CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

# AIRCRAFT ACCIDENT REPORT

## OCCURRENCE NUMBER 03/976

## FU24-101

## ZK-LTF

## 5 KM NORTH-EAST OF DOUGLAS, TARANAKI

## 4 APRIL 2003

**Glossary of abbreviations used in this report:**

| | |
|---|---|
| AD | Airworthiness Directive |
| AC | Advisory Circular |
| CAA | Civil Aviation Authority |
| CPL(A) | Commercial Pilot Licence (Aeroplane) |
| E | east |
| GPS | Global Positioning System |
| kg | kilogram(s) |
| km | kilometre(s) |
| LCD | liquid crystal display |
| LED | light-emitting diode |
| m | metre(s) |
| M | magnetic |
| METAR | aviation routine weather report |
| mm | millimetre(s) |
| mph | (statute) miles per hour |
| NZST | New Zealand Standard Time |
| PPL(A) | Private Pilot Licence (Aeroplane) |
| S | south |
| STC | Supplementary Type Certificate |
| UTC | Coordinated Universal Time |
| VHF | very high frequency |
| WGS 84 | World Geodetic System 1984 |

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# AIRCRAFT ACCIDENT REPORT

## OCCURRENCE No 03/976

| | |
|---|---|
| **Aircraft type, serial number and registration:** | FU24-101 Falcon, 200 (WAW), ZK-LTF |
| **Number and type of engines:** | 1 Lycoming LTP-101-700A turboprop |
| **Year of manufacture:** | 1973 |
| **Date and time:** | 4 April 2003, 1830 hours[1] (approx) |
| **Location:** | 5 km north-east of Douglas, Taranaki<br>Latitude[2]: S 39° 16.9'<br>Longitude: E 174° 31.0' |
| **Type of flight:** | Agricultural - topdressing |
| **Persons on board:** | Crew: 1<br>Passengers: 1 |
| **Injuries:** | Crew: 1 fatal<br>Passengers: 1 fatal |
| **Nature of damage:** | Aircraft destroyed |
| **Pilot-in-command's licence** | Commercial Pilot Licence (Aeroplane) |
| **Pilot-in-command's age** | 29 years |
| **Pilot-in-command's total flying experience:** | 1438 hours,<br>340 on type |
| **Information sources:** | Civil Aviation Authority field investigation |
| **Investigator in Charge:** | Mr A J Buckingham |

[1] Times are NZST (UTC + 12 hours)

[2] WGS 84 co-ordinates

## Synopsis

The National Rescue Coordination Centre was notified on the evening of Friday 4 April 2003 that the aircraft had not returned to its Stratford base after the day's operations. A ground-based search had already been initiated, and the wreckage of the aircraft was found near the Strathmore Saddle, some 5 km north-east of Douglas, Taranaki, about 0030 hours. The pilot and his loader driver had not survived the accident.

## 1. Factual information

### 1.1 History of the flight

1.1.1 On 4 April 2003, the pilot had arranged to topdress properties for three clients, one of whom had three separate blocks to be treated. He departed from Stratford Aerodrome at 0653 hours in ZK-LTF for the first airstrip, located some 7 km to the north-east.

1.1.2 After an initial reconnaissance flight, he began topdressing at 0722, and finished this block at 1034 hours. Via brief landings at Stratford and another airstrip 11 km to the north, he positioned the aircraft to a strip near Huiroa. The remainder of the day's work was carried out from this strip.

1.1.3 Four blocks were treated from this location: the first was 8 km to the north-west of the strip, the second immediately to the north, the third some 3 km west and the last 4.5 km to the south, adjacent to the Strathmore Saddle. A reconnaissance of the fourth block was flown at 1518, but actual spreading on this property was not commenced until 1755 hours.

1.1.4 Two loads of urea were spread on the fourth block between 1755 and 1812 hours, with a 12-minute pause until the final take-off at 1824. During this break, the last of the urea was loaded, the fertiliser bins secured and the loading vehicle parked. It is not known if the aircraft was refuelled at this time.

1.1.5 The loader driver boarded the aircraft after completing his duties, the apparent intention being to accompany the pilot back to Stratford on completion of the last drop. On arrival over the property at 1825, the pilot performed one run towards the south, made a left reversal turn, spread another swath on a northerly heading, and pulled up to commence another reversal turn to the left.

1.1.6 At some time after this pull-up, the aeroplane struck the ground heavily on a south-westerly heading, killing both occupants on impact.

1.1.7 Later in the evening, the pilot's wife reported the aircraft and its occupants overdue, and a ground search was commenced, initially by friends and associates. The wreckage and the bodies of the crew were found about half an hour after midnight.

1.1.8 The accident occurred during evening civil twilight, at approximately 1830 hours NZST, adjacent to the Strathmore Saddle, at an elevation of about 530 feet. Grid reference: 260-Q20-409124; latitude S 39° 16.9', longitude E 174° 31.0'.

## 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 29, held a Commercial Pilot Licence (Aeroplane) and a Class 1 medical certificate valid to 1 March 2004. His logbook was endorsed with a Chemical Rating, a grade 2 Agricultural Rating (issued on 31 January 2001), and type ratings for the FU24-950 and FU24-101.

1.5.2 He had flown 962 hours on piston-engined FU24-950 aircraft, and 340.8 hours on the turbine-powered FU24-101. In the agricultural role, including training, he had accrued 37.55 hours dual and 1154.55 hours as pilot-in-command. His total flying time for the preceding 90 days was 231.5 hours, and he had flown on the three days immediately preceding the accident date. On 1 April he had flown a return ferry flight to the Wanganui base, and had topdressed on 2 and 3 April.

1.5.3 Having obtained his PPL(A) in 1998, the pilot was employed by the operator in July 1999, initially as a loader driver. He completed his CPL(A) in March 2000, and in December of the same year, began his agricultural training. In August 2002, he was transferred to the company's Stratford base, assuming the role of area manager in addition to his normal flying duties.

1.5.4 The loader driver, although he held a PPL(A), and had passed the flight test for a CPL(A) in August 2002, was employed solely on ground duties and had not undertaken any type rating or agricultural flying training with the operator.

1.5.5 Both had had pilot medical examinations within the 90 days preceding the accident. The pilot's height was 1.88 m and his weight 102 kg; the loader driver's 1.87 m and 96 kg.

## 1.6 Aircraft information

1.6.1 This aircraft was assembled as a FU24-950 at the premises of Wanganui Aero Work Ltd in 1972, from a new fuselage supplied by the manufacturer, Air Parts (NZ) Ltd; a remanufactured wing assembly; and kitset empennage and control surfaces. The assembly was monitored by the manufacturer and the Civil Aviation Division (of the Ministry of Transport) Regional Office. On completion, it was allocated the serial number 200 (WAW) and was placed on the register as ZK-DJD. A Certificate of Airworthiness was issued in January 1973.

1.6.2 In this configuration, the aeroplane was powered by a Lycoming IO-720 series piston engine, and accrued 5332 hours flight time. In 1990, it was dismantled, deregistered and placed in storage.

1.6.3 Between late 1999 and March 2000, the aeroplane was extensively rebuilt, and reconfigured as a FU24-101 "Falcon". This involved, among other things, the substitution of a Cresco mainplane, undercarriage and fuel system for the original items, and the installation of a Lycoming (now Honeywell) LTP-101-700A-1A turboprop engine. The reconfiguration was in accordance with STC 99/21E/3, approved by the Civil Aviation Authority. It was re-registered in March 2000.

1.6.4 Under the new registration ZK-LTF, the aeroplane was issued with a restricted category Airworthiness Certificate in April 2000, with a limited validity period, to facilitate operational proving for the issue of a non-terminating certificate. The latter document was issued in March 2001.

1.6.5 Although the reconfigured aircraft now had performance similar to that of the Cresco aircraft operated by the company, it was still subject to the same flight manual limitations as the original FU24 airframe, except for specific differences (mainly relating to engine operation) listed in the flight manual supplement for the STC. The original 43 cubic foot (1.22 cubic metre) FU24 hopper was retained, and had a placarded maximum load of 979 kg.

1.6.6 Up to the time of the accident, ZK-LTF had accrued 2560 hours since rebuild. It was maintained in accordance with the operator's FU24-101 maintenance schedule WAW-10. The most recent inspection was a 100-hourly, performed on 20 March 2003, and since which the aircraft had flown 64.8 hours. The last annual review of airworthiness was carried out on 18 February 2003.

1.6.7 The engine (serial number LE 51017) had run 8179.6 hours since new, and 349.8 hours since its last 600-hourly hot section inspection. During the latter inspection, some components had been replaced, including the upgrading of the combustor to the low-emission variant. Fuel used was Jet A-1.

1.6.8 The Hartzell HC-B3TN-3D propeller, serial number BUA 19936, had run 3630.7 hours since new and 349.8 since overhaul (in 2001). Both the engine and propeller had run 64.8 hours since the last 100-hourly inspection.

1.6.9 The weight and centre of gravity for the accident flight could not be calculated as the actual fuel and hopper loads were unknown, but even with a full fuel load,

some 500 kg of urea could still have been carried. The amount of urea found at the accident site was estimated as not more than about 200 kg.

## 1.7 Meteorological information

1.7.1 The weather in the area was described by another pilot as fine and clear with some high cloud, and no wind.

1.7.2 The 1800 METAR for New Plymouth Airport, 43 km to the north-west of the accident site was: wind variable at one knot; visibility 40 km; cloud "few[3]" at 2500 feet, broken[4] cover at 3500 and 4500 feet. This broken cover reportedly did not extend as far south as the accident area.

1.7.3 End of daylight was computed for the accident location, and was at 1838 hours, with sunset at 1811.

## 1.8 Aids to navigation

1.8.1 Not applicable.

## 1.9 Communications

1.9.1 The aeroplane was equipped with an aeronautical VHF transceiver and a cellphone hard-wired into the aircraft audio system.

1.9.2 No VHF calls were reported, and telephone company records showed no outgoing calls from the aircraft cellphone after 1740 hours. The small valley in which the aircraft was working was found to be outside cellphone coverage except for the few seconds above ridgetop level during each reversal turn.

1.9.3 The possibility of an incoming cellphone call distracting the pilot at a critical moment was considered. After some investigation, this line of enquiry was abandoned as it was considered unlikely that the short window of opportunity at each turn was long enough for the cellphone to log on to the network, let alone remain on line long enough for a call to connect.

## 1.10 Aerodrome information

1.10.1 Not applicable.

## 1.11 Flight recorders

1.11.1 The aeroplane was equipped with a Satloc® AirStar 2000 GPS system, which although not a flight recorder as such, did provide a replay of the day's activity.

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[3] 1-2 octas (eighths of sky cover)

[4] 5-7 octas

The unit was damaged in the impact sequence but the stored data was still accessible, and provided the basis for much of section 1.1 of this report.

1.11.2 The unit recorded GPS position at a two-second sampling rate, and stored a data string for each position. This included time (UTC), instantaneous position, altitude, heading, groundspeed (in mph) and several other parameters related to the fertiliser or spray application.

1.11.3 Pilot displays for the system comprised a moving-map display on a back-lit LCD screen, mounted obliquely on the right side of the instrument panel; and an external "light bar" display, mounted immediately forward of the windshield. The light bar was the primary guidance for precision application, and it was evident from the recorded swath patterns on the two largest properties treated on the day, that the pilot had been using the system. The GPS antenna was also mounted externally, on the top of the windshield frame.

## 1.12 Wreckage and impact information

1.12.1 The aeroplane struck the ground very heavily on a heading of 210° M, while in a 55° bank to the right, and on a descent path of at least 30°. The ground at the initial impact point sloped down to the right (relative to the impact heading) at 50° and down in the direction of travel at 20°.

1.12.2 After rebounding and crossing an intervening small gully, the wreckage again collided heavily with the ground some 47 m further on, coming to rest in several sections.

1.12.3 At initial impact, the undercarriage was demolished, the fertiliser spreader was torn from the hopper box by being driven into the ground, the right wing separated at the root, and the cockpit was disrupted. The propeller sustained severe damage at this point, one blade tearing free from the hub, and the propeller gearbox separating bodily from the reduction gearbox case at the front of the engine. The separated blade was later found about 75 m beyond the second impact point, in the direction of travel.

1.12.4 The rear fuselage fractured circumferentially immediately aft of the hopper, remaining attached only by the elevator and rudder control cables. The centre section and left wing, minus its outer panel, remained together, with the engine, firewall and instrument panel having been severely displaced to the left, compromising the occupiable space in the cockpit. It was inferred that the latter damage had occurred at the second impact, given the disposition of the cockpit contents and the occupants, both of whom were found outside the cockpit.

1.12.5 All extremities and control surfaces were accounted for at the site, and partial pre-impact control integrity was similarly established. The remainder (except for the actual functioning of the anti-servo tab on the tailplane) was verified after the wreckage was retrieved to the operator's base. Damage to the anti-servo tab mechanism precluded verification of normal pre-impact operation.

1.12.6 A limited amount of information was gleaned from the cockpit: both the power lever and propeller control were in the fully forward position, although this was

not considered to be a reliable indication as the control runs had been disrupted; the propeller tachometer had a trapped reading of 2100 rpm (red line at 1950); the Ng (compressor speed) tachometer showed 96%; the hour meter showed 356.1; of the seven warning lights, only two bulbs remained, those being the fuel filter and fuel pressure lights. The latter showed slight hot-stretch, indicating that the bulb was illuminated at impact. No particular significance was attached to this, as it was possible that the fuel system was disrupted at the first impact, the light illuminated, and the filament stretched at the second impact.

1.12.7 The trapped propeller rpm reading may have resulted from the loss of the propeller gearbox at the initial impact. The engine, suddenly freed of the governing effect of the propeller and its controlling mechanisms, would have instantly oversped, the rpm reading being trapped later in the impact sequence. The rpm sensing is by means of a magnetic pickup in the accessory gearbox, not the propeller gearbox. The magnetic field at the pickup is modulated by the teeth of a particular gear wheel, and the resulting signal is transmitted to the cockpit display.

1.12.8 A quantity of urea was present in and adjacent to the hopper. This was estimated to be between one eighth and one quarter of a cubic meter in volume, equating to a weight between 95 and 190 kg. A swath of jet fuel and topsoil covered the ground between the two impact points. The actual quantity of fuel on board prior to the accident could not be determined.

1.12.9 A Jet A-1 fuel sample taken from the supply tank on the loading vehicle showed no abnormality.

### 1.13 Medical and pathological information

1.13.1 Post-mortem examination showed that the pilot and passenger died instantly of injuries consistent with a high-energy impact.

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 showed the pilot's blood was 8% saturated with carbon monoxide, but otherwise nothing of significance.

### 1.14 Fire

1.14.1 Fire did not occur.

### 1.15 Survival aspects

1.15.1 The pilot was wearing a protective helmet and was restrained by a lap and shoulder harness. The passenger was seated beside the pilot, but had only a lap belt restraint. The forces of the initial impact were such that the structure to which the pilot's lap belt attached was torn free, the shoulder harness was cut by an unidentified sharp edge, and both occupants were ejected from the cockpit.

1.15.2 The impact forces were not survivable.

1.15.3 The aeroplane was equipped with an ACK E-01 emergency locator transmitter (ELT), which had been mounted in the cockpit area to the left of the pilot's seat. During the impact sequence, the antenna cable was severed at the ELT connector, and although a panel-mounted LED indicated that the unit was transmitting, no detectable signal was emitted. A CAA safety action was developed in regard to the location of ELTs in agricultural aeroplanes.

## 1.16 Tests and research

1.16.1 The propeller was transported to an overhaul facility, where it was dismantled and examined. Only damage consistent with impact was found, and the damage and internal witness marks indicated that significant power was being developed at impact. This was confirmed by reference to the manufacturer.

1.16.2 The engine was similarly examined, and internal damage confirmed that it had been operating at impact. The compressor housing had been fractured in the vicinity of the number 1 bearing; the bearing had disintegrated and the balls from the bearing had struck the compressor first stage. Although they had severely damaged the blades of the first stage, they had been deflected by the rotating blades and were not ingested into the engine.

1.16.3 The disintegration of the number 1 bearing permitted radial and axial movement of the compressor, resulting in interference machining of the centrifugal stage and the diffuser housing. The accessory/reduction gearbox housing was extensively damaged, but it was possible to establish pre-accident integrity of the various gear trains. The output shaft from the power turbine to the propeller gearbox was fractured in a manner consistent with rotation at the time.

1.16.4 All accessories except for the overspeed governor had been shattered on impact, and no testing was possible. The fuel manifold was placed on a test rig and performed normally. The combustor, turbine nozzles and turbine wheels showed no pre-existing abnormality.

1.16.5 Some time was spent analysing the GPS data from the day's work. The first recorded take-off was at 0653 hours, and the last data string was logged at 1826:50. Random samples of the reversal turns performed by the pilot during the day showed that he was consistently achieving a 180° turn in 10-12 seconds. The altitude data indicated that these were "wingovers" (combined pull-up and turn, in which the angle of bank exceeds, or can exceed, 90° at the apex of the manoeuvre).

1.16.6 In some turns, one or two data points had not been logged, giving an irregular shape to the turn. These omitted points were presumed to be caused by momentary loss of satellite signal, because of the beyond-the-vertical angle of bank.

1.16.7 The GPS replay of the turns was consistent with the observations of a helicopter owner and his pilot, who transited the area where the aircraft was operating, about 1745 hours. Both commented on the exuberance of the reversal manoeuvres.

1.16.8 At a later date, the GPS data from the last flight of LTF was loaded into the unit installed in a company Cresco, and several re-enactments of the last manoeuvre performed. This was done in conjunction with an airstrip inspection on the same property, and the investigator-in-charge accompanied the pilot on this flight.

1.16.9 Up to this time, it had been assumed that the accident happened shortly after the data recording ceased, but during the re-enactment, the possibility was raised that the pilot had turned off the GPS display to avoid the distracting glow from the screen as the ambient light level decreased. If this were the case, it is possible that he could have made further spreading runs before the accident occurred.

## 1.17 Organisational and management information

1.17.1 The company is a long-standing aerial agricultural operator, having been in the business for 50 years. It is essentially a family business, headquartered in Wanganui, and having six outstations.

1.17.2 In recent years, in common with the rest of the agricultural aviation industry, the company has suffered a number of accidents, some involving fatalities. With no apparent causal connection between any of the accidents, the company management has invested considerable time and effort in attempting to improve safety.

1.17.3 In July 2002, the company appointed a full-time safety officer with a background of agricultural flying and safety investigation. In addition to flight safety matters, this officer also has responsibility for company compliance with the Health and Safety in Employment Act 1992, and for mentoring of junior pilots within the company.

1.17.4 The safety officer has introduced numerous safety initiatives, the most significant of which was a seminar held in July 2003, and attended by all company personnel. The theme was safety, and presentations were made by management, aviation consultants, and by Certification Unit and Safety Investigation Unit personnel from the CAA.

1.17.5 Additionally, some internal restructuring of the company has taken place since (but not as a result of) the accident. This has involved both the redesignation of some staff, and physical improvements to the head office premises.

## 1.18 Additional information

1.18.1 Rule 91.311 *Minimum heights for VFR flight,* at 91.311(c)(2) permits the carriage of persons on aircraft flown at a height lower than that required by 91.311(a)(2), only if that person is performing an essential function associated with the flight. A company internal memo detailing the provisions of rule 91.311 had been circulated on 25 February 2003. In this case it could not be said that the loader driver was performing an essential function associated with the flight.

1.18.2 On ZK-LTF, a shoulder harness was not provided for the passenger seat, although it was required by 91.505(a)(4)(iii). During the investigation it was noted that other company aircraft were equipped with shoulder harness at the passenger seat,

and the company safety officer was developing an internal procedure to ensure compliance on all occasions when a passenger is carried (for example, a farmer on a property reconnaissance prior to topdressing or spraying).

1.18.3 No flight and duty limitations for agricultural pilots exist in Civil Aviation Rules. However, a review of Part 137 *Agricultural Aircraft Operations* is scheduled for the 2004-05 financial year, with possible outcomes being a rewrite of part 137 and the publication of an Advisory Circular. There is scope for including fatigue management as a topic covered by the AC; additionally with the widening of the coverage of the Health and Safety in Employment Act 1992 to include aircrew, there is now another avenue for addressing this subject as applicable to agricultural pilots.

### 1.19 Useful or effective investigation techniques

1.19.1 Nil.

## 2. Analysis

2.1 An exhaustive investigation did not disclose any pre-accident defect with the aircraft that may have led to the accident. As far as could be ascertained, the aircraft was serviceable and operating normally up to the moment of impact.

2.2 The aircraft had struck the ground in an attitude that suggested it was pulling out of a dive, but with insufficient height for terrain clearance. Possible reasons for the manoeuvre include a normal pull-out from a reversal turn, or partial recovery from a stall or loss of control during a reversal turn.

2.3 Although there was no firm evidence to support any particular one of these possibilities, the circumstances in which the accident occurred could have given rise to any of them, and these are discussed in the following paragraphs.

2.4 The last GPS data was recorded at 1826:50. It is not known if this time immediately preceded the accident, or whether the pilot switched the unit off to avoid distracting glare in the reducing ambient light level. The sun had set at 1811, and the official end of daylight was only some 11 minutes off. The high ground surrounding the valley where the accident occurred would have increased the effects of the fading light, making height judgement progressively more difficult.

2.5 The accident occurred at the end of a long working day. The pilot had been on duty over 12 hours, and in that time had flown 5.6 hours, which included at least 80 take-offs and landings. He had a blood carbon monoxide level of 8%, which in itself is normally insignificant, but in combination with a degree of fatigue that undoubtedly existed, had the potential to dull the edge of the pilot's skill and judgement.

2.6 Although the task at hand was generally no different from the work performed during the day, the pilot had some subtle differences to adapt to during the final

flight. This was the first occasion on the day on which he had carried a passenger while actually applying fertiliser, the lighting conditions were deteriorating, and there may have been a self-imposed sense of urgency to complete the job to avoid having to return next day just for one remaining load.

2.7 The presence of the passenger would have introduced subtle changes to the pilot's immediate working environment. For example, with the passenger beside him (and both were big men), the pilot would inevitably have less "elbow room" making control manipulation at least different, if not necessarily more difficult.

2.8 These factors, some of them with only a slight influence, may have combined at a critical moment, causing the pilot to misjudge a reversal manoeuvre, either with not enough height for completion, or experiencing an aerodynamic stall with associated "wing drop", requiring a recovery height greater than for a routine reversal turn. It is evident from the record of the day's work that the pilot was extracting the maximum manoeuvring performance from the aeroplane, and it would take only minor changes, such as those discussed, to push the performance requirements beyond the performance available.

2.9 Although the known factors do point to a possible explanation for this accident, there is no hard evidence to substantiate this explanation, which must necessarily remain conjectural. As feasible as the possible explanation may be, it has to be said that no firm cause could be determined for this accident.

2.10 Apart from the positioning of ELTs, no other safety recommendations or actions could be developed from this investigation.

## 3. Conclusions

3.1 The pilot was licensed, rated and fit for the flights being undertaken.

3.2 The aeroplane had a current Airworthiness Certificate and had been maintained in accordance with current requirements.

3.3 No pre-accident aircraft defect was found.

3.4 The impact was consistent with partial recovery from a dive with insufficient height to do so.

3.5 No conclusive reason could be found for the aircraft to have been in such a situation.

3.6 Light conditions were probably conducive to difficult height judgement.

3.7 The pilot's judgement may have further been eroded by fatigue and a degree of carbon monoxide absorption.

3.8 The accident was not survivable.

## 4. Safety actions

4.1 In view of the damage to the ELT in this accident and those involving similar aircraft, the CAA Aircraft Certification Unit is investigating the feasibility of relocating ELTs fitted to agricultural aeroplanes to the aft portion of the fuselage. A similar requirement had been mandated by AD (DCA/HELI/3) for helicopter ELT installations in September 2000.

Report written by:

(Signed)

Alister Buckingham
Safety Investigator
22 June 2004

Authorised by:

(Signed)

Max B Stevens
Deputy Director of Civil Aviation

**NOTE**: this is an amended version of the original report. Further information regarding pilot hours was provided to CAA after publication; appropriate adjustments have been made to sections 1.5 and 1.6, without affecting the overall tenor of the report.

Civil Aviation Authority of New Zealand
Aviation House 10 Hutt Road Petone
P O Box 31 441 Lower Hutt New Zealand
Tel: +64-4-560 9400 Fax: +64-4-569 2024
www.caa.govt.nz