



AIRCRAFT ACCIDENT REPORT
OCCURRENCE NUMBER 98/3405
PIPER PA-18-90
ZK-BTX
KAREKARE BEACH
20 DECEMBER 1998

Glossary of abbreviations used in this report:

AD	Airworthiness Directive
agl	above ground level
avgas	aviation gasoline
CAA	Civil Aviation Authority
E	east
kg	kilogram(s)
km	kilometre(s)
m	metre(s)
°M	degrees magnetic
mm	millimetre(s)
NZDT	New Zealand Daylight Time
UTC	Coordinated Universal Time
VHF	very high frequency

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Aircraft type, serial number and registration:	Piper PA-18-90, 18-7309, ZK-BTX
Number and type of engines:	One Continental C90-12F
Year of manufacture:	1960
Date and time:	20 December 1998, 1830* approx
Location:	Karekare Beach, West Auckland Latitude: S 36° 59.5' Longitude: E 174° 28.4'
Type of flight:	Private
Persons on board:	Crew: 1 Passengers: 1
Injuries:	Crew: Fatal Passengers: Serious
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence	Commercial Pilot Licence (Aeroplane)
Pilot-in-command's age	37 years
Pilot-in-command's total flying experience:	500 hours 200 on type (both totals estimated)
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr A J Buckingham

* Times are NZDT (UTC + 13 hours)

Synopsis

The Civil Aviation Authority was notified of the accident at 1846 hours on Monday 20 December 1998. The Transport Accident Investigation Commission was in turn notified shortly thereafter, but declined to investigate. A CAA site investigation was commenced later the same evening.

The aeroplane had taken off from Karekare Beach and turned out over the sea at low level before making a reversal turn as if to fly back along the beach. In the reversal turn, the aeroplane stalled and spun, impacting on the beach before recovery could be effected. The pilot was killed and the passenger sustained serious injuries.

1. Factual information

1.1 History of the flight

- 1.1.1 On Sunday 20 December 1998 the pilot had arranged to hire ZK-BTX from an Ardmore-based syndicate, for a recreational flight to Karekare Beach. He and his passenger arrived at Ardmore early in the afternoon and took over the aeroplane from another hirer. The pilot carried out a normal pre-flight inspection and established that there was sufficient fuel on board for his intended flight.
- 1.1.2 The aeroplane took off from Ardmore at 1439 hours and flew to Karekare, landing on the next beach to the south of Karekare Beach. The pilot and passenger walked the short distance to Karekare Beach, and met the duty surf lifeguards who were friends and sporting colleagues of the pilot. The pilot arranged with the lifeguards to keep people clear of the beach when he returned with the aeroplane, and he and one of the lifeguards returned to the aeroplane and flew it to Karekare Beach.
- 1.1.3 The pilot and his passenger spent over three hours at the beach, where they joined in the lifeguards' activities. These included a training swim and a game of touch football, in which the pilot suffered a minor hamstring strain.
- 1.1.4 About 1830 hours, the pilot and his passenger boarded the aircraft for the return flight to Ardmore. Just prior to engine start, the pilot made some remark about the rudder control to one of the lifeguards, but neither the lifeguard nor the passenger could remember the substance of the remark. The pilot occupied the front seat, with the passenger in the rear.
- 1.1.5 The subsequent events were witnessed by a number of people, including the lifeguards, on the beach and by a group on the bluff at the northern end of the beach. This group included an overseas visitor, who was a pilot and aircraft owner. The group arrived at the top of the bluff about half a minute before the aircraft engine started.
- 1.1.6 After start, the pilot taxied the aeroplane to the northern end of the beach, turned and lined up facing south on the wet sand just above the waterline. According to

the pilot witness on the bluff, some 500 feet above the beach, no engine run-up was carried out; the aeroplane lined up and took off parallel to the surf.

- 1.1.7 Immediately after lifting off, the aeroplane was seen to make a turn to the right through approximately 45° and head out over the sea with little gain in altitude. A short distance out to sea, the aeroplane rolled out of its right turn straight into a left turn, this turn continuing as though the pilot intended lining up with the beach for a “fly-by” prior to departure. Several of the witnesses made this assumption independently. Estimates of the bank angle during the turn varied from about 15° to about 45°. The passenger recalled thinking that the pilot was “pulling it around quite steeply”. He said that the pilot did not make any comment to him at any time in the turn.
- 1.1.8 Part way around the turn, during which the aeroplane had not climbed above an estimated 100 to 150 feet, the nose was seen to rise and the aeroplane “flicked” into a spin. Some witnesses recalled that the spin was to the left, and one was sure that it was initially to the left but flicked back to the right immediately before impact. The passenger could recall looking straight at the ground through the windshield, but could not recall details of the spin entry or direction of rotation. Several of the witnesses, including the pilot witness on the bluff, said that the engine was running normally up to the moment of impact.
- 1.1.9 The aeroplane struck the beach in a near-vertical attitude, in the centre of a shallow stream which flowed out across the beach. The lifeguards and others ran to the wreckage, and despite a high risk of fire from leaking fuel, one lifeguard broke his way into the cockpit to render assistance.
- 1.1.10 The pilot and passenger were extricated with some difficulty, the pilot dying within a few minutes of impact. The lifeguards and a nurse from a family group at the beach tended the injured passenger until the arrival of emergency services.
- 1.1.11 The accident occurred in daylight, at approximately 1830 hours NZDT, at Karekare Beach, at sea level elevation. Grid reference 260-Q11-416671, latitude S 36° 59.5', longitude E 174° 28.4'.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	1	0
Serious	0	0	0
Minor/None	0	0	

1.3 Damage to aircraft

- 1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 Nil

1.5 Personnel information

1.5.1 The pilot held a Commercial Pilot Licence (Aeroplane) and a current Class 2 medical certificate with no endorsements.

1.5.2 His logbook could not be located after the accident, so exact experience levels could not be established accurately. His total flight time was estimated at 500 hours, with some 200 hours on the PA-18 series. From such records as were available, it was determined that he had flown a minimum of 6.5 hours in the preceding 90 days.

1.5.3. The date of the pilot's last biennial flight review could not be ascertained.

1.6 Aircraft information

1.6.1 Piper PA-18 ZK-BTX, serial number 18-7309, had accrued a total of 4144 hours in service up to the day of the accident. The last 100-hour inspection and Annual Review of Airworthiness were carried out on 1 July 1998, at 4129 airframe hours. BTX had a valid non-terminating Airworthiness Certificate, issued on 24 December 1992.

1.6.2 Some overdue AD inspections were discovered on examination of the aircraft logbooks, but it was considered that these had no bearing on the circumstances of the accident.

1.6.3 The Continental C90-12F engine had run 99 hours since overhaul.

1.6.4 The aeroplane all-up weight and centre of gravity were calculated and found to be within limits.

1.6.5 At the time of the accident the aeroplane was operating on 100/130 octane avgas.

1.6.6 Performance graphs in the aircraft Flight Manual gave an approximate take-off distance of 350 m to achieve a height of 50 feet agl.

1.6.7 The level-flight stall characteristics of the PA-18 series are conventional, generally docile and readily recoverable, but in certain situations such as an unbalanced steep turn with power on, the aeroplane can "flick" into a spin rapidly and with little or no warning.

1.7 Meteorological information

1.7.1 On 20 December 1998 a weak ridge of high pressure lay over the north of the North Island, giving fine weather with light winds and scattered cloud.

1.7.2 The overseas pilot witness referred to in 1.1.5 described the weather at Karekare Beach at the time of the accident as: wind north-westerly, 5-10 knots, with six eighths altostratus cloud cover and good visibility. This observation is consistent

with the Auckland Airport 1700 and 1800 reports of light and variable winds, 40 km visibility and broken cloud cover at 15 000 feet.

1.7.3 High and low tides at Karekare Beach on 20 December 1998 were about 1137 and 1751 hours respectively, with a range of 3.3 metres.

1.7.4 The sun position at the time of the accident was: azimuth 238° M, elevation 23°.

1.8 Aids to navigation

1.8.1 Not applicable

1.9 Communications

1.9.1 BTX was equipped with an aeronautical VHF transceiver, but no air-ground communication took place between the aircraft and the personnel on the beach.

1.10 Aerodrome information

1.10.1 Karekare Beach is a small black-sand beach on Auckland's west coast, some four kilometres south of Piha. The beach is oriented 325/145° M and is approximately 900 m in length between high bluffs at either end.

1.10.2 The bluffs at the northern end of the beach rise almost vertically to over 500 feet in elevation, while at the southern end, the ground rises to 970 feet elevation within 1000 m of the beach.

1.10.3 Some 300 m from the northern end of the beach, a razorback feature known as the "Watchman" encroaches on to the sand, rising steeply inland to some 300 feet. Along the southern face of this feature flows a small stream, the mouth of which is variable, depending on sea conditions. On 20 December 1998, the position of the stream where it crossed the beach was about 200 m from the southern limit of the beach.

1.10.4 Inland of the beach, the terrain rises steeply to elevations of over 1500 feet, to form the southern portion of the Waitakere Ranges.

1.10.5 The aeroplane landed when the tide was ebbing, leaving a sufficient expanse of beach for landing. Spring tides prevailed on the day of the accident, and at high tide there would have been no available space above the high water mark on which to land.

1.11 Flight recorders

1.11.1 Not applicable

1.12 Wreckage and impact information

1.12.1 The aeroplane was observed to strike the beach in a near-vertical attitude while in a spin. The aeroplane did not rebound after impact and remained in approximately the same attitude in which it impacted. Emergency services later towed the wreckage above the high water mark to avoid further damage by the incoming tide.

- 1.12.2 The impact was taken by the nose and the outer two metres of the leading edge of the right wing, suggesting a right-hand spin at impact. Severe longitudinal compression of the forward fuselage occurred, forcing the engine back some 500 mm. Despite this, the engine suffered only light superficial damage to the carburettor, some exhaust stacks and induction tubes. A number of ignition leads received crush damage when trapped between the magneto bodies and the firewall.
- 1.12.3 All of the aircraft was accounted for at the site, and pre-impact control integrity and normal operation were established during the initial examination and subsequent salvage.
- 1.12.4 The left fuel tank had been ruptured during the impact sequence and the contents dispersed, but the right tank remained intact and retained its contents. It was found to be full, and the fuel appeared to be 100/130 avgas. The firewall fuel strainer was ruptured and the contents of the filter bowl lost.

1.13 Medical and pathological information

- 1.13.1 Post-mortem examination established that the pilot had died of multiple injuries consistent with impact. No evidence was found of any pre-existing condition which may have led to in-flight incapacitation of the pilot.
- 1.13.2 Toxicological tests revealed no trace of alcohol, or medicinal or recreational drugs.

1.14 Fire

- 1.14.1 Fire did not occur.

1.15 Survival aspects

- 1.15.1 Although the pilot was restrained by a lap belt and shoulder harness, impact forces and the loss of occupiable space combined to render the accident unsurvivable for the pilot. The passenger was restrained by only a lap belt, and suffered facial injuries and a fracture of the left foot. Had the passenger been restrained by a shoulder harness as well, the severity of his head injuries may well have been much reduced.

1.16 Tests and research

- 1.16.1 Following recovery of the wreckage to Ardmore, the engine was removed from the airframe for further examination. In view of the light damage, it was decided to attempt to test run rather than bulk strip the engine. Some impact-damaged components (ignition leads, exhaust stacks and induction tubes) were replaced, and a serviceable carburettor fitted.
- 1.16.2 The engine started and ran normally, and power was increased in stages until it was evident that it was capable of operating at full power.

1.16.3 The damaged carburettor was stripped, and, apart from showing evidence of having ingested a considerable quantity of seawater at impact, showed no sign of any defect which would have impeded normal operation.

1.17 Organisational and management information

1.17.1 Not applicable

1.18 Additional information

1.18.1 Nil

1.19 Useful or effective investigation techniques

1.19.1 Nil

2. Analysis

2.1 A southerly take-off and departure from Karekare Beach was achievable in the ground run distance available, with a minimal diversion to seaward to clear the high terrain at the southern end of the beach.

2.2 The pilot's right turn immediately after lift-off suggests that the subsequent left turn was a premeditated manoeuvre, and not prompted by any aircraft malfunction. The initial right turn would have increased the space available in which to carry out a reversal turn to the left. The space available for a left turn was laterally constrained by the high ground at each end of the beach, and by the "Watchman" feature about mid-beach.

2.3 Commencement of the left turn at an estimated altitude of 100 to 150 feet gave the pilot less space to complete the turn than would have been available had he climbed to, say, 500 feet. At the lower altitude, his options were limited by the "Watchman" ridge, which was a significant obstruction to avoid, and which may have influenced the pilot in his selection of angle of bank. At 60 knots airspeed, the turn radius achieved at an angle of bank of 15° is 362 m; at 30°, 168 m; and at 45°, 97 m.

2.4 The effect of angle of bank on the basic stalling speed is to increase it by a factor of 1.2 at 45°, and by 1.4 at 60°.

2.5 Additionally, as the aeroplane progressed around the left turn to the point where it was facing the beach, the pilot would have experienced a "false horizon" effect, due to the high ground immediately ahead. The effect of this is that the pilot, having lost sight of the true horizon, is obliged to estimate the position of the horizon for himself. Such estimated horizon may well be considerably above the line of the true horizon, resulting in an inadvertent raising of the nose of the aeroplane.

2.6 A steep turn at low altitude and low airspeed, where the margin above the stall would have been minimal, and an inadvertent raising of the aircraft nose as the

high terrain behind the beach came into the pilot's view, appear to have combined to lead to the aircraft stalling and entering a spin. There was no chance of recovering from the spin in the height available before the aircraft struck the ground.

- 2.7 The prompt actions by the surf lifeguards in extricating the occupants of the aeroplane, at considerable personal risk, is worthy of mention.

3. Conclusions

- 3.1 The pilot was appropriately qualified and experienced for the flight.
- 3.2 The pilot had not suffered any incapacity in flight.
- 3.3 The aircraft had a valid Airworthiness Certificate and had been maintained generally in accordance with relevant requirements.
- 3.4 The aircraft was in an airworthy condition prior to the accident.
- 3.5 The pilot commenced a reversal turn after take-off with insufficient altitude to assure safe completion of the manoeuvre.
- 3.6 During the early stages of the reversal turn, there was probably little airspeed margin above the stalling speed.
- 3.7 Later in the turn, the pilot probably experienced a degree of spatial disorientation, causing him to perceive a false horizon and raise the aircraft nose sufficiently to dissipate what little airspeed margin existed.
- 3.5 The aircraft stalled in the turn and entered a spin with insufficient height to recover before ground impact.
- 3.6 The post-crash actions of the surf lifeguards were commendable.

4. Safety recommendations

- 4.1 Nil.

(Signed)

Michael G Hunt
Assistant Director Safety Investigation and Analysis
13 October 1999