hours. The weather station contract does not include the provision of an airport advisory service, and there is no regulatory requirement for airport advisory services to be provided.

TAFs are not produced for the Powell River Airport but are available for Comox. Throughout the day, the wind at Powell River had been consistently from the east at speeds from 24 knots and gusting as high as 50 knots. The weather report for 1600, about 40 minutes before the accident, reported that the wind had calmed down to 120° magnetic (M) at 6 knots. However, weather changes associated with the cold front passage over the 15-minute period preceding the accident resulted in the on-site weather station issuing two special observations.

The first, at 1622, reported the wind to be 120°M at 8 knots, the visibility reduced from 10 to 6 statute miles (sm) and light rain had become light rain showers and mist. The second special report issued at 1628 (six minutes before the first approach) reported a change in the wind to 200°M at 10 knots, visibility reduced to 4 sm in light rain showers and ice pellets. Both special observations also reported towering cumulus clouds embedded.

The latest special observation was followed immediately by a correction that changed the intensity of the rain showers and ice pellets from light to moderate. Subsequent to the 1628 special report, the winds in Powell River shifted from light southwesterly to gusty conditions (11 to 37 knots) from the northwest. The weather observation station personnel were in the process of taking another wind reading when the accident occurred.

### *Survival Aspects*

Both pilot seat frames were deformed from the force of impact. Damage to the right-hand seat was more extensive as was damage to the floor structure below it. Both seats were equipped with lap belt, single diagonal shoulder strap, and inertia reels. Both pilots wore all restraints.

Since both pilots suffered injuries, both shoulder strap inertia reels were sent to the TSB Engineering Laboratory for examination. These components showed signs of minor damage, which was determined to have resulted from the loads applied during impact. Despite this damage, both inertia reels were found to be in working order. A manufacturer's Alert Service

Bulletin (SB), A25-1124A, dated 01 June 2000, was applicable to both inertia reels, but had not been implemented. The SB recommended replacing the inertia reel aluminum shaft with a steel shaft to prevent premature failure due to wear contact with another part. Non-completion of this SB resulted in the risk of failure increasing over time, but was not a contributing factor in this accident. Completing the maintenance action recommended in an Alert Service Bulletin is not mandatory.

The autopsy examination attributed the fatality to a pattern of injury most often associated with a vertical force. It was likely that the initial impact with the dirt berm caused the fatal injuries to the first officer. The nose section of the aircraft did not contact the dirt berm but was substantially damaged in the second impact, and this is most likely when the feet and ankle injuries occurred.

## *Analysis*

There were no anomalies found with the aircraft that would have contributed to this accident.

Runway 09 and its overrun area complied with Transport Canada standards. The embankment lies beyond the overrun area, but within airport property. However, it is not located within the runway strip and, therefore, does not fall under any airport guidelines regarding surface preparation. Regardless of the formal requirements, the obstacles and terrain contour beyond the overrun area contributed to the severity of injuries and the damage to the aircraft. Any grading and obstacle removal improvements to this area would enhance the survivability of overrun accidents that may occur there.

The weather forecasts issued during the morning of the day of the accident proved to be reasonably accurate, and subsequent forecasts became more so when updated with the actual weather reported throughout the day. The latest TAF for Comox and METARs for Comox and Powell River were obtained by the crew less than an hour before the aircraft taxied for departure from Vancouver. It could not be determined what level of weather analysis and understanding the crew had regarding the effects of the cold front passage on their flight.

There were ground stations available at several locations within communication range of the aircraft route. If the flight crew contacted any of these stations, the most recent weather report that could have been provided before their approach was issued at 1628 and indicated that the surface wind was 200°M at 10 knots, and was therefore favouring Runway 27.

The crew also could have conducted the recommended procedure of overflying the airport before joining the circuit and their observation of the windsocks likely would have provided the same information. The Powell River weather station was not equipped with air-ground advisory communications. Even though windsocks were within view of the flight crew during both approaches, a current wind update received during the final approach likely would have influenced the crew members to re-evaluate their decision to continue either approach.

Throughout the time of the two approaches, the cold front was passing through the Powell River area and the actual local winds were shifting from light southwesterly to gusty conditions (11 to 37 knots) from the northwest. It is evident that any cues received on the first approach were not sufficiently compelling to the crew to cause them to abandon their stop at Powell River or to change runways.

The decision to make a second approach was consistent with normal industry practice, in that the crew could continue with the intent to land while maintaining the option to break off the approach if they assessed that the conditions were becoming unsafe. The overall risk exposure increased during the late stages of the flight when the crew elected to continue their second approach when it became apparent that the landing would be long. The downwind condition on approach contributed to the aircraft landing long and with a high ground speed, therefore increasing the landing distance. This, in combination with the hydroplaning, prevented the crew from stopping the aircraft in the runway length remaining.

When the decision to abort the landing was made, there was insufficient distance remaining for the aircraft to accelerate to lift-off speed. A perception of sufficient airspeed due to the high groundspeed may have been a factor. The aircraft went over the embankment in an aerodynamically stalled condition with the nose gear retracting and the main gear still extended but unlocked.

The following TSB Engineering Laboratory reports were completed:

LP019/2006 – GPS Analysis

LP031/2006 – Shoulder Strap Inertia Reels Analysis

These reports are available upon request from the Transportation Safety Board of Canada.

### *Findings as to Causes and Contributing Factors*

1. The downwind condition on approach contributed to the aircraft landing long and with a high ground speed. This, in combination with hydroplaning, prevented the crew from stopping the aircraft in the runway length remaining.
2. When the decision to abort the landing was made, there was insufficient distance remaining for the aircraft to accelerate to a sufficient airspeed to lift off.
3. The overrun area for Runway 09 complied with regulatory standards, but the obstacles and terrain contour beyond the overrun area contributed to the fatality, the severity of injuries, and damage to the aircraft.

### *Finding as to Risk*

1. Alert Service Bulletin A25-1124A (dated 01 June 2000), which recommended replacing the inertia reel aluminum shaft with a steel shaft, was not completed, thus resulting in the risk of failure increasing over time.



## *Other Findings*

1. The weather station at the Powell River Airport does not have any air-ground communication capability with which to pass the flight crew timely wind updates.
2. The decision to make a second approach was consistent with normal industry practice, in that the crew could continue with the intent to land while maintaining the option to break off the approach if they assessed that the conditions were becoming unsafe.

## *Safety Action Taken*

The TSB forwarded a Safety Information Letter, dated 18 August 2006, to the Powell River Airport operator. The letter addressed the terrain contour beyond the overrun area for Runway 09 reflecting the third item under Findings as to Causes and Contributing Factors.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 January 2007.*