CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

AIRCRAFT ACCIDENT REPORT

OCCURRENCE NUMBER 02/3746

MICRO AVIATION BANTAM B22J

ZK-SPK

3.5 KM SOUTH-WEST OF THAMES AERODROME

25 DECEMBER 2002

Glossary of abbreviations used in this report:

ATC	air traffic control
CAA	Civil Aviation Authority
EPIRB	emergency position indicating radio beacon
GPS	Global Positioning System
kg	kilogram(s)
km	kilometre(s)
NZDT	New Zealand Daylight Time
RAANZ	Recreational Aircraft Association of New Zealand
SAC	Sport Aviation Corporation Limited
SSE	south south-east
UTC	Coordinated Universal Time
WGS 84	World Geodetic System 1984

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Aircraft type, serial number and registration:	Micro Aviation Bantam B22J, 02-203, ZK-SPK
Number and type of engines:	1 Jabiru 2200
Year of manufacture:	2002
Date and time:	25 December 2002, 1525 hours[1] (approx)
Location:	3.5 km south-west of Thames Aerodrome Latitude[2]: S 37° 11.16' Longitude: E 175° 30.95'
Type of flight:	Private
Persons on board:	Crew: 1 Passengers: 1
Injuries:	Crew: 1 fatal Passengers: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence:	Advanced Microlight Pilot Certificate
Pilot-in-command's age:	46 years
Pilot-in-command's total flying experience:	200 hours, 185 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr A M Moselen

[1] Times are NZDT (UTC + 13 hours)

[2] WGS 84 co-ordinates

Synopsis

The Civil Aviation Authority was notified of the accident at 1600 hours on Wednesday 25 December 2002. The Transport Accident Investigation Commission was in turn notified, but declined to investigate. A CAA site investigation commenced the next day.

The microlight aircraft was on a local flight over the Thames area when it was seen to suddenly roll to the left and steeply descend toward the ground. Shortly thereafter, the wreckage of the aircraft was found by a local farmer. The pilot and passenger did not survive the accident.

1. Factual information

1.1 History of the flight

1.1.1 On Wednesday 25 December 2002 about 1430 hours, the owner-pilot of ZK-SPK and a passenger departed Thames airfield for a local flight.

1.1.2 Several people saw the aircraft flying in the Thames area; initially in the hills performing steep turns then later over the township, timber mill, and the farming district west of Thames. Two photographs reproduced from the passenger's digital camera were views taken from an aircraft while in flight. One photograph appeared to have been taken during a turn over a residential area (assumed to be near Thames) and the other showed a low level easterly view of the Opani Point tidal flat area near Thames.

1.1.3 Shortly before the accident, a local pilot witnessed the aircraft at about 1000 feet near the Thames airfield as it appeared to join towards runway 29 from the south, but the aircraft turned away and flew off in a westerly direction.

1.1.4 At approximately 1525 a local farmer who also saw the microlight aircraft, recalled that it had appeared to be struggling against the wind which was strong and gusty at the time. He estimated the aircraft was flying at a height between 500 and 1000 feet. He could not hear the aircraft but observed it continually turning to the right against the wind before heading back towards Thames. It was at that point when the aircraft suddenly banked sharply left and spiralled straight down a number of times before passing from view behind trees.

1.1.5 At approximately 1530, another local farmer came upon microlight aircraft wreckage in a paddock on his property. He approached the site and found the two occupants were still strapped inside the aircraft but had not survived the accident.

1.1.6 The accident occurred in daylight, at approximately 1525 hours NZDT, in a farm paddock, adjacent to Orongo Road near Thames, at an elevation of approximately 10 feet; grid reference 260-T12-336432, latitude S 37° 11.16', longitude E 175° 30.95'.

1.2 Injuries to persons

Injuries	*Crew*	*Passengers*	*Other*
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, aged 46, held an Advanced Microlight Certificate with a passenger rating first issued in October 2001. His associated Medical Certificate and Declaration was valid until 21 June 2003.

1.5.2 The pilot was a client of the Sport Aviation Corporation Ltd (SAC) and his membership was current until 27 June 2003. At the time of the accident, his total flight time was approximately 200 hours; 185 hours of those were flown on Bantam aircraft.

1.5.3 The pilot's total flying experience had accrued over a period of eighteen months, and during that time, his flying colleagues noted that he used to turn the engine off (rather than closing the throttle to idle) when simulating an in-flight engine failure. It was believed the pilot did this to establish the gliding characteristics of the aircraft. The knowledge gained from the exercise would dictate the height he would fly at over water (in order to reach landfall in the event of an actual engine failure).

1.5.4 An interview with the pilot's instructor revealed nothing of concern that would suggest the pilot had been a safety risk; it was simply thought that he was very keen. This aspect is perhaps supported by entries in the pilots log book where on at least two occasions the pilot flew ZK-SPK into the Kaimanawa ranges (Boyd Airfield) on hunting expeditions, which is mountainous terrain known for turbulent conditions and can be very challenging for light aircraft.

1.6 Aircraft information

1.6.1 Bantam B22J, serial number 02-0203, ZK-SPK was a Class 2 microlight aircraft designed and manufactured by Micro Aviation New Zealand Limited. It was a high-wing monoplane with conventional controls, two-place side-by-side seating

and was powered by an 80-horsepower Jabiru 2200 engine driving a fixed-pitch wooden propeller.

1.6.2 The aircraft was registered with the CAA in September 2002 and at the time of the accident ZK-SPK had accrued approximately 65 hours. The most recent maintenance to the airframe and engine was a 50-hour check completed on 6 November 2002. In addition, an oil and filter change, and cylinder head re-torque, was carried out. There were no pre-existing defects with the airframe or engine noted during the investigation, which could have affected normal flight.

1.6.3 It was calculated that the aircraft would have weighed approximately 356 kg at the time of the accident. The weight did not exceed the maximum allowable of 377 kg and the centre of gravity would have been within the normal range.

1.6.4 During flight, the Bantam aircraft exhibits low inertia and high drag. In the event of an engine failure, deceleration is rapid. Considerable nose down pitch change is required at airspeeds below 39 knots to maintain flying speed. The minimum height loss associated with an engine failure at the best angle of climb speed (30 knots) is approximately 100 feet, just to achieve the nose down attitude to maintain flying speed.

1.6.5 The Bantam Microlight Flight Manual recommends a cruise speed between 43 knots and 61 knots, and a best rate of climb speed of 34 knots. However, the Flight Manual suggests a higher climb speed of 43 knots to be more favourable because the transition to the recommended glide speed of 43 knots is minimal in the event of an engine failure.

1.6.6 There are emergency procedures in the Bantam Flight Manual for in-flight engine fire and engine failure events. The following actions in Section 3 Paragraph 3.5 pertain to an in-flight engine fire:

1. Immediately shut down the engine and switch off the fuel pump.
2. Turn the fuel cock off.
3. Turn the master switch off.
4. Lower the nose to extinguish the fire.
5. Carry out the forced landing procedure without delay.

This emergency procedure varies from that of an in-flight engine failure where the first action is to immediately lower the nose to maintain 43 knots.

1.6.7 The Bantam aircraft provides the pilot with very little warning of an impending stall. Depending on the configuration (load, power setting, flap setting, and fabric tightness), the aircraft may or may not exhibit any pre-stall buffet. The onset of the stall is evidenced by a drop in the nose attitude together with a loss of altitude, and if the aircraft is unbalanced there may be a tendency for a wing drop.

1.7 Meteorological information

1.7.1 During the afternoon of 25 December 2002 a cold front was approaching the upper North Island. A north-westerly flow preceded the front.

1.7.2 At 1500 hours, the automatic weather station at Paeroa (24 km SSE of the accident site), recorded surface winds from the north-west at 11 knots. The aerodrome forecast for Hamilton and Tauranga gave similar surface wind direction but slightly higher wind speeds. The 2000-foot winds at both airfields were forecast to be 25-30 knots.

1.7.3 A local pilot commented that he departed Thames Aerodrome for Auckland at about 1245 and noted that the wind was moderate and straight down runway 29. After take-off, at an altitude of 1000 feet, his GPS indicated a headwind of 20 knots.

1.7.4 Other witnesses in the Thames area commented that the wind was strong and gusty at times but no rain was present and visibility was good.

1.8 Aids to navigation

1.8.1 A Garmin GPS was fitted to the aircraft, and whilst these units can be invaluable for navigation purposes, they can also record some flight navigation data in memory.

1.9 Communications

1.9.1 The aircraft had an array of communication systems including a VXA-210 Air Band Transceiver, a DRE -201 Portable intercom system, personal EPIRB and a hardwired Flightcell telephone.

1.9.2 There were no recorded ATC communications during the flight and although a potential distraction to the pilot, the cell phone had not been used for outgoing calls. While an incoming call cannot be discounted, this would have been unlikely to have influenced events.

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 accident site was a level farm paddock adjacent to Orongo Road near Thames. The aircraft struck the ground in a steep nose down attitude and was on a westerly heading at impact. Spanwise crushing to the left wing, along with angular displacement of the keel and tail surfaces showed there had been some degree of down-wind drift and an anticlockwise rotation during the aircraft's steep descent. Both wings showed severe chordwise crush damage. There was no evidence of an in-flight structural wing failure.

1.12.2 All extremities and control surfaces were accounted for at the site. Although flight control cable runs were disrupted by the impact forces, pre-accident control integrity was easily established.

1.12.3 The two blades of the wooden propeller assembly had broken away at the hub and it was evident that the propeller had not been rotating prior to impact.

1.12.4 The fuel selector was in the on position and there was fuel contained in the filter, fuel lines and carburettor. The fuel was found to be free from contaminants.

1.12.5 Inspection of the cockpit area revealed that the bulk of occupiable space had been severely reduced by crushing. Only limited information could be derived from the majority of instruments except that the two magneto switches, master, and fuel pump switches were found in the off position. Enquiries found that they had not been secured in those positions by emergency services. It was impossible to determine positively whether the switches were selected there by the pilot or had been disrupted in the impact. However, the off positions were coincidental with the engine not operating and no evidence was found during the investigation that the engine had stopped due to a mechanical or fuel related malfunction.

1.13 Medical and pathological information

1.13.1 Post-mortem examination found that both occupants had died of multiple injuries sustained in the accident.

1.13.2 There was no indication of any pre-existing condition that could have resulted in incapacitation or affected the pilot's ability to fly the aircraft.

1.13.3 Routine toxicological tests revealed nothing of significance.

1.14 Fire

1.14.1 Fire did not occur.

1.15 Survival aspects

1.15.1 The impact forces sustained during the accident were unsurvivable.

1.16 Tests and research

1.16.1 The Garmin GPS data chip was recovered and forwarded to the manufacturer for data retrieval. No useful data could be obtained.

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

1.18.1 The passenger, a student pilot, had some experience on light aircraft but none flying microlight aircraft. There was no evidence found that would suggest the passenger was manipulating the controls or indeed flying the aircraft at the point it departed from normal flight.

1.18.2 Another recent CAA field investigation into a fatal microlight aircraft accident found both magneto switches in the off position. In another case, a Bantam aircraft heavy landing incident reported to the CAA, explained that the heavy

landing occurred due to the unexpected rate of descent on final approach. The pilot was simulating an engine failure at the time and had selected the magnetos switches to the off position. The pilot further described the event as "the microlight literally dropped out of the sky".

1.18.3 The manufacturer has conducted a number of flights where engine failure simulations were carried out. The degradation in flight performance was considerably more noticeable when the engine was shut off than when operating with the throttle closed.

1.18.4 Normal practice for engine failure simulation is to leave the engine running at the idle setting. In this state there still remains the effect of the propeller slipstream which provides some rudder and elevator effectiveness for positive control at low airspeeds. A lightweight propeller has low inertia; therefore, stopping an engine in flight on a low-speed microlight aircraft will immediately stop the propeller. The resultant loss of slipstream increases the power-off stall speed.

1.18.5 An independent agency conducted flight testing of the aircraft including spin testing. The test pilot commented in his report that the aircraft could not be induced into a fully developed spin easily. When a spin was produced it immediately stopped when the control column was relaxed. The report concluded that this was probably due to the good directional stability of the aircraft.

1.19 Useful or effective investigation techniques

1.19.1 Nil.

2. Analysis

2.1 The investigation eliminated the possibility of structural failure, or an engine or airframe defect. There was no evidence of a bird strike or of pilot incapacitation. The wind conditions at the time, although reported as "strong and gusty", would have resulted in some mechanical turbulence at low level, but otherwise should not have affected the conduct of the flight.

2.2 The description of the final manoeuvre up to when the primary witness lost sight of the aircraft is consistent with a wing drop stall that possibly led to an incipient spin to the left. This was borne out by the disposition of the wreckage. What remains to be determined is how the aircraft was put into a situation that led to loss of control.

2.3 Other witness observations, and photographs retrieved from the passenger's camera, indicate that the pilot performed low-level flying and steep turns prior to the accident. This could suggest that the pilot was keen to show his passenger, who was a student pilot, the characteristics of the Bantam aircraft.

2.4 The area where the accident occurred has an abundance of large flat paddocks perfectly suited for forced landing practice, and the pilot may well have decided to demonstrate at least the early stages of a practice forced landing to his passenger.

2.5 On this type of aircraft, when the throttle is closed or the engine is completely switched off, the nose must be lowered immediately to maintain flying speed. If this action is not taken promptly, the high drag and low inertia will lead to a very rapid decay in airspeed. If the airspeed is low to begin with, and the wing thus at a high angle of attack, stall onset will also be very rapid.

2.6 Standard stall recovery requires primarily the reduction of the wing angle of attack, accompanied by the use of full power to minimise height loss, and in the event of a "wing drop", the use of opposite rudder to prevent yaw. Uncorrected yaw or attempting to level the wings with aileron at this point can lead to a loss of control.

2.6 With the engine shut off completely, a pilot does not have power available to assist with stall recovery. Additionally, there is no residual slipstream over the rudder and elevators, and this can marginally reduce control effectiveness, giving a delayed response to control inputs.

2.7 In this accident, whatever the initiating event, the pilot would have found himself in a probably unfamiliar situation, which very quickly became irretrievable, and with not enough height in which to recover. Damage to the aircraft showed that the aircraft's rotation had not been arrested before the ground impact. Even had the rotation been stopped, the ensuing dive would still have required considerable height for recovery.

2.8 It was not possible to say conclusively that the pilot had deliberately shut off the engine to practice a forced landing, but the circumstances of the accident and anecdotal evidence about his approach to flying tend to support the likelihood that he did. As a result of this aspect of the investigation, a safety action regarding the practising of emergency procedures was agreed with both microlight organisations.

2.9 During the investigation, the Bantam Flight Manual was found to contain an anomaly in the emergencies section. This confused operational priorities for managing an in-flight engine fire. The priority in the event of an emergency where the engine has to be stopped should be to lower the nose to maintain a safe airspeed, and this was not specifically stated. Although this was not directly related to the accident, a safety recommendation was made to the manufacturer and accepted.

3. Conclusions

3.1 The pilot had been declared medically fit and was appropriately qualified for the flight.

3.2 The aircraft was airworthy prior to the accident.

3.3 During a local flight, which included low flying, the aircraft stalled and was not recovered in the height available.

3.4 The stall possibly resulted from the pilot's shutting off the engine in order to practice or demonstrate a forced landing, and not maintaining sufficient airspeed in the process.

3.5 The accident was unsurvivable.

4. Safety recommendations

4.1 The aircraft manufacturer accepted a CAA recommendation to amend the Bantam B22 Flight Manual to ensure that consistency is maintained where emergency procedures require similar actions.

5. Safety actions

5.1 The SAC and RAANZ organisations agreed to continue education initiatives to their members, particularly in respect to the practice of emergency procedures in a controlled environment and under appropriate supervision.

6. Observations

6.1 The CAA continues to conduct "Av Kiwi" safety education seminars. These seminars use aircraft accident reports as topics of discussion to better inform the general aviation community in New Zealand of the safety messages those accidents produced.

6.2 A CAA video entitled "Momentum and Drag" elaborates on some of the principles discussed in this report. Although not specifically directed at microlight aircraft pilots, the principles are the same and can be applied accordingly.

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8 December 2004

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