No 94-025

FLETCHER FU 24-950

ZK-EFO

NEAR KAIKOHE AERODROME

5 NOVEMBER 1994

ABSTRACT

On 5 November 1994 ZK-EFO was being used to top-dress a farm near Kaikohe Aerodrome. During a turn the aircraft stalled and collided with the hillside.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO 94-025

Aircraft Type, Serial Number and Registration:	Fletcher FU24-950, 218, ZK-EFO
Number and Type of Engines:	One Lycoming IO-720- A1B
Year of Manufacture:	1976
Date and Time:	5 November 1994, 0715 hours*
Location:	0.5km East of Kaikohe Aerodrome Latitude: 35° 27'S Longitude: 173° 49'E
Type of Flight:	Aerial Work, Agricultural
Persons on Board:	Crew: 1
Injuries:	Crew: 1 Fatal
Nature of Damage:	Destroyed
Pilot in Command's Licence:	Commercial Pilot Licence (Aeroplane)
Pilot in Command's Age:	22
Pilot in Command's Total Flying Experience:	764 hours 330 hours topdressing on type
Information Source:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	Mr D G Graham

* All times in this report are NZDT (UTC+ 13 hours)

1. NARRATIVE

1.1 On 5 November 1994, the pilot, who lived near Kaikohe, telephoned the loader operator at 0600 hours to discuss the day's top-dressing programme. The pilot arranged to meet him at 0700 hours at Kerikeri Aerodrome where the company's aircraft, a leased Fletcher 24-950 ZK-EFO was based.

1.2 The loader operator who held a Private Pilot Licence regularly assisted the pilot in preparing the top-dressing aircraft for the day's work. At the aerodrome he taxied ZK-EFO to the fuel pump where he added 28 litres of Avgas 100 to the left wing tank and filled it to capacity. He stated that the level of fuel in the right tank was approximately 50 mm to 70 mm below full and it was not replenished. The loader operator said his fuel drain checks disclosed no evidence of water and the engine start and warm-up and operation of the aircraft on the ground were normal.

1.3 Shortly before 0700 hours the pilot arrived by road from Kaikohe and after carrying out pre-flight checks he and the loader operator flew in ZK-EFO to Kaikohe Aerodrome. The aircraft performed satisfactorily throughout the ten minute flight.

1.4 The early morning task involved spreading 10 tonnes of a specially blended fertiliser on a 25 hectacre farm situtated close to the south-east boundary of Kaikohe Aerodrome. The farm was owned and managed by the pilot's sister and brother-in-law.

1.5 The pilot had intended sowing the fertiliser the previous afternoon after finishing a contract in another area. The loader had been driven to the aerodrome that afternoon and the fertiliser mix had been delivered earlier in the day and placed in the wooden-sided bin at the aerodrome. The weather proved too windy for top dressing so the pilot and loader operator returned to Kerikeri in ZK-EFO. The fertiliser was covered by a tarpaulin overnight.

1.6 The loader operator reported that at the time of their arrival at Kaikohe Aerodrome in the morning there was little or no wind. The pilot requested "a light tonne" for his first load and the loader operator placed 19 hundredweight (966 kg) in the aircraft's hopper. The pilot took off toward the south-east with no apparent difficulty. The loader operator, whose practice was to monitor the first take-off of the day then continue with his duties, returned to the bin and filled the loader's bucket in preparation for the next load.

1.7 The pilot's sister was aware that her brother hoped to topdress their farm early in the morning. Hearing the aircraft commence its first sortie she went to the window. She had heard the aircraft pass behind the house flying toward the south and she observed it after it had turned to the north, making an initial topdressing run up the eastern boundary of the farm. It was flying at about 100 feet agl and appeared to be operating normally as it disappeared from her view toward the north.

1.8 A witness located to the north-east was outside his home and watched the aircraft as it flew overhead and then carried out a turn to the left. He recalled seeing the aircraft's left wing go down, then come back up in a "wobble" as the turn progressed. He then attended to his own tasks but 5 or 6 seconds later heard a "bang" and shortly afterwards saw a plume of black smoke rising from the side of the valley. Fearing that the aircraft had been involved in an accident he alerted his wife, asked her to telephone 111 and proceeded immediately by car to the accident site. He reported that the engine had sounded normal, "making lots of noise", when it flew overhead and the engine sound continued until it ceased suddenly at impact.

1.9 A farmer driving to Kaikohe from the south briefly saw ZK-EFO below the skyline in a very steep bank to the left. He estimated he was about 2 km from the aircraft's position at the time. The whole planform of the aircraft was visible and "it did not seem to be going very fast". During the brief sighting the aircraft appeared to "cartwheel" towards the ground. Some 20 seconds to 30 seconds later the farmer saw smoke beginning to rise which increased quickly. The farmer continued driving then stopped his vehicle on the road adjacent to the smoke and made his way without delay to the burning aircraft. The fire had already consumed much of the forward area and a column of flame engulfed the aircraft's cockpit.

1.10 Despite the rapid arrival of people at the scene, including the pilot's brother-in-law from their house nearby, the fierceness of the fire prevented any attempt to render assistance to the pilot. However, post-mortem investigation indicated that he had died instantly as the result of severe injury on ground impact.

1.11 There was no evidence of any pre-existing medical condition which might have affected the pilot's ability to conduct the flight.

1.12 Police, Fire, and Ambulance services responded promptly to the emergency. Two fire appliances and crews from the Kaikohe Volunteer Fire Brigade subdued the aircraft fire and prevented it spreading through the surrounding bush and undergrowth.

1.13 The aircraft had collided with the hillside on the eastern side of Mangakahia Road at an elevation of about 450 feet in an area of gorse and scrub between the road and the overgrown track of the Otiria-Okaihau branch railway. Kaikohe Aerodrome, located immediately to the west of the accident site, had a published elevation of 573 feet. The adjacent valley containing the flat portions of the farm being sown had an elevation of approximately 300 feet.

1.14 A clear cut swath through the tall gorse and compression damage to the fuselage and wings showed that the aircraft was banked some 45° to the left and in a 30° nose down attitude when it struck the slope. The left wingtip was sheared off and the left outer wing panel separated on initial impact. The aircraft had struck the ground heavily and had come to rest within about 23 m on a heading of 125° M.

1.15 The severity of impact forced the nose undercarriage upward under the cockpit floor and dislodged the hopper outlet assembly and the left main undercarriage. The engine and propeller remained loosely attached to the airframe but all the engine mounts had fractured and the engine assembly had inverted during the impact sequence.

1.16 A span of powerline conductors traversed the slope some 15 m to the north of the wing impact area. The conductors were suspended about 6 m agl, supported on wooden poles. The aircraft had passed over these lines before striking the ground confirming the relatively steep angle of final descent.

1.17 The entire cockpit, hopper, and rear fuselage was destroyed by fire. No significant information was obtained from the cockpit instruments or controls. The available evidence suggested that the flaps had been fully lowered. The aircraft was fitted with an electric trim system. The extension of the stabiliser trim actuator corresponded to an approximate neutral setting.

1.18 The severe forces and disruption of the engine from its mounting rendered unreliable the "as found" positions of the throttle, propeller rpm, and mixture controls, but the consensus of witness evidence and damage to the propeller suggested that the engine was producing power when ground contact occurred.

1.19 The pilot was wearing his lap and shoulder harness and a helmet. Impact forces, however, were such that the accident was unsurvivable.

1.20 Continuity and integrity of the elevator, aileron and rudder control systems was established as far as practicable. There was no evidence of abnormality or malfunction in the aircraft's control surfaces, their attachments, or in the operating cable layout, but the extent of fire damage within the cockpit and fuselage rendered it impracticable to establish with absolute certainty pre-impact integrity of this area of the aircraft's structure and controls.

1.21 A trail of fertiliser on the gorse and scrub indicated that the pilot had activated the "dump" control before the aircraft struck the ground. The hopper outlet doors were fully open. Fertiliser recovered from the burnt out hopper at the accident site weighed 150 kg. It was not practicable to estimate the quantity of fertiliser ejected during the jettison which had evidently taken place during the latter stage of the aircraft's descent. However, the completion of only one sowing run along the relatively short farm boundary suggested that the hopper may have been approximately two thirds full when the pilot initiated the turn to the left which culminated in the accident.

1.22 ZK-EFO was manufactured by New Zealand Aerospace Industries Limited in New Zealand in 1976. It incorporated the revised wing and aileron fairings and vortex generators installed to improve the handling qualities of the aircraft type.

1.23 At the time of the accident the airframe had accumulated an estimated total of 7982 hours. 3750 hours had been flown since the last complete overhaul.

1.24 ZK-EFO was maintained in accordance with the owners Fletcher FU24-950 series inspection schedule. The most recent scheduled maintenance comprised a Check 4 carried out at the end of August 1994. The aircraft had flown some 73 hours 30 minutes since this inspection. There were no outstanding defects or deferred maintenance requirements on ZK-EFO at the time the accident occurred.

1.25 Lycoming IO-720-A1B Serial number L609-54 was installed in ZK-EFO in 1993 and had run a total of 6590 hours, with 1561 hours since overhaul. Hartzell propeller HC-3YR-1RF, hub serial number DY497 had a total of 5483 hours and 2047 hours since overhaul.

1.26 The engine and propeller were transported to an approved overhaul facility and subjected to strip examination and rig testing of various components. No evidence was found to suggest that any mechanical defect or failure in the engine or propeller had contributed to the accident. Residual fuel within the engine fuel system, and ingestion of foreign material into the cylinders on impact, supported witness reports that the engine continued operating until the aircraft struck the hillside. The similarity of damage to each propeller blade and fracture of each pitch change knob was consistent with a "power-on" impact.

1.27 The pilot had commenced flying training at Kerikeri in mid 1990 and had obtained a Private Pilot Licence in December 1991. He had commenced formal training for a Commercial Pilot Licence (CPL) in March 1992 and was issued with a New Zealand lifetime CPL in June 1993.

1.28 In July 1993 he had commenced a course of Agricultural Pilot Training which he had successfully completed in January 1994. The course was conducted in accordance with Civil Aviation Safety Order 12 Part 23 which defined an Approved Training Syllabus leading to the issue of an Agricultural Pilot Rating. The majority of his flying

training had been carried out using Fletcher FU24A950 aircraft ZK-EGX which was equipped with dual controls. His training had taken place in Northland in conjunction with the operation of his family's aerial topdressing business.

1.29 In his association with the family Company the pilot had opportunity to fly the FU24-950 aircraft type from an early stage. He had first flown ZK-EGX in May 1991, and had flown this aircraft subsequently during training for his NZCPL, assisting with aircraft positioning and other tasks involved in typical topdressing activity. After qualifying for his Agricultural Pilot Rating the pilot had flown ZK-EGX and similar FU24-950 aircraft for a combined total of some 330 hours productive topdressing. All of his topdressing flying had been carried out in the Northland region.

1.30 In addition to topdressing, the pilot flew commercial charters and survey flights for the Bay of Islands Aero Club. He had completed a Civil Aviation Regulation 76 check satisfactorily in connection with this flying, on 8 October 1994.

1.31 He regularly acted as tow pilot for the Gliding Club operating from Kaikohe Aerodrome and he had accumulated some 43 hours of flight time in gliders when he obtained his Glider Towing Rating in January 1992.

1.32 At the time of the accident to ZK-EFO he had an estimated total of 764 hours flying experience on aeroplanes of which 108 hours was recorded as dual.

1.33 On 19 September 1994 the pilot was involved in an accident while flying ZK-EGX. During the completion of a lime sowing contract it became evident that the aircraft would be unable to outclimb a hill ahead. The pilot turned away, gained more height and returned to sow the area but found that the lime would not sow. An attempt to jettison the load was unsuccessful and the confines of the gully in which the aircraft was being flown held the risk of a stall if a turn was carried out. The aircraft subsequently struck the top of the nearby ridge and came to rest in some scrub. The pilot escaped with minor injury but the aircraft was substantially damaged.

1.34 As a result of this accident the Company had leased FU24-950 ZK-EFO. The leased aircraft was essentially similar to ZK-EGX and the pilot had experienced no difficulty adapting to it. However, poor weather during October 1994 had limited the amount of topdressing that could be undertaken. The pilot had flown an estimated 22 hours and 30 minutes on ZK-EFO when the second accident occurred.

1.35 The pilot could have been expected to be familiar with the country surrounding Kaikohe Aerodrome both from gliding activities and previous topdressing operations. However he had not topdressed his brother-in-law's farm before. The farm was of relatively small area and its location, at the side of the shallow valley adjoining Kaikohe Aerodrome, involved some sowing runs along the hillside contours and others over the flat valley farmland.

1.36 The accident circumstances suggested that having completed a sowing run along the eastern boundary the pilot had commenced a wide turn to the north of the property prior to lining up for a further sowing run. Witness observations and the location of the accident site suggested that in positioning ZK-EFO to skirt the side of the valley the pilot may have misjudged the extent of turn required. The available evidence indicated that during the latter part of the turn to the left the aircraft stalled, descended rapidly and collided with the hillside. The trail of jettisoned fertiliser and probable application of full flap were consistent with an attempt by the pilot to recover control of the aircraft and/or minimise ground impact.

1.37 The pilot had been engaged in full-time topdressing for about nine months and also took part in a variety of other flying. Under normal conditions he was likely to

ensure that his airspeed was adequate for any turn manoeuvre especially if the aircraft was heavily laden. The aircraft's flight path on this occasion, however, was toward rising ground and the lack of a visual horizon may have led to an inadvertent decay in airspeed, particularly as some gain in height was required prior to sowing the western boundary of the farm. If this had occurred and the pilot initiated a steeply banked turn, the available margin of airspeed above the stall may have been less than the pilot anticipated. Similar potential for a stall existed if the pilot had deliberately, or inadvertently, climbed the aircraft while steepening the turn above the rising terrain at the side of the valley.

1.38 Destruction of ZK-EFO's cockpit and fuselage by fire rendered it impracticable to eliminate the possibility of an in-flight control malfunction or critical component failure which might have precipitated the accident. The sum of evidence and general circumstances, however, were consistent with previous occurrences involving FU24-950 aircraft engaged in topdressing operations in which a stall during the course of a reversal turn was the most likely accident cause.

2. FINDINGS

2.1 The pilot in command was appropriately qualified to conduct top-dressing operations.

2.2 The pilot was familiar with the operation of Fletcher FU24-950 aircraft and had been engaged in productive topdressing using this aircraft type over a period of about nine months.

2.3 The pilot was familiar with the Kaikohe area but had not previously topdressed the farm near which the accident occurred.

2.4 The topdressing contract required fertiliser to be sown on level paddocks and over sloping ground at the side of the valley.

2.5 The accident occurred in calm conditions on the first sortie of the day and following an initial short sowing run.

2.6 The pilot was turning to make a sowing run over an elevated area of the farm when the accident occurred.

2.7 The location of the turn involved the aircraft flying toward higher ground with consequent lack of a visual horizon during the turn.

2.8 The aircraft's hopper was likely to have contained a substantial quantity of fertiliser at the commencement of the turn.

2.9 The aircraft was last observed in a steep bank to the left and flying slowly.

2.10 The accident circumstances suggested that the aircraft stalled in the latter stages of the turn.

2.11 Destruction of the aircraft's cockpit and fuselage by fire prevented conclusive determination of the pre-impact integrity of the aircraft structure and primary control systems.

2.12 The aircraft had a valid Certificate of Airworthiness and Maintenance Release.

2.13 The available evidence did not disclose any defect or malfunction in the airframe, engine, or propeller which might have contributed to the accident.

19 April 1995

M F Dunphy
Chief Commissioner

ABBREVIATIONS COMMONLY USED IN TAIC REPORTS

AD	Airworthiness Directive
ADF	Automatic direction-finding equipment
agl	Above ground level
AI	Attitude indicator
AIC	Aeronautical Information Circular
AIP	Aeronatical Information Publication
amsl	Above mean sea level
AOD	Aft of datum
ASI	Airspeed indicator
ATA	Actual time of arrival
ATC	Air Traffic Control
ATD	Actual time of departure
ATPL (A *or* H)	Airline Transport Pilot Licence (Aeroplane or Helicopter)
AUW	ll-up weight
C	Celsius (normally preceded by °)
CAA	Civil Aviation Authority
CASO	Civil Aviation Safety Order
CFI	Chief Flying Instructor
C of G	Centre of Gravity
CPL (A *or* H)	Commercial Pilot Licence (Aeroplane or Helicopter)
DME	Distance measuring equipment
E	East
ELT	Emergency location transmitter
ERC	En route chart
ETA	Estimated time of arrival
ETD	Estimated time of departure
F	Fahrenheit (normally preceded by °)
FAA	Federal Aviation Administration (United States)
FL	Flight level
g	Acceleration due to gravity
GPS	Global Positioning System
HF	High frequency
hPa	Hectopascals
IAS	Indicated airspeed
IFR	Instrument Flight Rules
IGE	In ground effect
ILS	Instrument landing system
IMC	Instrument meteorological conditions
ins Hg	Inches of mercury
kgs	Kilograms
kHz	Kilohertz

KIAS	Knots indicated airspeed
kt	Knot(s)
LF	Low frequency
LLZ	Localiser
M	Mach number (e.g. M1.2)
M	Magnetic (normally preceded by °)
MAANZ	Microlight Aircraft Association of New Zealand
MAP	Manifold absolute pressure (measured in inches of mercury)
MAUW	Maximum all-up weight
METAR	Aviation routine weather report (in aeronautical meteorological code)
MF	Medium frequency
MHz/Mhz	Megahertz
mph	Miles per hour
N	North
NDB	Non-directional radio beacon
nm	Nautical mile
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board (United States)
NZAACA	New Zealand Amateur Aircraft Constructors Association
NZDT	New Zealand daylight time (UTC + 13 hours)
NZGA	New Zealand Gliding Association
NZHGPA	New Zealand Hang Gliding and Paragliding Association
NZMS	New Zealand Mapping Service map series number
NZST	New Zealand standard time (UTC + 12 hours)
octa	Eighth's of sky cloud cover, (e.g. 4 octas = 4/8 of cloud cover)
OGE	Out of ground effect
PAR	Precision approach radar
PIC	Pilot in command
PPL (A or H)	Private Pilot Licence (Aeroplane or Helicopter)
psi	Pounds per square inch
QFE	An altimeter subscale setting to obtain height above aerodrome
QNH	An altimeter subscale setting to obtain elevation above mean sea level
RNZAC	Royal New Zealand Aero Club
RNZAF	Royal New Zealand Air Force
rpm	revolutions per minute
RTF	Radio telephone or radio telephony
S	South
SAR	Search and Rescue
SSR	Secondary surveillance radar
T	True (normally preceded by °)

TACAN	Tactical Air Navigation aid
TAF	Terminal aerodrome forecast
TAS	True airspeed
UHF	Ultra high frequency
UTC	Coordinated Universal Time
VASIS	Visual approach slope indicator system
VFG	Visual Flight Guide
VFR	Visual flight rules
VHF	Very high frequency
VMC	Visual meteorological conditions
VOR	VHF omnidirectional radio range
VORTAC	VOR and TACAN combined
VTC	Visual terminal chart
W	West