Report 09-007: Piper PA32-260, ZK-CNS, impact with ground following a loss of control after take-off, near Claris, Great Barrier Island, 29 September 2009

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The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Report 09-007

Piper PA32-260

ZK-CNS

impact with the ground following a loss of control after take-off

near Claris, Great Barrier Island

29 September 2009

ZK-CNS
(image used with permission)

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Abbreviations

CAA	New Zealand Civil Aviation Authority
CAR	New Zealand Civil Aviation Rules
kg	kilogram(s)
km	kilometre(s)
m	metre(s)
UTC	coordinated universal time
VFR	visual flight rules

Data Summary

Aircraft registration:	ZK-CNS
Type and serial number:	Piper PA32-260, 32-686
Number and types of engine:	one Lycoming 0-540-E4C5
Year of manufacture:	1966
Operator:	Great Barrier Airlines
Date and time:	29 September 2009, 1310[1]
Location:	about 700 metres west of Great Barrier Aerodrome latitude: 36° 14.3´ south longitude: 175° 27.37´ east
Type of flight:	air transport
Persons on board:	crew: one passengers: 5
Injuries:	crew: moderate passengers: one moderate, 4 minor
Nature of damage:	aircraft destroyed
Pilot's licence:	commercial pilot licence (aeroplane)
Pilot's age:	36
Pilot's total flying experience:	3145 (137 hours on type)
Investigator-in-charge:	K Mathews

[1] Times in this report are in New Zealand Standard Time (UTC + 12 hours) and are expressed in the 24-hour mode

Executive Summary

Introduction

This executive summary summarises the main points contained in this report to provide the reader with a high-level overview of the circumstances and causes of the occurrence, and the Transport Accident Investigation Commission's findings and recommendations. For a full description, readers should refer to the main part of this report.

Summary

At about 1305 on 29 September 2009, ZK-CNS, a Piper Cherokee 6, took off from runway 28 at Great Barrier Aerodrome for a scheduled 30-minute flight to Auckland International Airport. On board were 5 passengers and the pilot.

The aeroplane was near its maximum authorised weight, and when it lifted off it encountered a wind shift at a critical time that caused a loss of lift. The wind shift, along with the pilot's premature retraction of flap, prevented the aeroplane reaching sufficient speed to climb before it struck vegetation. The pilot consequently lost control of the aeroplane and it stalled into a swampy area about 700 metres from the end of the runway.

The pilot and one passenger received moderate injuries and the other 4 occupants received minor injuries. The aeroplane was destroyed.

The selection of runway offered limited options for any escape manoeuvre if there were a loss of aeroplane performance for any reason.

No new safety issues have been identified that have not already been documented and widely recognised throughout the aviation industry.

(Note: Unless otherwise specified, photographs, diagrams and pictures included in this report are provided by, and owned by, the Commission.)

1 Factual Information

1.1 History of the flight

1.1.1 At about 1300 on 29 September 2009 the pilot began taxiing ZK-CNS, a Piper PA 32-260 Cherokee 6, for runway 28 at Great Barrier Aerodrome near Claris for a scheduled 30-minute visual flight rules (VFR) flight to Auckland International Airport. On board were the pilot and 5 passengers, of whom one was another pilot with Great Barrier Airlines (the company).

1.1.2 About 15 minutes earlier the pilot had landed ZK-CNS at Great Barrier Aerodrome after a flight from North Shore. The pilot had approached the Aerodrome from the north and during his left crosswind landing approach to runway 10 experienced some mild turbulence. He had experienced no difficulties but encountered a slight tailwind during the landing.

1.1.3 The other company pilot was travelling as a passenger back to Auckland. He assisted with the loading of the aeroplane and seating the 4 passengers and helped ensure their seat belts were fastened. Before preparing the computerised load sheet for the flight, company office staff weighed the baggage and freight on calibrated scales at the Claris office, and for the occupants used New Zealand Civil Aviation Authority (CAA) approved standard weights of 81 kilograms (kg). No additional fuel was added. The standard fuel for the return trip had earlier been loaded at North Shore, leaving approximately 2 hours' fuel endurance for the return leg. The aeroplane load sheet showed ZK-CNS was 26 kg under its maximum permitted take-off weight, with an aft centre of gravity within limits. Of the 61 kg of baggage, 45 kg (the maximum allowed) had been secured in the nose locker and the balance secured in the aft baggage area.

1.1.4 Various witnesses and both pilots said the weather for the departure had been a clear sky with no rain, good visibility and a mild temperature. The wind was assessed to have been blowing about 15 knots from the north to northeast, making it essentially a full crosswind across the main runway. The witnesses, who included company office staff and the chief pilot for a different company, said the wind had been somewhat gusty and swinging around quite a bit. They said it was not uncommon for the wind to be quite gusty and strong at Claris, but on that day they had thought the wind was more moderate in strength but swinging around somewhat more than usual. The Claris company office manager said that the wind direction had been very changeable. The witnesses said that pilots often operated in a lot worse wind conditions on the Island.

1.1.5 The other pilot was seated in the cockpit right seat beside the pilot and wore a headset for communication. The pilots knew of no defects with the aeroplane and reported that the start-up, taxi and pre-take-off checks were all normal, including the magnetos and use of carburettor heat to eliminate the potential for any carburettor icing. From observing the aerodrome windsocks (see Figure 3) during taxi and prior to take-off, both pilots assessed that there was about a 15-knot direct crosswind from the right for the take-off on runway 28. The pilot was mindful that during his earlier landing on runway 10 there had been some tailwind, so he considered that runway 28 was the better choice for take-off.

1.1.6 The other pilot said that he would have chosen runway 10 for the take-off because the departure path over the coast was away from rising ground, and it was the company's preferred runway if the wind allowed it. However, he said that he was not concerned about the wind strength or that the pilot's choice of runway for take-off was unsafe, and did not query the decision because he considered the pilot was exercising his judgement from experience and the previous landing.

1.1.7 The pilot selected the standard one notch of flap for take-off and lined the aeroplane up near the threshold of the sealed runway. He ran the engine up to full power before releasing the brakes and starting the take-off roll.

1.1.8 The pilots said the take-off run seemed normal and that the aeroplane lifted off near the usual place about halfway along the 950-metre (m) runway. The other pilot was looking outside

during the take-off but felt that the acceleration was normal. He noticed nothing unusual with the aeroplane, and did not observe the airspeed indicator, which was located on the pilot's side of the instrument panel.

1.1.9 The ground witnesses noticed nothing unusual with the aeroplane when it taxied or during its take-off roll, and saw it get airborne in about the usual place for a Cherokee 6. After it got airborne they lost sight of it behind some trees and bushes along the side of the runway.

1.1.10 The pilot said he rotated the aeroplane normally for lift-off at about 65 or 70 knots. After reaching about 50 to 75 feet the aeroplane no longer continued to climb as expected and the pilot thought that he might be caught in a downdraught. The positioning pilot noticed that they were not gaining height, so he looked inside the cockpit. Neither pilot noticed any loss of power and said everything felt and sounded normal but that the aeroplane would not climb.

1.1.11 The pilot said he was concerned not to raise the nose too much and to keep the aeroplane level as he tried to accelerate, initially to the best climb angle speed of 82 knots and then the best rate of climb speed of 91 knots.

1.1.12 The aeroplane was not much higher than the tree tops that were ahead past the end of the runway, so the pilot briefly considered attempting a landing on the rough clearway at the end of the runway, but given the landing distance available he elected to try to climb. The pilot selected the flaps up in an attempt to reduce drag to accelerate the aeroplane to its best climb speed. The positioning pilot said he noticed the stall warning light flickering on and off.

1.1.13 The pilots then saw trees ahead at about their level, so the pilot started a shallow left turn towards a clear area over a swamp to avoid the trees, but the aeroplane began to sink and clipped a bush. The pilot continued to manoeuvre the aeroplane over the swampy area, but the left wingtip eventually hit some bushes and the aeroplane cartwheeled into the swamp. The aeroplane came to rest on its right side after the right wing broke, facing back towards the end of the runway about 700 m away (see Figures 1 and 2). No fire occurred.

1.1.14 None of the passengers noticed anything unusual with the aeroplane, except that it was not very high when it banked left shortly after take-off and then the accident followed. Both pilots said that the aeroplane was functioning correctly until impact. The passengers said it was windy but not enough to concern them. One passenger, who regularly flew to the Island with the company and had flown with the pilot in ZK-CNS before, said she had experienced no previous problems, and had flown in worse and windier conditions on the Island. The passengers all confirmed their seat belts had been fastened.

1.1.15 The front windshield smashed during the impact and water came into the cabin. The other pilot was trapped under the control column but advised the pilot he was all right and to get the passengers out. The pilot escaped through the broken windscreen and assisted the passengers onto the broken right wing through the left rear cargo door. He then returned to help the other pilot out of the cockpit. In the meantime the positioning pilot pulled the fuel mixture control to the cut-off position and attempted to transmit a distress call on the local frequency before turning the master electrical switch off.

1.1.16 Once out of the aeroplane, the other pilot left the others on the wing and walked through the swamp to a nearby road to summon help. He was picked up by a passing motorist and given a ride to the local PostShop, where he raised the alarm and met with the Police.

1.1.17 Shortly after ZK-CNS had taken off, the chief pilot of the other company had been standing by her aeroplane near the apron when she heard an unusual noise like a bang in the distance. A passenger approached her and reported hearing the same noise, so she reported her concern to the company office then walked out to the runway to check, but saw nothing. After being unable to contact the pilot of ZK-CNS by radio, and since the normal after-departure radio call had not been heard, she contacted Christchurch Information, which advised it had not heard

from ZK-CNS. As she made her enquiries the Police arrived and with the passenger she went to the end of the runway to look for ZK-CNS.

1.1.18 When the Police and passenger returned having not seen the aeroplane, the chief pilot decided to take the passenger as an observer in her twin-engine Islander aeroplane and do an airborne search. She took off on runway 28 about 15 minutes after the accident with no difficulty, with a steady full right crosswind blowing also about 15 knots, and did not encounter any turbulence or downdraughts. At about 300 feet she saw ZK-CNS to the left in the swamp, so she advised Christchurch Information of the situation and to alert emergency services. She circled at 1000 feet until the Claris emergency services arrived.

1.1.19 The Police and other rescue personnel responded and evacuated everyone from the site to the local medical centre. The pilot and one passenger were flown by helicopter to Auckland Hospital for treatment for suspected back injuries, while the remaining passengers and other pilot were treated for minor cuts and bruises and returned to Auckland later that day in another company aeroplane.

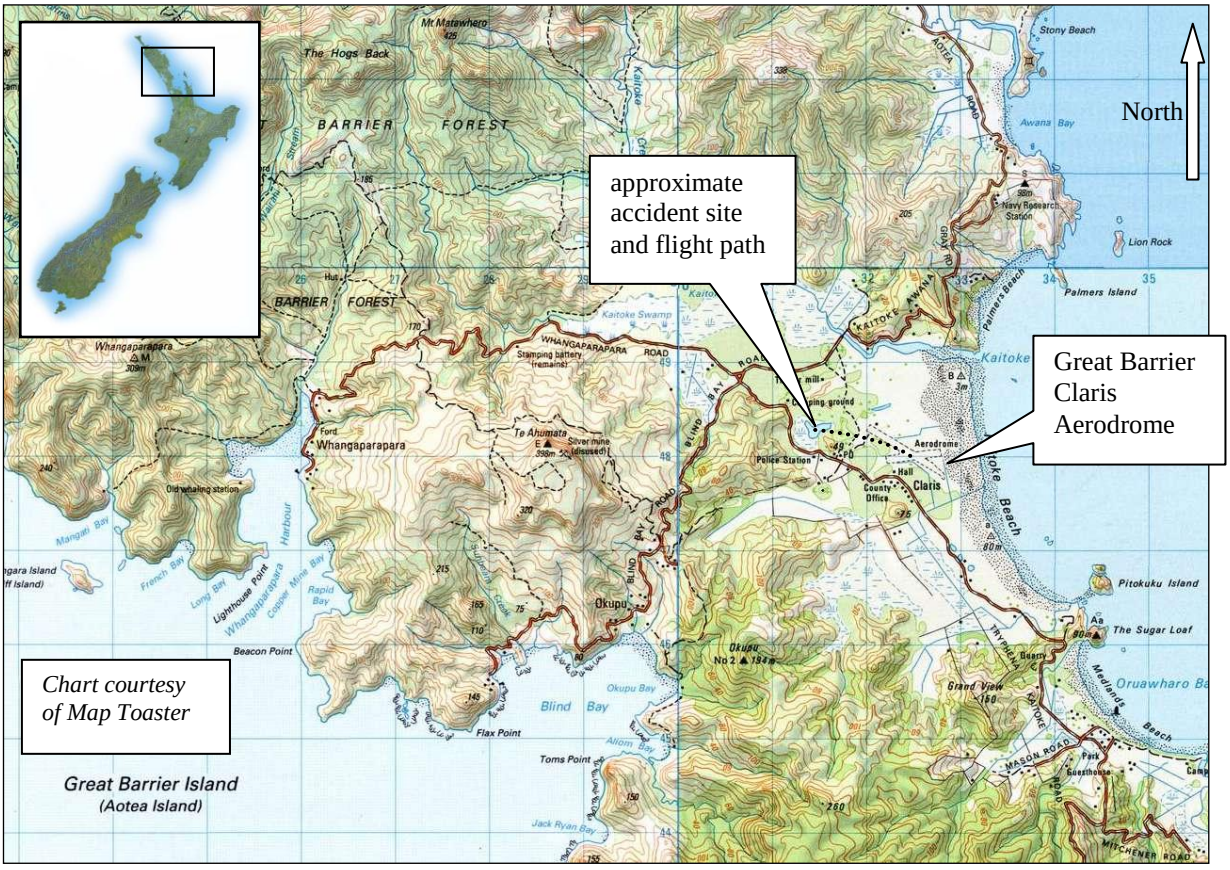

Figure 1
Great Barrier Island and Great Barrier Aerodrome
(MetaMedia Ltd 1997-2009)

1.2 Wreckage and impact information

1.2.1 The aeroplane was destroyed during the impact with the swamp, and came to rest semi-submerged (see Figure 2). All of the aeroplane structure was accounted for at the site and there was no evidence of any pre-impact failure. Pieces of the left wingtip fuel tank were found about 15 m north of the aeroplane by a bush that the wingtip had struck.

1.2.2 The flaps were selected up and found in the up position. The elevator trim was set to about a neutral position. The throttle and propeller controls were set at the take-off maximum power position. Carburettor heat was selected off, the fuel pump was on and the outboard fuel tanks

were selected, being the normal selections for take-off. The fuel gauges were submerged and provided unreliable readings. The wingtip fuel tanks were destroyed and the left inboard tank ruptured. The fuel cap was off the right wing inboard tank that was semi-submerged and full of water. A significant smell of fuel emanated from around the aeroplane and some fuel and oil pools could be seen in the water around the fuselage and engine.

1.2.3 The altimeter was set to 1007 hectopascals and indicated zero, the altitude of the swamp. The ignition switch was found off, but a part-time company employee who attended the wreckage had found it selected on. Both magnetos had been turned off in order to remove the ignition key. The master electrical switch was off. A functional ARTEX ME 406 emergency locator transmitter was fitted in the rear fuselage and was found armed with its antenna intact, but it had not activated. However, there was a notice of a proposed airworthiness directive DCA/RAD/54 to minimise the possibility of an automatic switch failure that could result in the transmitter failing to transmit in an emergency situation. Any submissions on the directive were to be sent to the CAA by 28 June 2010.

1.2.4 No dangerous goods or any baggage or cargo were found in the cabin. Personal and lightweight cargo items from the rear baggage area had previously been recovered to a secure location and tallied with the weight on the load sheet. The nose locker was under water and inaccessible.

Figure 2
ZK-CNS in the swamp

1.3 Aircraft information

1.3.1 ZK-CNS was a single-engine Piper PA32-260 (Cherokee 6) aeroplane, serial number 32-686 – a 6-seat, low-wing aeroplane with fixed tricycle landing gear that had been manufactured in the United States in 1966. The aeroplane was fitted with a Textron Lycoming 0-540-E4C5 engine, serial number L-18358-40A, rated at 260 horsepower.

1.3.2 ZK-CNS had a non-terminating New Zealand airworthiness certificate in the standard category issued on 27 July 1998. At the time of the accident the aeroplane had flown a total of 13 813.4 airframe hours. The engine had accumulated 3282.8 hours since new and 1233.8 hours since overhaul.

1.3.3 The most recent recorded inspection had been a 50-hour check on 12 August 2009. The next inspection due was a 100-hour check at 13 818.6 airframe hours, or 13 August 2010. There were no known or reported defects with the aeroplane prior to the accident. The pilot said his impression was that the engine had lost no power at any point during the accident flight.

1.3.4 No flight recorders were fitted nor were they required to be fitted.

1.3.5 The aeroplane flight manual stated that one notch of flap was the standard setting for take-off. The manual also advised that the CAA had classified the aeroplane as being in group 5[2] for take-off and landing performance (CAA, AC91-3 Aeroplane Performance).

1.3.6 The company's standard operating procedures did not give any guidance on flap retraction after take-off for the PA32, whereas for its multi-engine aeroplane types the procedures said 400 feet was the normal flap-retraction height.

1.3.7 The maximum approved take-off weight for the aeroplane was 1542 kg. The demonstrated maximum crosswind component was 17 knots. The computer-generated load and passenger sheet prepared at the company's Great Barrier Aerodrome office before departure showed the weight to be 1516 kg. The sheet was prepared using the known fuel and standard approved occupant weights and by weighing all the baggage and personal carry-on items on scales calibrated in July 2009. Comparative checks with scales in Auckland suggested they were accurate. The load sheet showed the aeroplane centre of gravity to be aft but within limits.

1.3.8 A check of the occupants' actual weights showed their combined weight was 6 kg more than the load sheet recorded weight. The baggage was independently weighed and tallied with the weight recorded on the sheet, except for the additional 9 kg for the 3 bags in the nose locker because they were water saturated (see paragraph 1.4.2). The recorded fuel weight of 84 kg (117 litres) could not be verified, but it gave approximately 1.9 hours' fuel endurance for the 30-minute flight. The minimum company-approved fuel weight for the VFR flight was 65 kg (90 litres), which gave an endurance of 1.4 hours.

1.4 Tests and research

1.4.1 The aeroplane and engine were recovered from the swamp by helicopter and deposited at Great Barrier Aerodrome, where they were further inspected. Control integrity was established and no evidence of any pre-impact failure was found. An external examination of the engine showed no evidence of any failure. The pitot static airspeed indicator system tubing was not blocked and a little air pressure applied to the pitot line moved the airspeed indicator normally. A subsequent independent calibration check of the airspeed indicator showed it was functioning normally.

1.4.2 The nose locker contained 3 waterlogged bags with personal clothing and items, which in that state weighed 54 kg.

1.4.3 The engine and propeller were sent to an independent overhaul facility for disassembly and examination under the Transport Accident Investigation Commission's supervision. The examination included a check of the entire ignition system, a rig check of the 2 magnetos and a

[2] Each aeroplane type with a maximum certified take-off weight of 2270 kg or less was given a group rating number in the aircraft flight manual. The number for a particular type was determined on the basis of its take-off and landing performance (see footnote 3).

disassembly of the carburettor. No evidence of any failure or defect was found that might have contributed to a power loss.

1.5 Pilot information

1.5.1 The pilot, aged 36, held a New Zealand commercial pilot licence (aeroplane) with a class 1 medical certificate valid until 7 June 2010. He held a multi-engine instrument rating. He was a "D" category flight instructor, and had held a "B" category instructor rating when he had previously been working as an instructor.

1.5.2 The pilot held a Piper PA32 type rating. His total flight time of 3145 hours included 137 hours on the aircraft type. In the 90-day period before the accident he had flown 98.4 hours, including 20 hours in the PA32. In the 30-day period before the accident he had flown 30 hours, and in the 7-day period he had flown 5.9 hours. At the time of the accident he had been on duty for about 1.6 hours and flown 0.7 hours. The day before the accident he had been off duty. The day prior he had flown 4.5 hours, including 1.1 hours in ZK-CNS from North Shore to Great Barrier return. That day he had been on duty for about 10 hours, with about a 2-hour break in the middle of the day.

1.5.3 The pilot had flown for the company for the previous 2 years and was one of the more senior pilots. His most recent check had been a company instrument flight check on 4 August 2009 in a multi-engine BN2A Islander, from which a note said he had completed it to a good standard. His single-engine pilot proficiency check was valid until 2 October 2010.

1.5.4 The pilot said he had flown to Great Barrier Aerodrome "thousands" of times, but had not experienced a similar loss of climb performance before. He said his impression at the time was that he was caught in a downdraught as he had heard of other aircraft being affected by them at Claris.

1.5.5 The positioning pilot had about 200 hours' experience on the PA32 and said he had operated ZK-CNS out of Great Barrier Aerodrome at its maximum weight with no difficulties. He thought the pilot's rotation in the aeroplane on the accident flight was positive and in the usual position along the runway. For the first 50 feet or so after take-off, everything seemed normal. He said the PA32 at its maximum weight could be a bit sluggish and that it needed to be handled correctly.

1.6 Aerodrome information

1.6.1 Great Barrier Aerodrome (see Figure 3) had an elevation of 21 feet and consisted of a main sealed bitumen runway 10 and 28 of 950 m in length for take-off and landing, and a grass cross-runway 06 and 24 of 620 m. Runway 10 and 28 each had a group rating[3] of 8 for landing and 7 for take-off and group 4 for runway 06 and 24. At the time the grass cross-runway was closed to operations. Auckland City Council was the owner and operator (CAA, 2005).

1.6.2 Hilly terrain (see Figure 1) rising to 345 m lay some 3 kilometres (km) to the north, and 4 km to the south rising to 406 m. Another range of hills some 4 km to the west ran in a northwest direction, reaching the highest point of 627 m at Mount Hobson, some 7 km away along the extended centreline of runway 28. A note on the aerodrome chart advised that during strong southwest winds wind shear could be encountered on short final for runways 24 and 28. Company and other personnel advised that the southwest winds were the worst winds and they could create turbulence and downdraughts. The northeast winds were not known to generate the same problems. The company's route guide said that wind shear and turbulence were common in strong wind conditions and advised that runway 10 was the preferred runway for take-off for obstacle clearance, with the tailwind not to exceed the performance limit of the aeroplane.

[3] Each runway has a group number, so in practice a pilot of an aeroplane can use any runway that has a group number equal to or greater than the aeroplane group rating for the aeroplane type.

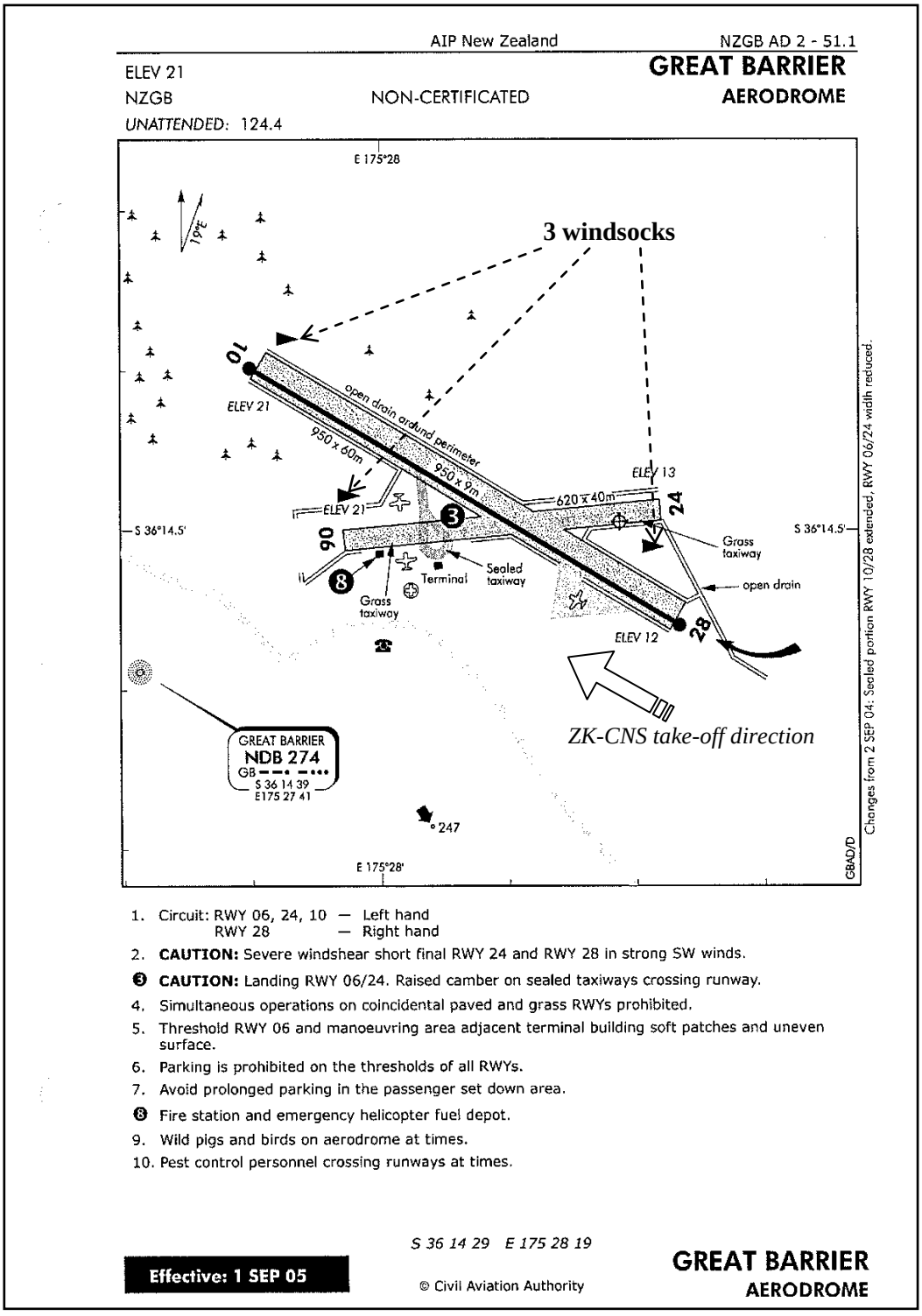

Figure 3
Great Barrier Aerodrome chart

1.7 Meteorological information

1.7.1 The company had a contract with MetService to provide aviation meteorological information, and this information was downloaded as required from the internet from MetService's Metflight Commercial aviation weather briefing system. There were no public weather reporting stations on Great Barrier Island and MetService did not provide area forecasts for the Island. Company personnel stationed at Claris were trained to provide basic weather report observations that included wind direction and strength, temperature conditions and cloud cover. The personnel

entered the latest observations via the internet on the company "TakeFlite" message board for pilot information (Company, 2009).

1.7.2 Visual flight conditions were observed to prevail at the time of the accident and the weather was said to be suitable for the flight. Three standard orange-coloured windsocks (see Figure 3) provided wind information at the aerodrome. The wind was observed to be blowing from the northeast but somewhat variable in direction at 10 to 15 knots.

1.7.3 The other company chief pilot had also operated into Great Barrier Aerodrome earlier that morning and said the conditions then had been calm, with the 2000-foot wind about 10 knots. Later, at about 1030, the wind had picked up and the 2000-foot wind had been 20 to 25 knots from the north. When taxiing and taking off about 15 minutes after the accident, the chief pilot, the pilot of the search aircraft, noted that the windsock near the threshold of runway 28 showed a steady crosswind from the northeast at about 15 knots, the mid-field windsock was varying but favouring runway 28 and the windsock at the threshold of runway 10 was slack, being in the lee of the surrounding hills.

1.7.4 The other pilot on the flight had twice flown to Great Barrier Aerodrome that morning, including on a return flight at about 1015, where he waited for ZK-CNS to return him to Auckland. He had encountered no difficulties with the visual flight conditions weather. On his first landing he had landed on runway 10, where he encountered some tailwind up to 5 knots. He had taken off on runway 28 and landed on the same runway because the wind was then favouring 28. The pilot had had no concerns with any wind shear. He said it was unusual to get a full crosswind and no headwind component, but thought it had been a normal day and noticed nothing untoward to concern him.

1.8 Organisational and management information

1.8.1 Great Barrier Airlines was established in 1983 and operated out of Auckland, North Shore, Whangarei, Whitianga, Claris and Matarangi Aerodromes. The company employed about 25 staff and operated a fleet of 9 aircraft, including multi-engine Islander, Trislander, Partenavia, Chieftain and 2 single-engine Cherokee 6 types.

1.8.2 The company had a CAA-issued Airline Air Operator Certificate valid until July 2013, authorising it under the provisions of Civil Aviation Rule (CAR) Part 119[4] to perform air operations and other associated activities in accordance with CAR Part 125[5] and Part 135[6] as defined in its operations specifications and the exposition.

1.8.3 The company was subject to routine CAA surveillance. The most recent 2 CAA safety audit reports had documented the results of the safety audits carried out on 30 April 2009 and 1 May 2009, which had examined CAR Part 125 and Part 135 flight operations. The reports were unremarkable with 2 unrelated finding notices.

[4] Part 119 prescribes the certification requirements for operators to conduct air operations and the operating requirements for the continuation of this certification. Air operations include Air Transport Operations and Commercial Transport Operations.

[5] CAR Part 125 prescribes the operating requirements for air operations conducted by a holder of an Airline Air Operator Certificate issued in accordance with Part 119 using an aeroplane that has (1) a passenger seating configuration of 10 to 30 seats; or (2) a payload capacity of 3410 kg or less and a maximum certified take-off weight greater than 5700 kg; or (3) a single engine and is carrying passengers under instrument flight rules.

[6] CAR Part 135 prescribes the operating requirements for air operations conducted by a holder of an Airline Air Operator Certificate or a general aviation air operator certificate issued in accordance with Part 119 using (1) an aeroplane that has a seating configuration of 9 seats or fewer, excluding any required crew member seat, and a maximum certified take-off weight of 5700 kg or less, except for a single-engine aeroplane used for an air operation carrying a passenger under instrument flight rules; or (2) a helicopter.

2 Analysis

General

2.1 The flight began as a routine scheduled flight in suitable weather conditions for a visual flight. There was a wind blowing up to15 knots directly across the main runway that was within the "demonstrated" crosswind limits listed in the aeroplane flight manual.

2.2 The main sealed runway, either 10 or 28, was available for the flight and provided more than sufficient length and obstacle clearance for the normal performance of the aeroplane. The grass cross-runway 06 was more into wind but was not available nor was it the correct group rating for the aeroplane. Three standard orange-coloured windsocks on the aerodrome provided good wind information for the pilot.

2.3 After having loaded the aeroplane with the assistance of the positioning pilot and checked the computer-generated load sheet, the pilot signed the sheet indicating that he was satisfied with the aeroplane weight and balance. The pilot was also satisfied the aeroplane was serviceable with sufficient fuel on board for the flight. A subsequent check of the actual weights showed the aeroplane was some 6 kg heavier than the recorded weight, but this was still within its weight and balance limits and should not have prevented the aeroplane taking off and (for its weight) climbing normally. The fuel quantity could not be verified because of the disruption to the fuel tanks during impact, but the recorded fuel showed the aeroplane had about 30 minutes' extra flight time over the company minimum. Standard fuel loads were used and there would have been no reason to have additional unrecorded fuel on board. For the take-off the aeroplane was heavy, being within 2% of its maximum permitted take-off weight, but for the reasons given above it was unlikely to have been over its maximum permitted weight.

2.4 The aeroplane was correctly loaded, with the 2 pilots, the heaviest occupants, in the 2 forward seats and the maximum allowable cargo weight in the forward locker. This ensured the centre of gravity remained within the aft limit.

2.5 During the taxi the pilots checked the windsocks, including the sock close to the threshold of runway 28. Given the crosswind the pilot could have chosen either runway 28 or runway 10 for the take-off, but because he had encountered some tailwind on runway 10 during his landing 15 minutes earlier, this influenced his decision to use runway 28. However, with the wind direction varying around northeast, runway 10 would have had the least risk. Even if a tailwind had been encountered, the aeroplane would have had a clear path ahead free of obstacles in order to accelerate to its climbing speed.

2.6 The company's preferred runway policy was to use runway 10 if the wind was suitable. This took into account the possibility of encountering sink after take-off because the departure path from 10 was obstacle free and away from rising terrain over the sea. Runway 28 was also in the lee of rising terrain to the north, which meant downdraughts could be present in the prevailing north-easterly wind, although none was reported by the pilot of the search aeroplane 15 minutes after the accident.

2.7 Subsequent examinations of the aeroplane, including the engine and airspeed indicator, revealed nothing that might have prevented the aeroplane performing as designed. The general weather conditions were suitable for the flight and were not conducive to producing carburettor ice or any other factor that could have adversely affected the aeroplane or its engine performance.

2.8 The pilot had been suitably rested in the days before the flight and was reportedly his normal self before the flight. Pilot fatigue or other conditions that could have affected his performance were not considered to have been factors in the accident. His pilot medical certificate was current. No conditions, including external influences, were identified that might have adversely affected his piloting ability. He was current on the aeroplane and was familiar with the operation and the aerodrome.

The take-off

2.9 Prior to the take-off, the wind was observed to be blowing generally about 90 degrees from the right of runway 28 at about 15 knots in strength, but the wind direction had also been noted by pilots and others throughout that morning to be varying in direction around the prevailing northeast direction. The aeroplane accelerated as expected and the pilot rotated it at the usual point and speed to climb away. After about 50 feet or so the aeroplane would not accelerate as expected, even though the pilot had checked the nose forward normally to accelerate to best climb angle or rate of climb speed.

2.10 After the aeroplane became airborne, the pilot sensed that he was caught in a downdraught, which prevented the aeroplane climbing and accelerating. Although a downdraught could not be discounted, a more likely scenario was that at the critical time after rotation, the wind swung more towards the east and produced a tailwind component. The aeroplane would then have encountered a wind shear at the critical point just after the high-pressure cushion of air under its wings (known as ground effect) had dissipated, and before it had accelerated to its best climb performance speed. The pilot was then faced with the dilemma of not being able to land ahead on the runway and having obstacles in the distance that the aeroplane might not out-climb, with rising terrain further to his right that could have downdraughts in the lee. In his attempt to accelerate the aeroplane, he raised the take-off flap and did a shallow left turn towards a swampy area that had fewer obstacles and was an area that he thought might have put him in updraughting air.

2.11 By turning left, the pilot would have effectively put the wind more towards the tail of the aeroplane, which would have increased the tailwind component and wind shear effect and hence further reduced the aeroplane's performance at the critical phase of the flight. Also, by raising the take-off flap, which produced more lift than drag at slower speed before the aeroplane had reached its best angle or rate of climb speed, the pilot further reduced the ability of the aeroplane to climb and increased its stalling speed.

2.12 These factors, combined with the aeroplane being near its maximum take-off weight, resulted in a near stall and loss of control as the pilot attempted to avoid the terrain.

2.13 That no occupants were seriously injured in the resulting accident was fortunate. The relatively slow, near-stall, speed impact with the soft swamp, coupled with the fact that all the occupants were properly restrained, helped prevent the accident being more serious.

2.14 Although there were limited Police, rescue and medical services available on the Island, they, and the actions of the chief pilot from the other company, ensured that the aeroplane was located quickly and the occupants rescued and attended to speedily. The aeroplane emergency locator transmitter, although armed and functional, did not activate. The impact forces might have been below the activation criteria because of the soft terrain and slow impact speed, or from a defect. However, the implementation of the proposed airworthiness directive will help eliminate any deficiencies with the automatic switching of the transmitter.

3 Findings

Findings are listed in order of development and not in order of priority.

3.1 The aeroplane was serviceable and suitable for the operation at the aerodrome. No defect or other factor was found that could have adversely affected the performance of the aeroplane.

3.2 The pilot was suitably experienced for the operation and familiar with the aerodrome and aeroplane. No issues were identified with the pilot that could have affected his ability at the time.

3.3 Shortly after rotation during a crosswind take-off, the aeroplane most likely encountered a tailwind at a critical point when it had just left ground effect and needed to accelerate to its best rate of climb speed to climb away.

3.4 The pilot's early retraction of take-off flap before the best angle or rate of climb speed had been achieved would have further reduced lift and hampered the capability of the aeroplane to climb away.

3.5 The aeroplane was operating near its maximum authorised weight and consequently did not have sufficient surplus power to overcome the adverse effects of any wind shear and consequent loss of lift. This would have hindered the pilot's ability to accelerate the aeroplane normally and to climb away before encountering obstacles beyond the runway.

3.6 Under the prevailing wind conditions, had the pilot used the company-preferred opposite-direction runway that was away from rising terrain and obstacles, the aeroplane should have been able to accelerate normally and climb away even had it encountered a similar tailwind.

3.7 The pilot's choice of runway was not in accordance with the company standard procedures for the conditions at the time and increased the risk to the safety of the flight.

4 Safety recommendations

4.1 The Commission has not identified any new meaningful recommendation that could have helped prevent this accident that has not already been identified and taught through industry training providers. This report does, however, present 3 safety lessons for aviators, which are:

- the adverse effects of premature flap retraction on aeroplane initial climb performance
- when wind or other conditions permit, the need to elect to use the runway that carries the least risk by providing a departure path clear of obstacles such as rising terrain or trees
- the need to appraise fully the performance of an aeroplane that is operating close to its maximum approved operating weight.

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Mr John Marshall QC
Chief Commissioner

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