CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

CAA Safety Investigation Report
Loss of directional control during approach to land
Sabre Aircraft Company - Sabre 503 Trike ZK-JHE
Kaitoke airstrip
23 Nov 2020

Sabre 503 Sample image only (Source: Sabre Aircraft Archives – ByDanJohnson.com)

CAA final report 20/6202
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Executive summary

The Civil Aviation Authority (CAA) was notified on 23 Nov 2020 by the Rescue Coordination Centre New Zealand, that a microlight trike aircraft was reported by a witness to have crashed in the vicinity of the Kaitoke airstrip, north of Upper Hutt, Wellington. Refer Figure 1.

Police and rescue services arrived at the airstrip and began a search for the aircraft. ZK-JHE, a Sabre Aircraft Company Sabre 503 was located in scrub adjacent to the edge of the airstrip. The pilot was found to be deceased. A CAA safety investigation was commenced the following day.

On the day of the accident, the pilot was carrying out a flight to gain handling experience and regain currency on the aircraft, following replacement of the aircraft's wing.

The CAA safety investigation determined that the accident most likely occurred as a result of the pilot losing directional control of the aircraft during the final approach to land, because of gusty crosswind conditions. The aircraft had veered to the left of the airstrip and in doing so, had entered thick native scrub, bordering the eastern side of the airstrip.

The pilot suffered fatal injuries as a result of the accident.

Figure 1: Kaitoke airstrip location with inset view – Reference Google Earth™

What happened

The pilot, who was the owner of the aircraft, had been observed by witnesses to be conducting a series of circuits at the airstrip. The witnesses were at the local gun club, which was approximately 400 metres to the north-east of the airstrip.

The witnesses heard the aircraft flying towards the airstrip while on final approach, followed by what was described as a 'thud' or similar sound, and then silence.

The witnesses then discussed between themselves what they had just experienced and decided to call the Police to report their suspicions that the aircraft may have crashed. Police and rescue services arrived at the Kaitoke airstrip and began a search for the aircraft. Approximately two hours later, the aircraft was found in thick scrub 10 metres from the edge of the airstrip. The pilot, who was the sole occupant, had not survived the accident.

The location of the accident was adjacent to the Kaitoke airstrip, position S41° 05' 22.43" E175° 10' 54.74" elevation 1130 feet above mean sea level.

Pilot information

The pilot held a Recreational Aircraft Association of New Zealand (RAANZ) advanced local pilot certificate (group A weight-shift) and had accrued 91.8 hours total flight time, all carried out in ZK-JHE, as recorded in his pilot logbook. A biennial flight review (BFR) had been completed on 20 June 2020. Following the BFR and prior to the accident, the pilot had recorded one further flight in his logbook. That entry showed he had completed eight circuits at the Kaitoke airstrip on 29 July 2020, four months prior to the accident, with a flight time of 0.8 hours.

The pilot also held a current RAANZ medical declaration last signed by the pilot and his general practitioner on 01 February 2019. This was appropriate for the flight. The medical declaration was valid until 01 February 2021.

Family and friends of the pilot described him as being a 'fair weather flier', very conscientious and someone who would not take any unnecessary risks. However, he was also described as being very determined in the activities he undertook.

Weather conditions

To assist with the safety investigation, a NZ MetService forensic meteorologist was tasked with providing analysis of the likely weather conditions at the Kaitoke airstrip at the time of the accident.
The analysis determined that there was a ridge of high pressure over the Wellington region, with the highest pressure just south of Wellington. Thus, the general [wind] flow was south to southwest across the region. Given the alignment of the Hutt Valley and local topography of the Kaitoke airstrip, the wind was likely to be a south-southwesterly (blowing from the south-southwest) with an approximate wind speed of 8 to 10 knots.

The actual weather conditions at the time of the accident were described by the witnesses as generally fine. They noticed, however, that the wind conditions were fluctuating. The wind direction was described as from the west and possibly 10 to 15 knots which was causing the

pine trees on the ridge between the airstrip and gun club to sway. They also noted the wind at ground level was 'swirling' which was having some effect on their shooting accuracy. However, when the first responders arrived at the airstrip, it was noted that the wind conditions were calm.

When the pilot's wife was interviewed by police, she stated the pilot was aware that in the coming few days, the weather conditions were expected to again deteriorate.

Kaitoke airstrip information

The Kaitoke airstrip is located north of Upper Hutt, Wellington, and consists of a grass covered airstrip approximately 800 metres in length. The airstrip is formed on the top of a ridge line with an orientation of 030/210 degrees magnetic.

A local gliding club is based at the airstrip from where they conduct occasional gliding activities, ZK-JHE was permanently hangared in the gliding club's hangar. At the time of the accident, there was no wind direction indicator (windsock) installed at the airstrip. However, following the accident, the gliding club has installed a windsock to provide current wind indications, when gliding activities are taking place.

Aircraft information

ZK-JHE, a Sabre 503 trike was manufactured by the Sabre Aircraft Company in 1996 in the USA. The company ceased trading in 2008. The aircraft is a weight shift two-seat microlight trike powered by a 50 horsepower Rotax 503 two-stroke engine driving a three-blade pusher propeller. The aircraft construction consists of a fuselage pod with tricycle landing gear and a tandem seating arrangement. The engine is mounted at the rear of the fuselage pod. The fuselage pod is suspended under the wing which is constructed from aluminium tubing with a synthetic fabric covering. Refer Figure 2:

Figure 2: Sabre ultralight trike similar to ZK-JHE
(Source: Sabre Aircraft Archives – ByDanJohnson.com)

At the time of the accident, the aircraft had accrued 342.6 hours total flight time as recorded in the aircraft logbook. An annual inspection was carried out on 07 March 2020 at 341.6 airframe hours. No defects were recorded.

Following a forced landing incident into scrub on 28 July 2019, as a result of the engine stopping during a simulated forced landing exercise, the aircraft's Sabre 16 wing was damaged, and required repair.

As replacement parts to repair the Sabre 16 wing were no longer available, an Airborne Wizard wing was fitted to the aircraft as a suitable replacement. The replacement wing was slightly larger with a surface area of 17.6 square metres, compared with the original Sabre 16 wing with a surface area of 16 square metres.

The Sabre 16 wing was also a double surface wing with fabric on the upper and lower surfaces, whereas the Airborne Wizard wing, was a single surface wing with only the upper covering of fabric forming the aerofoil contour of the wing.

The operating limitations section of the pilot handbook for the aircraft states that the aircraft may be operated with a maximum crosswind of up to 11 knots at light operating weights, and up to 15 knots maximum crosswind at maximum operating weight.

At the time of the accident, the aircraft was at a light operating weight with only the pilot onboard, therefore the 11-knot crosswind limit was applicable.

As far as could be determined during the safety investigation, no defects were found that may have affected the pilot's ability to control the aircraft in flight.

Wreckage and impact information

Examination of the accident site revealed that the aircraft had collided with scrub on the left side of the airstrip approximately two metres above the runway elevation. The aircraft penetrated 10 metres into the scrub and was found suspended two metres above the ground. Refer Figure 3.

Entry into the scrub resulted in major structural damage to the wing which had folded rearward. It was noted the wing control bar which the pilot holds to control the aircraft had been bent rearwards at the ends of the bar, forming a partial U-shape.

Impact damage was evident on the fuselage pod, along with the left-hand main landing gear being detached, as a result of striking some sizable tree branches in the scrub.

Damage to the three-blade composite propeller indicated that significant power was being produced by the engine when the aircraft entered the scrub.

Due to damage to the fuel tank resulting in a loss of fuel, it was not possible to determine the amount of fuel onboard the aircraft at the time of the accident. However, fuel was noted

to be still dripping from the fuel tank and also found in the fuel lines to the engine. Fuel exhaustion was not considered to be a causal factor in the accident.

Ballast in the form of a 10-litre plastic fuel container was found strapped to the rear seat. The container held a small quantity of fuel and weighed a total of three kilograms.

Figure 3: Accident scene (Source: Still image taken from New Zealand Police file video)

Medical pathological information

Post-mortem examination revealed the cause of death was due to blunt force impact injuries to the pilot's chest area.

Toxicological testing showed no evidence of any substances which may have impaired the pilot's ability to fly the aircraft.

Survivability

The pilot's seat was fitted with a lap safety belt. This had restrained him in his seat during the accident sequence.

The pilot was wearing a crash helmet for head protection. Damage to the helmet indicated the pilot had sustained a head injury, most likely from striking vegetation. This injury, however, was not determined to be fatal.

Due to the design of the trike, the wing control bar which the pilot holds to control the trike is mounted directly in front of the pilot and is attached to the wing above. During examination of the aircraft, the control bar was observed to be bent which indicates it had been bent rearward with considerable force during the accident sequence. This rearward

movement of the control bar would have caused it to strike the pilot in the chest area, most likely resulting in fatal injuries.

The pilot carried a personal locator beacon (PLB) for use in emergencies. The PLB, however, relies on manual activation by the pilot. Examination of the PLB revealed that no attempts had been made to activate it.

Why it happened

The pilot was known by his family and friends for his careful assessment of the weather conditions prior to flying. However, the pilot's wife commented that the pilot was also aware that the weather conditions were forecast to deteriorate over the coming days. Having not been able to fly recently because of unsuitable weather conditions, it is possible the pilot may have felt self-imposed pressure to accept flying conditions in which he would not typically fly.

Prior to getting airborne, it is highly likely the pilot would have assessed the current wind conditions at the airstrip. As a windsock was not available at the airstrip, this would have reduced the pilot's ability to assess the wind conditions accurately. However, having assessed the conditions as being suitable prior to flying, it is also possible the wind conditions may have changed while he was flying, exceeding the crosswind limit for the aircraft and the ability of the pilot.

The pilot had little recent flying experience, having only flown 0.8 hours in the four months prior to the accident. Other records in the pilot's logbook show his BFR being carried out in June 2020, and prior to that, the flight in June 2019 where the accident occurred which damaged the wing. Therefore, with little flight experience over the period of a year, the pilot may have found himself facing challenging wind conditions for which he wasn't practised or prepared.

The replacement Wizard wing was a single surface wing and of a larger surface area when compared with the original Sabre 16 wing. This may have resulted in slightly different handling characteristics than the pilot was familiar with, such as being more susceptible to the effects of a crosswind. The instructor who carried out the test flying following the wing replacement and then the pilot's BFR, commented that the larger wing would have required the pilot to exert more control force. The instructor had also recommended to the pilot that he carry out five hours solo flying to become accustomed to the different handling characteristics of the wing.

During examination of the aircraft, a partially filled fuel container was found strapped to the rear seat - the container and contents had a combined weight of three kilograms. Due to the pilot's relatively light weight, the instructor had recommended that the pilot carry an additional 10 to 20 kilograms of ballast on the rear seat when flying his trike solo. The additional weight was to assist in creating more wing dihedral[1] when airborne. Without the additional ballast, the wing would have less dihedral which would result in it being less stable around the longitudinal (roll) axis. This increased instability could have affected the pilot in his

[1] Dihedral: The upward angle from horizontal of the wings of an aircraft. Refer Wikipedia – Dihedral (Aeronautics) for further reference.

efforts to control the aircraft in the existing wind conditions. It could not be determined whether the pilot had encountered difficulties controlling the wing due to the factors mentioned. Or possibly, he had turned with the wind during an attempted go-around and subsequently lost lift, descending into the scrub due to the tailwind.
The reason why the ballast carried in the aircraft was of a lesser weight than that recommended by the instructor could not be determined.

What was learned

The safety investigation determined that the following causal factors may have contributed to the accident:

- The pilot was not current on the aircraft
- The pilot had little flying experience in his aircraft following the fitment of the replacement Wizard wing
- The pilot may have misjudged the effect of the wind conditions either prior to getting airborne, or he did not recognise changes in the conditions while airborne
- If a windsock had been available at the airstrip, this may have assisted the pilot in assessing the wind conditions
- More likely, crosswind conditions exceeded the ability of the pilot to maintain directional control of the aircraft
- The light weight of the ballast may have made control of the aircraft more difficult for the pilot in the existing wind conditions
- When directional control was lost, the aircraft entered scrub adjacent to the airstrip
- The pilot was most likely struck by the wing control bar due to forces applied to the wing as the aircraft entered the scrub. The resulting injuries to the pilot proved to be fatal.

Safety message

As a part of planning and decision making prior to flight, pilots who are not in current flying practice, or are faced with environmental conditions that they are not familiar with, should consider flying dual with an instructor to regain currency or experience for those conditions.

Additionally, assessment should be made of any possible threats to their intended flight. This should include a good assessment of the weather conditions prior to, and also during flight. This assessment needs to consider aircraft limitations and the pilot's own personal limitations, to be able to safely operate in the prevailing conditions.

The CAA GAP booklet *VFR MET* which is freely available on the CAA web site states:
"*A comprehensive MET briefing is one of the most important tools in your planning and decision-making kit. But beyond getting the briefing, it's critical you understand it, and can build a mental picture of what effect the weather will have on your flight*

Weather is a significant contributing factor in air accident statistics, and all too often these accidents could have been prevented by the pilot having all the MET information available and understanding how it affects their flight. There are practical steps you can take to ensure your understanding of the weather, and how it changes".

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About the CAA

New Zealand's legislative mandate to investigate an accident or incident are prescribed in the Transport Accident Investigation Commission Act 1990 (the TAIC Act) and Civil Aviation Act 1990 (the CA Act).

Following notification of an accident or incident, TAIC may open an inquiry. CAA may also investigate subject to Section 72B(2)(d) of the CA Act which prescribes the following:

> **72B Functions of Authority**
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> (2) The Authority has the following functions:
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> (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in section 14(3) of the Transport Accident Investigation Commission Act 1990

The purpose of a CAA safety investigation is to determine the circumstances and identify contributory factors of an accident or incident with the purpose of minimising or reducing the risk to an acceptable level of a similar occurrence arising in the future. The safety investigation does not seek to ascribe responsibility to any person but to establish the contributory factors of the accident or incident based on the balance of probability.

A CAA safety investigation seeks to provide the Director of Civil Aviation with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

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