

AIRCRAFT ACCIDENT REPORT

OCCURRENCE NUMBER 99/1311

PIPER PA-28-180

ZK-DIS

18 KM SOUTH-WEST OF TAUMARUNUI

11 MAY 1999

Glossary of abbreviations used in this report:

ADF	automatic direction finder
CAA	Civil Aviation Authority
E	east
g	gram(s)
GPS	Global Positioning System
km	kilometre(s)
m	metre(s)
mg	milligram(s)
MHz	Megahertz
µg	microgram(s)
NZST	New Zealand Standard Time
S	south
UTC	Coordinated Universal Time
VHF	very high frequency
VOR	VHF omnidirectional radio range

AIRCRAFT ACCIDENT REPORT

OCCURRENCE No 99/2824

Aircraft type, serial number and registration:	Piper PA-28-180, 28-7305549, ZK-DIS
Number and type of engines:	One Lycoming O-360-A4A
Year of manufacture:	1973
Date and time:	11 May 1999, 1115 hours* (approx)
Location:	18 km south-west of Taumarunui Latitude: S 39° 00.1' Longitude: E 175° 06.5'
Type of flight:	Private
Persons on board:	Crew: 1 Passengers 2
Injuries:	Crew: 1 Fatal Passengers 2 Fatal
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence	Private Pilot Licence (Aeroplane)
Pilot-in-command's age	81 years
Pilot-in-command's total flying experience:	365 hours (approx), 350 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr S Walker

* Times are NZST(UTC + 12 hours)

Synopsis

The Civil Aviation Authority was notified of the accident at 1146 hours on Tuesday 11 May 1999. The Transport Accident Investigation Commission was in turn notified shortly thereafter, but declined to investigate. A CAA site investigation was commenced later the same day.

The aircraft had taken off at about 0900 hours from Omaka, in good weather. The intended destination was Tauranga via Wanganui, Taumaranui and Tokaroa. The aircraft was later observed to be flying low in a south-westerly direction in the Whanganui river valley near Kirikau. It was then seen to make a tight 180-degree turn close to one side of the valley. Shortly after the reversal turn, the aircraft pitched up abruptly, rolled inverted and dived steeply into dense bush. A localised intense fire ensued. All of the occupants were killed.

1. Factual information

1.1 History of the flight

- 1.1.1 On Tuesday 11 May 1999 the pilot intended to perform the three-hour flight from Omaka to Tauranga with two passengers on board. He had planned to carry sufficient fuel for 4.5 hours of flight.
- 1.1.2 The aeroplane took off from Omaka at 0900 hours. The pilot reported his position en route via The Brothers, Tory Channel, and the mouths of the Manawatu and Whanganui Rivers.
- 1.1.3 At 1045 hours Ohakea Radar detected a mode C (altitude reporting) target with transponder code 1200 set, tracking in a northerly direction approximately six nautical miles east of the Whanganui River at 3000 feet. The tracking of this target continued until 1051 hours when terrain masked further detection. Given the reported positions, intended route and timings, it is highly likely that this target was ZK-DIS.
- 1.1.4 A topdressing loader driver was working in the Whanganui River valley at an airstrip six kilometres south-west of Kirikau when he saw aircraft "similar to a Piper Cherokee" travelling low and fast in the valley, in a northerly direction.
- 1.1.5 Several witnesses at the Kirikau school saw the aircraft enter the valley from the north, flying low in a southerly direction.
- 1.1.6 At about 1110 hours a radio transmission made on 119.1 MHz was heard by a helicopter pilot operating on the north-eastern side of Mount Egmont. The transmission read: "topdressing aircraft below and in front of me approximately three miles, please state your position". No reply was heard. A second transmission followed: "I am behind a topdressing aircraft about three miles, please identify your position".
- 1.1.7 At 1112 hours a woman working in her garden overlooking the Whanganui River valley observed ZK-DIS below her level, travelling in a southerly direction on the far side of the valley. The aircraft passed once over a domestic power line spanning the valley.
- 1.1.8 The witness then saw the aeroplane perform a 180-degree turn within the confines of the valley and fly in the opposite direction, close to her (the south) side of the valley. The aeroplane had again passed over the power line when it pitched up abruptly and rolled into an inverted dive into the dense bush below.
- 1.1.9 The accident occurred in daylight at approximately 1115 hours NZST, in the Whanganui River valley near Kirikau, at an elevation of 460 feet. Grid reference 260-S19-923424, latitude S 39° 00.1', longitude E 175° 06.5'.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	2	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 Private Pilot Licence (Aeroplane) and a current Class 2 medical certificate. The latter was endorsed with a requirement for the pilot to carry half spectacles.

1.5.2 The pilot's logbook could not be located after the accident, so exact experience levels could not be established. His total flight time was estimated from the aircraft maintenance logbooks to be approximately 350 hours on type.

1.5.3. His last biennial flight review was carried out on 5 May 1998.

1.5.4 The pilot had previously been involved in three airspace occurrences over a period of 2½ years. These included loss of positional awareness and unauthorised airspace incursion. The last occurrence was 14 months prior to the date of the accident.

1.5.5 It was reported that the pilot had commented that he perceived that any further reported airspace occurrences would have meant "the end of his licence".

1.5.6 The pilot was known to have been a meticulous planner. His flight plans were seen to be complete at least two days before the flight.

1.5.7 Observers who knew the pilot commented that he was a very proud and positive man who would not easily admit defeat.

1.6 Aircraft information

1.6.1 Piper PA-28-180 ZK-DIS, serial number 28-7305549, had accrued a total of 2177.05 hours in service up to the last recorded entry in the logbook on 21 September 1998. The last 100-hour inspection was carried out on 30 October 1998, at 2177.05 airframe hours. The Annual Review of Airworthiness was carried out on 6 October 1998.

1.6.2 ZK-DIS had a valid non-terminating Airworthiness Certificate, issued on 18 March 1986.

1.6.3 The Lycoming O-360 engine had run 2177.05 hours up to the last entry in the logbook on 21 September 1998 and was operated "on condition", whereby the engine components are not required to be overhauled at the manufacturers

recommended overhaul periodicities. However, regular maintenance is required to be performed to monitor the engine condition.

1.6.4 The aircraft all-up weight and centre of gravity were not calculated, although there was nothing to indicate that they were outside the specified limits.

1.6.5 No discrepancies were found with the aircraft during the on-site inspection and subsequent investigation that could have contributed to the accident.

1.7 Meteorological information

1.7.1 On 11 May 1999 a ridge of high pressure lay over the North Island, giving light and variable winds and scattered cloud. The MetService local forecast for Taumaranui was valid from 0300 until 1800 hours NZST and indicated fog patches clearing mid-morning, with scattered cloud at 3000 feet, tops to 7000 feet.

1.7.2 During the morning of the accident there were 10-20 knot north-westerly winds recorded at the Wanganui automatic weather station.

1.7.3 The pilot of an aeroplane topdressing in a small valley off the main valley, to the south-west of the accident site, reported that shortly before the time of the accident, he could not fly over the tops of the ridges and found that he had to fly through the valley to reach his working area.

1.7.4 An experienced helicopter pilot operating on the western side of Mount Ruapehu observed that scattered cloud and low-lying mist obscured the area from Taumaranui through to Mount Ruapehu. This cloud was clearing from the north-west aided by the moderate north-westerly wind.

1.7.4 Witnesses living near the accident site observed that at the time of the accident there was unrestricted visibility in and around the valley.

1.7.5 The weather at Ohakea at the time that ZK-DIS passed through the control zone was reported by the MetService Office automatic weather station as few clouds at 1000 feet, scattered at 2000 feet and broken at 3000 feet with visibility reducing to 3000 m.

1.8 Aids to navigation

1.8.1 ZK-DIS was equipped with ADF and VOR instrumentation and a hand-held GPS unit

1.9 Communications

1.9.1 ZK-DIS was equipped with an aeronautical VHF transceiver.

1.9.2 At 0956 hours the pilot contacted Ohakea Control to request clearance to track via the coast to Wanganui. Ohakea Control cleared the pilot through the military operational area M304 (Raumai) which was not active at the time.

1.9.3 At approx 1000 hours the pilot was advised of approaching traffic. He acknowledged this and advised that he was cruising at 700 feet.

1.9.4 Soon after this transmission M304 was activated and the pilot was advised by Ohakea Control to track seaward of the area. The pilot read this back incorrectly as "I have him in sight". Ohakea Control then repeated the call. In the subsequent readback the pilot advised that he had the ADF system operating and requested advice should he encroach into the restricted airspace.

1.10 Aerodrome information

1.10.1 Not applicable.

1.11 Flight recorders

1.11.1 Not applicable.

1.12 Wreckage and impact information

1.12.1 The aeroplane struck the ground in an inverted attitude at an angle of approximately 45 degrees to the surface. The wreckage was contained in a slightly sloping area of dense native bush. The aircraft did not rebound and remained in approximately the same orientation as it was at initial impact.

1.12.2 It was evident that a significant amount of the energy of impact had been absorbed by the dense bush canopy and a number of punga trees, before the aeroplane reached the ground.

1.12.3 There was some longitudinal compression of the aircraft which was reduced in length by one metre. The left wing had detached and was resting alongside the fuselage.

1.12.4 All of the aircraft was accounted for at the site, and pre-impact control integrity was established during the on-site examination.

1.12.5 That the engine was producing power at impact was evidenced by the severing in two places of a 30-cm diameter punga tree by the propeller.

1.12.6 The flaps appeared to have been in the fully up position when the left wing attachments failed during the impact sequence.

1.12.7 There were no signs to indicate that the aircraft had collided with the cable in flight.

1.13 Medical and pathological information

1.13.1 Post-mortem examination of the pilot found that he had died of traumatic injuries consistent with the manner in which the aeroplane impacted.

1.13.2 Also noted in the examination was the presence of amyloidosis in the myocardium (the muscular tissue of the heart). Cardiac amyloidosis increases the risk of a sudden cardiac event, such as conduction defects and arrhythmia.

1.13.3 Toxicology tests detected quinine in 'cavity blood' at a concentration of 11 µg/ml and in the liver at 43 µg/g. It is reported that the pilot was taking quinine for relief of severe muscle cramps.

1.13.4 Expert pharmacological opinion suggests that the true concentration of quinine in the blood was likely to be less than that recorded in cavity blood and somewhere between 7 – 11 µg/ml. The available evidence lends support to chronic rather than acute dosing of quinine. The likely blood concentrations of quinine measured at the post-mortem are consistent with the predicted concentrations expected on a dose of 600 mg/day and not outside the realms of possibility with a dose of 300mg/day. Information from witnesses is conflicting but tends to indicate that the pilot took a dose of at least 300 mg of quinine per day.

1.13.5 There is evidence to suggest that the pilot had taken prescription medication which was not declared to the Aviation Medical Assessor, but this was ceased approximately two weeks before the final flight. Expert opinion is that this medication would not have interacted with the quinine. Similarly, the cardiac amyloidosis would be unlikely to affect quinine concentrations.

1.13.6 Quinine toxicity can be described in the syndrome of cinchonism. This consists of tinnitus, impaired hearing, headache, nausea and disturbed vision. Further, severe cinchonism is associated with vertigo, disturbed vision, decreased colour perception, double vision, decreased peripheral vision, scotoma, and night blindness. Sudden episodes of loss of vision can occur. Cinchonism is reported to occur at concentrations of around 5 µg/ml and above. An article by Balfour (1989) indicated that in a helicopter pilot who died in an accident to which spatial disorientation may have contributed, a post-mortem liver concentration of 6.8 µg/g was observed. This level was considerably below the level of 43 µg/g found in the pilot of ZK-DIS.

1.14 Fire

1.14.1 An intense but localised fire ensued as the wing fuel tanks had ruptured early in the impact sequence. The fire consumed the entire centre fuselage before it could be extinguished.

1.15 Survival aspects

1.15.1 In respect of the front seat occupants the accident was not survivable. However, post mortem examination has identified that the accident was potentially survivable for the rear seat occupant who may have been incapacitated from the force of the impact.

1.16 Tests and research

1.16.1 Not applicable.

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

Nil.

2. Analysis

2.1 There were no unusual events in the flight until the diversion around the restricted military airspace, where the pilot indicated some confusion with what was required of him by the controller, and unease with the proximity to the restricted airspace.

2.2 The pilot deviated to the west of the planned direct Wanganui to Taumaranui track, probably to remain clear of cloud and in visual contact with the ground. He may have had in his mind his previous controlled airspace incursions, factors in which were flight above cloud and loss of visual reference with the ground.

- 2.3 It is probable that the pilot then became unsure of his geographical position as evidenced by the reverse track into the river valley from the north, followed by the radio transmission to the agricultural aircraft pilot asking for position
- 2.4 Air Traffic Services are able to normally identify aircraft on radar using transponder codes, and to provide positional reference to pilots on request. The pilot of ZK-DIS could have flown clear of terrain and made use of this facility. This would have required declaration of the fact that the pilot was uncertain of his position. The fact that the pilot perceived that such a declaration could have an adverse effect on his licence may have influenced his decision not to request help.
- 2.5 The pilot of ZK-DIS may have been flying low in the river valley to try to obtain a positive geographical reference or to find somewhere suitable to carry out an expeditious landing. At this point he could have been suffering the effects of quinine toxicity.
- 2.6 It appears that the pilot then initiated an abrupt upward manoeuvre of the aeroplane. Sudden reaction to avoid the power line spanning the valley cannot be discounted because of its close proximity at the time of this manoeuvre. If this was the case, the pilot's reaction to the power line may have been slightly delayed, possibly as a consequence of the effects of the quinine toxicity and distraction caused by coping with what would have been a high-stress situation. The ability of the pilot to effectively process information quickly and instinctively, when faced with an emergency situation, may also have been compromised by his advanced age.
- 2.7 Such an abrupt manoeuvre can induce a stall by suddenly increasing the angle of attack of the wings beyond the stalling angle. If the wings stall asymmetrically, (through slightly different rigging, or if the aircraft is not in balanced flight) the aircraft can roll abruptly or "flick" into a spin in the direction of the wing that stalled first. The "flick" can result in the aircraft becoming inverted before the pilot is able to correct the situation

3. Conclusions

- 3.1 The pilot was appropriately qualified and experienced for the flight.
- 3.2 The pilot held a valid medical certificate.
- 3.3 The aircraft had a valid Airworthiness Certificate and had been maintained in accordance with relevant requirements.
- 3.4 The pilot may have suffered an in-flight incapacitation.
- 3.5 The pilot may have lost positional awareness.
- 3.6 It is probable that the aircraft suffered a high-speed stall resulting from an abrupt manoeuvre and entered a spin with insufficient height to recover before ground impact.
- 3.7 The post-impact fire rendered the accident not survivable.

4. Safety recommendations

- 4.1 It is recommended that the Director carry out further investigation to determine whether mental and physical standards are currently adequately specified for the control of entry, monitoring and exit of personnel within the aviation environment.

- 4.2 It is recommended that over-the-counter medications are identified that may present a hazard to the safe operation or maintenance of an aircraft. The Director should make this information available to the aviation community by way of a safety publication.
- 4.3 It is recommended that the Director make available contact details and information relating to aviation medicine issues to those doctors not familiar with the aviation industry, to allow them to readily seek advice on subjects that may be relevant to aviation safety.

5. Safety Actions

- 5.1 The Director has accepted the above recommendations.

Michael G Hunt
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