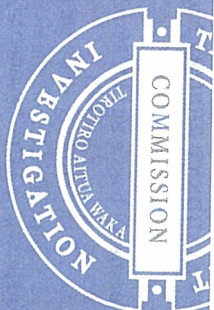


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AIRCRAFT ACCIDENT REPORT

No. 90-094

Cessna 172M

ZK-DNN

Makie Stream Headwaters

6 July 1990

**Transport Accident Investigation Commission
Wellington - New Zealand**

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT No. 90-094

1. NARRATIVE

1.1 ZK-DNN was owned and operated by Hurst Studio Limited but was, on occasion, leased to the Napier Aero Club.

1.2 The pilot in command had passed his flight test for his Commercial Pilot Licence (Aeroplane) [CPL (A)], two days before the accident. He had completed all of his flying training with the Aero Club and had flown regularly in the course of this training since his first flight in June 1989. During this training he had flown eleven dual sorties which included some low flying. He had also completed a low level navigation flight and practised had weather configuration flying regularly. He had completed a total of 16.5 hours simulated and actual instrument flying.

1.3 The pilot in command of ZK-DNN on this occasion had hired the aircraft from the Aero Club for a scenic flight from Napier to Mt Ruapehu and return.

1.4 On the morning of the flight he went to the Club with his sister and her friend and there he met another pilot who was invited to make up a foursome for the scenic flight.

1.5 The other pilot, nominated on the Load Sheet and Flight Release as co-pilot, was 46 years of age, with some 110 hours' flying experience and the holder of a Private Pilot Licence (Aeroplane) [PPL (A)]. His licence was restricted but he had applied for the necessary flight test to have the cross country endorsement lifted and had completed the necessary navigation training with an instructor from the Napier Aero Club. However the endorsement had not been removed at the time of the accident.

1.6 The day before the flight the pilot in command contacted the Chief Flying Instructor who approved the flight. On the day of the accident the CFI checked the weather forecast for the area and considered there was no cause for concern. At the aerodrome the pilot in command obtained the appropriate weather forecast and advised the duty Air Traffic Control Officer (ATCO) of his intentions. This advice included a discussion on the low level route through the hills to the north-west of Napier via the Repia Airstrip to Taupo.

1.7 The aircraft departed from Napier at 1035 hours for a scenic flight of 90 minutes duration, to Mt Ruapehu via the Repia Airstrip and reported clear of the Napier Control Zone at 1042 hours.

1.8 The pilot in command was seated in the front left seat and the co-pilot in the right front seat with the two female passengers on the rear bench seat.

1.9 The weather was generally fine but a cap of cloud with a base of approximately 3000 feet and tops near 6000 feet lay over the hills to the west of Napier. There were however some large gaps over the area which included the route taken by ZK-DNN. These gaps had closed when the searching aircraft began their task. The temperature and dew point were estimated as plus 6° at 3000 feet, in the vicinity of the accident and the wind at that level was light and variable. The QNH was 1012 hPa which was the value set on each of the aircraft's altimeters.

1.10 After the pilot in command had reported clear of the Napier Control Zone nothing further was heard of the aircraft.

Aircraft Type, Serial Number and Registration: Cessna 172M, 62107
ZK-DNN

Number and Type of Engines: One Lycoming O-320-E2D

Year of Manufacture: 1973

Date and Time: 6 July 1990 at 1050 hours NZST

Location: Makietie Stream headwaters
Latitude: 39°10'S
Longitude: 176°25'E

Type of Flight: Aero Club (Scenic)

Persons on Board: Crew: 2 Passengers: 2

Injuries: Crew: 2F Passengers: 1F
1S

Nature of Damage: Substantial

Pilot in Command's Licence: Commercial Pilot Licence
(Aeroplane)

Pilot in Command's Age: 24

Pilot in Command's Total Flying Experience: 266 hours
11.5 on type
236 on a Cessna 152

Information Sources: Office of Air Accidents
Investigation field
investigation and Engine Test Report

Investigator in Charge: Mr R Chippindale

1.11 As the pilot in command had established a reputation for punctilious position reporting, at 1150 hours the ATCO at Napier asked several airborne aircraft to endeavour to make contact with ZK-DNN and asked the Flight Information Officers at Wellington and Auckland and the Taupo Flight Service Station if they had received any reports from the aircraft.

1.12 At 1220 hours a weak electronic locator transmitter (ELT) signal was heard and at 1235 hours the uncertainty phase which had been declared by the ATCO at 1220 hours was upgraded to a distress phase. The first search aircraft, a helicopter, was airborne from Hastings at 1310 hours.

1.13 The pilot of the searching helicopter heard the ELT while flying at 6000 feet above cloud but the signal was lost when the aircraft descended. This signal fading delayed the locating of the aircraft until 1430 hours.

1.14 A pilot from the helicopter was lowered onto a hill top some 15 minutes walk from ZK-DNN which had come to rest in a stand of tall beech trees.

1.15 The rescuer confirmed there were two survivors one being the pilot in command who was still in his seat in the aircraft and the other who was one of the female passengers. The female passengers were lying alongside each other on the ground below the rear of the aircraft which was suspended in the trees.

1.16 The ELT was still transmitting so the rescuer deactivated it as another aircraft carrying paramedics arrived from Taupo.

1.17 The survivors were airlifted to Hastings's Memorial Hospital but the pilot in command failed to respond to treatment and died shortly after arrival.

1.18 The accident occurred in daylight at about 1055 hours. The accident site was short of the head of the Makiekie Stream valley at approximately 3000 feet ansl NZMS 260 Sheet U 19 "Kainanawa" National Grid reference 073242.

1.19 The location of the wreckage was on the bank of a stream which was a tributary running from the west into the Repia River the valley of which was part of the low level route which the pilot had discussed with the ATCO and had been shown to him by the Club's Chief Flying Instructor (CFI), during his training with the Club.

1.20 The CFI had pointed out that one of the virtues of this route was that a pilot could see along its length before entering it and there was therefore little likelihood of being trapped in the valley by a lowering cloud base.

1.21 One of the disadvantages of the route was that the Repia River flowed around a bluff on its northern bank at the point where the Makiekie Stream joined it. If a pilot was forced to approach the bluff from the east at such a low height that he was required him to fly around the bluff, the Makiekie Stream appeared to be the continuation of the Repia River and could mislead him or her into turning south into the blind valley of the Makiekie Stream. It was not envisaged by the CFI that a pilot would fly the route at such a low height. He stressed to pilots that it was essential when flying the route to maintain a height from which the exit point could be kept in sight.

1.22 The route was well known locally as a bad weather or low level route. However it was not included in any authorised low flying area and could not be said to be used as a result of stress of weather because the weather conditions on the day allowed it to be negotiated by an aircraft without infringing the requirement to remain 500 feet above the terrain within a 2000 feet radius of the aircraft.

1.23 It could not be established which of the pilots was flying the aircraft although the pilot in command had injuries consistent with operating the controls at the time.

1.24 Similarly it was not established whether the one pilot was flying and navigating the aircraft or these duties were shared between the two.

1.25 It was probable that the aircraft was flying in conditions conducive to carburettor icing and the carburettor heated air system was selected towards warm air at the time of the accident so the pilot was probably aware of the potential for carburettor icing and taking the appropriate steps to ensure the engine did not lose power from this cause. The alternate possibilities of using too little heat and thus bringing the carburettor into the icing range or having neglected to select the correct carburettor heat setting and attempting to remedy a loss of power due to icing immediately prior to the accident could not be eliminated. However the aircraft was fitted with a carburettor air temperature gauge and the pilot had been specifically instructed in its use after he had encountered carburettor icing a week earlier. The captured setting of the carburettor heated air system did not eliminate the probability that full "carb heat" had been selected as the pilot had been taught.

1.26 The engine was subjected to a test run following the accident and met the manufacturer's specifications. No problems were detected which could have lead to a loss of power at a critical stage. There was no clear evidence of the amount of engine power being produced at the time of the accident due to the propeller not being involved in the initial collisions with the trees. However the engine rpm gauge had a captured reading of 1700 rpm which indicated that the engine was operating until immediately prior to the final impact.

1.27 The witness marks in the trees indicated that the aircraft had collided with them at some 50 to 80 feet above the ground and then fallen to a lower height before diving into the hillside and coming to rest with the rear fuselage suspended 10 to 15 feet above the ground. The impact with the trees was consistent with the result of the actions of a pilot finding that he was unable to turn in the space available and deliberately directing the aircraft so that a tree trunk hit the wing alongside the cabin while the aircraft was travelling as close to the stall as practicable. The witness marks on the wreckage suggested that at least 10° of flap was also applied at the time which was consistent an attempt to slow the aircraft or decrease its turning radius. The flap setting for bad weather flying which was advocated by the CFI was 20°.

1.28 The position of the two rear seat passengers on the ground indicated they may have been ejected through the windscreen at the time of the initial impact and fallen to the ground alongside each other. Neither of the rear seat belts appeared to have been fastened at the time indeed the outer end of the lap strap for the right seat was lodged beneath the seat in a manner suggesting that it had been in that position before the initial impact.

1.29 The entire cabin space maintained its original shape and the damage was confined to the windscreen and rearward compression of the bulkhead in front of the pilots' legs. The nature of the occupants' injuries and the lack of damage to the aircraft cabin indicated that had the rear seat occupants been restrained by lap and shoulder harnesses they would have escaped with little or no injury. The pilots' injuries were survivable but may have been aggravated by the impact of the rear seat passengers on their upper bodies. The pilots' seats had tipped forward during the impact due to the spreading of the attachment fittings which allowed them to leave the floor rails.

1.30 The description "low level bad weather route" was common place among general aviation pilots. What was not generally considered was the requirement for the "low level" to be not closer than 500 feet vertically from the highest ground within a radius of 2000 feet from the aircraft. Only if a pilot became trapped by bad weather was he/she entitled to fly at a lower level on such a route. Thus a pilot was not entitled to plan a flight along such a route if he knew beforehand that the weather would not permit the maintenance of the minimum separation from the terrain described above. The minimum altitude for this route other than "under stress of weather" was 3500 feet indicated.

1.31 The reason for the pilot in command electing to fly the low level route was not established. He discussed the route with the ATCO and the prevailing weather conditions would have made this a reasonable choice. The low level route had been promoted as safe by the Club CFI but no proposal to use it on this occasion was discussed with him.

1.32 But for the apparent error in navigation the indications were that the flight could have been flown in safety, along the low level, bad weather route up the Repia River on the day in question without contravening Civil Aviation Regulations.

1.33 Although it could not be established if the two pilots were sharing the task of navigating and flying the aircraft the presence of two qualified pilots should have decreased the risk of an error of navigation if their combined potential was properly used. Whatever happened the hirer of the aircraft who was the pilot in command was the individual responsible for the safety of the flight.

2. FINDINGS

2.1 The pilot in command was properly qualified for a passenger carrying flight over the route as planned.

2.2 The pilot in command had flown the low level route shortly before the accident under the supervision of the Club CFI.

2.3 The pilot in command had received appropriate low level navigation and bad weather flying instruction during his training.

2.4 The aircraft was airworthy and performing normally up to the time of the collision with the trees.

2.5 The accident was survivable.

2.6 The front seat occupants were properly secured in their lap and diagonal upper restraint harnesses and these harnesses did not fail.

2.7 It was probable that the rear seat passengers were not restrained at the time of the collision.

2.8 Had the rear seat occupants been restrained by the lap strap alone their injuries would have been significantly reduced.

2.9 Had the rear seat occupants had upper restraint harnesses available and worn them it is likely that both would have survived.

2.10 The rear seat occupants may have contributed to the pilots' injuries by the addition of their momentum to the load on the pilots' restraint systems.

2.11 The reason for the pilot's decision to fly along the low level route was not established.

2.12 The pilot in command had demonstrated to the CFI his ability to fly the low level route competently.

2.13 There was no "stress of weather" requirement to fly the low level route to Mt Ruapehu at less than the minimum height specified in Civil Aviation Regulations.

2.14 As the aircraft was not on a flight plan the ATCO's initiative in alerting the rescue services at an early stage was commendable and probably instrumental in saving the life of the lone survivor.

2.15 A navigation error was a causal factor in this accident.

2.16 While evidence was circumstantial it appeared likely that the aircraft was flown along the "low level" route at such a height that the pilot mistook the Makiekie Stream for the continuation of the Repia River and entered the Makiekie Valley. Having entered the valley the aircraft was at such a height the pilot was unable to climb above the valley sides or to complete a reversal turn to retrace his track.

2.17 The Civil Aviation Regulations in existence required the aircraft to maintain a height of at least 500 feet above ground level.

2.18 Any low flying with passengers was contrary to Civil Aviation Regulations as it jeopardised their lives unnecessarily.

3. RECOMMENDATIONS

3.1 As a result of the investigation of this accident it was recommended to the Civil Aviation Authority that:

They publicise the hazards associated with low level bad weather routes, and

They draw pilots' attention to the limited circumstances under which low level bad weather routes can be used legally, and

They explore the practicability of requiring harnesses with an upper restraint facility to be available for each aircraft passenger in single engine aircraft, and

They consider ways of educating pilots on a safe procedure for negotiating localised cloud areas when the planned route involves crossing high ground.

3.2 It was also recommended to the management of the Napier Aero Club that:

They emphasise to all members and students and to other hirers of the aircraft the hazard of the Repia River low level route which led to this accident, and

Draw pilots' attention to their duty to ensure that their passengers use the safety harness provided, and

They emphasise that the minimum altitude that the route can be used legally is 3500 feet amsl.

12 November 1992

M F Dunphy
Chief Commissioner