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AIRCRAFT ACCIDENT REPORT

No. 92-017

Thorp T-18

ZK-KID

Alexandra Aerodrome

11 October 1992

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

TRANSPORT ACCIDENT INVESTIGATION COMMISSION
AIRCRAFT ACCIDENT REPORT No. 92-017

Aircraft Type, Serial Number and Registration: Thorp T-18, AACNA/476, ZK-KID

Number and Type of Engines: 1 Lycoming O-320-A

Year of Manufacture: 1984

Date and Time: 11 October 1992, 1615 hours NZDT

Location: Alexandra Aerodrome
Latitude: 45°13'S
Longitude: 169°23'E

Type of Flight: Private

Persons on Board: Crew: 1
Passengers: 1

Injuries: Crew: 1 Fatal
Passengers: 1 Fatal

Nature of Damage: Destroyed

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

Pilot in Command's Age: 42

Pilot in Command's Total Flying Experience: 885 hours
540 on type

Information Sources: Transport Accident Investigation Commission field investigation

Investigator in Charge: Mr Alistair Buckingham

1. NARRATIVE

1.1 ZK-KID was owned and operated by Mr S J Kidd, who had built the aircraft himself. He had flown the aircraft to Alexandra to attend a meeting of the Southland Chapter of the New Zealand Amateur Aircraft Constructors Association (NZAAACA).

1.2 The pilot had flown from Invercargill earlier in the afternoon with another private pilot as passenger. The passenger stated that the aircraft's fuel tank was filled to capacity (109 litres) with Avgas before departure, and that the flight to Alexandra was uneventful.

1.3 The NZAAACA meeting was attended by members from various centres including Dunedin and Wanaka. Some had flown their own aircraft to Alexandra, and these included two Jodels and a Kitfox. At the conclusion of the formal portion of the meeting, it was decided to hold a "mini-competition" to round off the afternoon's activities.

1.4 As a number of those attending were relatively inexperienced, the competition was deliberately kept "low-key" to cater for these members. The exercises were set by the Secretary of the Southland Chapter and comprised:

take-off and climb to 500 feet above aerodrome level,

a right-hand 500 foot circuit,

a run into wind along the right-hand edge of grass runway 32 (to the east of the sealed runway) whilst banking alternately left and right 3 times each to about 25° bank, a horizontal figure-of-eight (also at 500 feet) around two ground personnel acting as markers,

followed by a 500 foot circuit with powered approach and spot landing.

Pilots were briefed that if they felt uncomfortable with a particular manoeuvre, they should discontinue the manoeuvre and start again.

1.5 The stalling speed and normal cruise speed of the Thorp T-18 were known to be significantly higher than those of the other aircraft present. If the manoeuvres were flown at normal cruise speed, the aircraft would require either a greater turn radius at a fixed angle of bank, or for a fixed radius of turn, a greater angle of bank. Before the competition, the pilot of ZK-KID was asked if he would require more spacing between the ground markers, and he replied to the effect that he would "slow down and go around the circuit anyway".

1.6 The first aircraft to fly the set exercise was a Jodel D-9, flown by the Chapter Secretary. A recently-qualified private pilot flew second in his Jodel D-11. Both pilots reported that they found no difficulty in completing the exercise. Each flew around the pattern at an indicated airspeed (IAS) of about 60 knots, and did not require large angles of bank to achieve the desired results in the figure-of-eight manoeuvre.

1.7 The surface wind was north-westerly, almost directly aligned with Runway 32, and estimates of its strength varied from 7 to 20 knots. Flying conditions in the circuit were described by the Chapter Secretary as being so pleasant that he flew an extra circuit after completing the competition.

1.8 ZK-KID was taxied out, and after an engine run-up and pre-take-off checks had been completed, was observed to take off without difficulty and climb to 500 feet to carry out the set manoeuvres. The first circuit and into-wind run along the runway edge appeared to be performed normally, after which the aircraft was positioned for the figure-of-eight pattern. The first, or northernmost, half of the manoeuvre was flown to the right, and the direction of turn was reversed at the centre point to fly the second half to the left.

1.9 One witness, a commercial aeroplane and helicopter pilot, observed that the aircraft drifted noticeably during the first half of the eight, and by the time it reached the crossover position, it had drifted "well downwind". As the aircraft was part way round the second lobe of the eight, it appeared to lose height as it turned from a downwind heading to crosswind, at a steep angle of bank. At this point, it "flicked" rapidly into an incipient spin to the right, out of the turn. The pilot appeared to arrest the spin within one rotation, but in an inverted 45° dive. The aircraft was not recovered from this attitude and struck the ground on a south-easterly heading, approximately 60 m east of the threshold of sealed runway 32.

1.10 The accident was witnessed by all the personnel associated with the competition. Several were on the scene within seconds, but found that both occupants of ZK-KID had died instantly as a result of the impact.

1.11 Witnesses described the engine operation up to the time of impact as normal, although at less than cruise power. This was consistent with the pilot's stated intention of "slowing down". One witness was sure he heard a burst of increased power during the final dive, although others thought that the engine note did not change.

1.12 The impact was sufficiently severe to separate the engine and firewall from the remainder of the structure, which pitched rearward and slid tail first for some 40 m.

1.13 The engine damage was consistent with the severe impact. The pre-accident integrity of the flight controls was established. No evidence was found of any pre-existing structural defect in the aircraft. The fuel tank had ruptured and its contents dispersed at impact. From the engine hourmeter and the flight records, it was established that the aircraft had been flown for approximately one hour since refuelling, out of a total endurance of at least three hours. During the on-site investigation, it was noted that the aircraft had been constructed and finished to an extremely high standard.

1.14 The basic stalling IAS of ZK-KID was 54 knots, in a power-off, flaps up configuration. Stall characteristics were conventional with pre-stall buffet evident, but the initial test flight report for this aircraft described its behaviour in a power-on stall in a turn as "the outer wing stalling abruptly and the aircraft rolling away from the direction of turn".

1.15 In performing the figure-of-eight manoeuvre at 500 feet, the pilot of ZK-KID would have been faced with three potential problems. One was the need to maintain the reasonably tight radius of turn necessary to keep within the allotted space, the second was the illusion of slip or skid as the aircraft turned across wind, and the third the differing groundspeeds when flying into wind and downwind.

1.16 With the aid of a witness, the required radius of turn was estimated as being between 100 and 150 m. Calculation showed that if the aircraft was flying at 70 knots, to achieve a 150 m radius of turn would require a bank angle of 41°, and the basic stalling speed would be increased to 62 knots. If the pilot were to tighten the turn to achieve a 100 m radius, the bank angle required would be 53° and the aircraft would stall at 70 knots. (These examples take no account of the slightly reduced stalling speed with power on, nor of the tendency of the aircraft to decelerate due to induced drag as the turn is tightened). Thus little margin for error existed in the operation of this high performance aeroplane at reduced speed in tight manoeuvres.

1.17 That there was sufficient wind at 500 feet above aerodrome level to impart significant drift during the manoeuvres is apparent from the witness observation. Turning from upwind to crosswind in a balanced turn can give the illusion, if the pilot is watching the ground, of slip towards the centre of the turn. Conversely, during the turn from downwind to crosswind, an illusion of skid can be perceived. If the pilot does not cross refer to his slip indicator, an inappropriate application of rudder may be made in an attempt to balance the turn.

1.18 If the manoeuvre were to be flown at 70 knots IAS and the 500-foot wind was 20 knots, the groundspeed would vary between 50 knots into wind and 90 knots downwind. The perceived groundspeed downwind can give a pilot the illusion he is flying too fast, and may prompt him to reduce power in an attempt to slow down.

1.19 ZK-KID "flicked" out of the turn at a position where it had drifted noticeably downwind, and the pilot appeared to be trying to regain the pattern by tightening the turn. Also, he was at the stage of the turn where both a high groundspeed and an illusion of skid would have been apparent. If he was concentrating on his path over the ground, he may have applied right rudder instinctively to balance the apparent skid. As the wing reached the stalling angle, the application of top rudder would have aggravated the tendency to flick out of the turn. An alternative scenario is that he may have instinctively reduced power during the high-groundspeed stage of the turn, thus unintentionally slowing the aircraft to the stalling speed for the angle of bank selected.

1.20 The illusions associated with turns into and out of wind at low level are normally demonstrated at an early stage in low flying training. However, at the time the pilot obtained his Private Pilot Licence, low flying was not a required exercise for the flight test, nor was there any subsequent low flying dual instruction recorded in his logbook. Although he did have a substantial amount of glider towing experience in locations where flight in close proximity (albeit more horizontally than vertically) to terrain was required at times, it is still possible that he was not fully aware of the inherent hazards of low level operations.

1.21 The passenger in ZK-KID was also the holder of a Private Pilot Licence and the co-owner of a homebuilt aeroplane which had been completed to the stage of being test flown. The owner of ZK-KID was known to be very particular as to whom he would allow to fly his aircraft solo, but was not averse to letting others have control while he was aboard. The possibility could not be excluded that the passenger may have been handling the controls at the time of the accident. However, there was no evidence that this was the case.

2. FINDINGS

2.1 The pilot held a valid Private Pilot Licence (Aeroplane).

2.2 The aircraft was airworthy and appeared to be operating normally up to the time of the accident.

2.3 The aircraft stalled during a steep turn and entered an incipient spin to the right.

2.4 Illusions associated with the effects of wind while manoeuvring near the ground may have led the pilot to stall the aircraft inadvertently.

2.5 The pilot had received no formal training in low flying.

2.6 The pilot probably recovered from the spin at an early stage but the aircraft was in an attitude from which it could not be recovered before colliding with the ground.

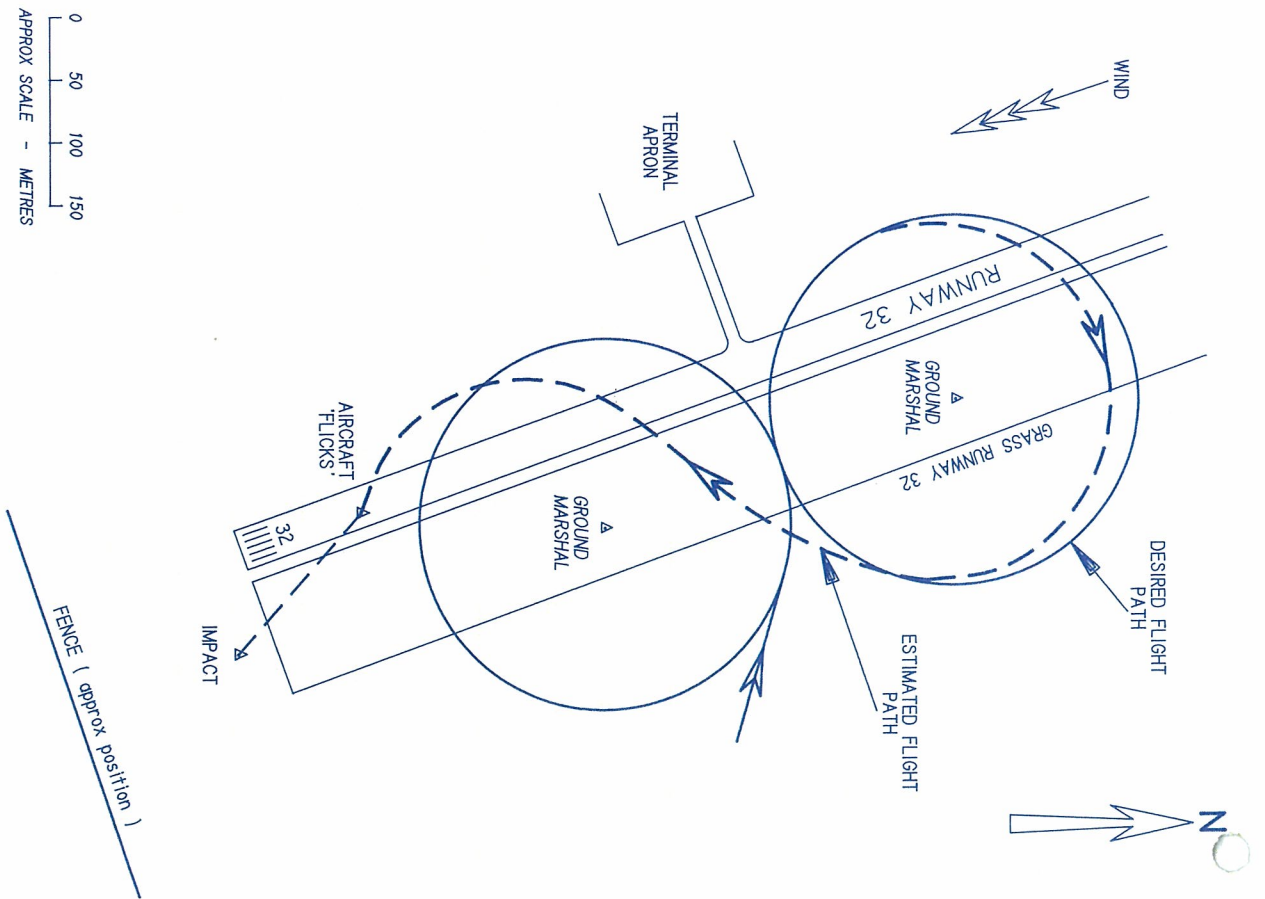
2.7 The possibility that the passenger was flying the aircraft at the time of the accident could not be completely eliminated.

3. OBSERVATIONS

3.1 Although references are made in the text of the report to "low flying", this is not to imply that any breach of Civil Aviation Regulation 38 was committed by any party. On the contrary, the competition was organised on the basis of safety and airmanship, and was designed to gently introduce the less experienced members of the group to competition flying.

3.2 The crucial factor was the disparity in performance between the participating aircraft types, and it is evident that the pilot of ZK-KID tried to compensate by voluntarily reducing the performance of his aircraft. While he could limit the upper end of the speed range by reducing power, there was little he could do about the stalling speed, which was as much as double that of some of the other types. Thus his safety margins were reduced, particularly as the angle of bank was increased. There may have been reluctance on the part of the pilot to increase power early in the manoeuvre, when it became apparent that it was not going quite right; in doing so, he may have felt that he was "cheating", as he had considerably more power available than the other competitors.

M F DUNPHY
Chief Commissioner
15 April 1993



ZK-KID : FIGURE 8 MANOEUVRE