



AIRCRAFT ACCIDENT REPORT
OCCURRENCE NUMBER 02/2248
NZ AEROSPACE FU24-950M
ZK-EOE
ORONGO, NEAR THAMES
24 JULY 2002

Glossary of abbreviations used in this report:

CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
E	east
ELT	emergency locator transmitter
km	kilometre(s)
m	metre(s)
mm	millimetre(s)
NZST	New Zealand Standard Time
S	south
T	true
UTC	Coordinated Universal Time
W	west
WGS-84	World Geodetic System 1984

AIRCRAFT ACCIDENT REPORT

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Aircraft type, serial number and registration:	NZ Aerospace FU24-950M (Walter Fletcher), 143, ZK-EOE
Number and type of engines:	1 Walter M601D-11NZ turboprop
Year of manufacture:	1968
Date and time:	24 July 2002, 1450 hours ¹ (approx)
Location:	Orongo, 3 km SW of Thames Aerodrome Latitude ² : S 37° 10.7' Longitude: E 175° 31.6'
Type of flight:	Agricultural - spraying
Persons on board:	Crew: 1
Injuries:	Crew: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence	Commercial Pilot Licence (Aeroplane)
Pilot-in-command's age	27 years
Pilot-in-command's total flying experience:	2016 hours, 1522 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr J A Daley

¹ Times are NZST (UTC + 12 hours)

² WGS-84 co-ordinates

Synopsis

The Civil Aviation Authority was notified of the accident about 1530 hours on 24 July 2002. The Transport Accident Investigation Commission was notified shortly thereafter, but declined to investigate. A CAA field investigation was commenced the next day.

The pilot was engaged in agricultural spraying operations over flat farmland at Orongo, near Thames. The aircraft collided with a long row of trees on a paddock boundary and came to rest inverted. The pilot did not survive the accident.

1. Factual information

1.1 History of the flight

- 1.1.1 About 0900 hours on 24 July 2002, the pilot commenced spraying operations on flat farmland in the Orongo area, some three kilometres to the south-west of Thames Aerodrome.
- 1.1.2 Loading for the operation was carried out at Thames by the pilot's father, who as an experienced agricultural pilot, was also acting in a supervisory role. The pilot had only recently qualified for spraying, all his previous agricultural experience being topdressing.
- 1.1.3 Spraying was stopped about 1210 hours because of unsuitable wind conditions, and both pilot and loader driver took a break for lunch at the loader driver's home. Conditions improved after lunch, and spraying was restarted at 1350 hours, the pilot finishing the remaining treatment of the first property.
- 1.1.4 The second property was started at 1420. The long axes of the paddocks on this property were aligned approximately north-west/south-east, and the pilot carried out his spray runs at right angles to the general alignment, progressively covering several paddocks on each run.
- 1.1.5 The beginning of the runs was delineated by a row of about 30 mature trees of various species, over which the pilot had to descend on a south-westerly heading. On completion of the main part of the property, the pilot was left with one paddock on the other side of the trees. At the north-western end of this paddock was a barn and stockyards.
- 1.1.6 On the first run over this paddock, the pilot approached over the barn and made the first spray run to the south-east. He was seen to make a 180-degree reversal turn and align the aircraft with the left (looking north-west) boundary of the paddock, in close proximity to the trees. On this heading, he was flying into the sun and towards the barn.
- 1.1.7 Part -way into this run the left wing outer panel struck a protruding branch and part of the aileron was torn off. Further collisions occurred as the aircraft progressed along the tree line. The aircraft rolled inverted, struck the ground and slid to a halt with the engine still running.

- 1.1.8 The farmer and his partner were driving separately along the nearby road, towards the barn when the accident happened. The farmer continued to the scene while his partner went to a neighbour's house to alert emergency services. Arriving at the aircraft, the farmer quickly realised that there was nothing he could do for the pilot.
- 1.1.9 The accident occurred in daylight, at approximately 1450 hours NZST, at Orongo, at an elevation of 10 feet. Grid reference: 260-T12-347440; latitude S 37° 10.7', longitude E 175° 31.6'.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	0	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 The aircraft collided with and destroyed sections of two fence lines running either side of a raised farm race, and a concrete water trough.

1.5 Personnel information

- 1.5.1 The pilot held a valid Commercial Pilot Licence (Aeroplane) first issued on 19 November 1998, and subsequently endorsed with a Grade 1 Agricultural Rating and Chemical Rating. His logbook was endorsed with type ratings for both piston-engine and Walter turboprop versions of the FU24-950M.
- 1.5.2 He held a current Class 1 Medical Certificate with no limiting endorsements, valid to 23 February 2003.
- 1.5.3 The last entry in the pilot's logbook was dated 30 June 2002, at which point his flight time totalled 2016 hours, including 1522 on agricultural work. He had completed a CAR Part 137 competency check and biennial flight review in conjunction with his Grade 1 flight test on 12 April 2002.
- 1.5.4 Most of his agricultural flying had been on topdressing operations, the pilot having only recently undertaken spray training. This was certified in his logbook as being completed on 25 June 2002, and up to the last logbook entry, he had recorded some 20 hours on spray operations.

1.6 Aircraft information

- 1.6.1 Air Parts (NZ) Limited FU24-950M (Fletcher) serial number 143 was manufactured in 1968. In October 2000, at 12,181 airframe hours, the aircraft was modified with the installation of a Walter M601D-11NZ turbine engine in place of the original Lycoming IO-720 series piston engine. A new non-terminating Airworthiness Certificate was issued at this time.
- 1.6.2 At the time of the accident, the aircraft had accrued approximately 13,170 hours in service, exclusively on agricultural flying. The most recent scheduled maintenance was a 100-hourly check on 14 May 2002, and the last recorded unscheduled maintenance was the replacement of the left flap on 20 May 2002. An annual inspection was completed on 16 October 2001.

1.7 Meteorological information

- 1.7.1 The weather at the time of the accident was fine, partly cloudy and with good visibility. The wind was a very light breeze from the north-west.
- 1.7.2 The sun azimuth and altitude were 322.5° T and 23.5° respectively. The last spray run was on a heading of about 323° T.

1.8 Aids to navigation

- 1.8.1 Not applicable.

1.9 Communications

- 1.9.1 Not applicable.

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 aircraft's flight path was parallel to and in close proximity to the row of trees to the pilot's left. The initial impact was with a branch about 100 mm in diameter, some nine metres long and between four and five metres above ground level. The branch was struck by the left wing, about 450 mm inboard of the aileron tip, and a large section of the aileron was torn away.
- 1.12.2 The aircraft continued along this flight path parallel to the tree line maintaining a reasonably consistent heading and altitude. Numerous further tree strikes occurred, progressively demolishing the left wing outboard section.
- 1.12.3 At the end of the tree line, the aircraft rolled rapidly to the left and it struck the ground inverted 55 m further on. The initial ground impact was marked by a considerable amount of Perspex and debris from the cockpit area.

- 1.12.4 The aircraft slid across the wet ground upside down for approximately 60 m, crossed a raised farm access road (race), demolished sections of two fences flanking the race and collided with a concrete water trough. The right outer wing section and the vertical stabiliser (tail fin) were torn free in the impact sequence.
- 1.12.5 The farmer heard the engine still running after the aircraft came to rest; the engine noise increased momentarily then stopped. Rotational score marks made by the fuel control unit drive spline on the light alloy gearbox housing indicated that the gas producer section of the engine was turning during the ground impact sequence. The fuel control unit was dislodged, possibly when the engine and propeller struck the water trough.
- 1.12.6 The aircraft sustained major impact disruption around the engine mount area, and the upper cockpit area was completely destroyed.

1.13 Medical and pathological information

- 1.13.1 Post-mortem examination showed that the pilot died of major head injuries.
- 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 pilot was restrained by a lap and shoulder harness, and was wearing a Gentex SPH-4 safety helmet equipped with a neutral grey visor. The loader saw the visor in the down position when the pilot departed on the last flight.
- 1.15.2 The accident was not survivable, owing to the inverted attitude of the aircraft at ground impact, and the lack of any turnover protection in the cockpit structure.
- 1.15.3 An Artex E110 ELT was installed in the aeroplane. It activated on impact, and the signal was detected by satellite at 1539 hours.

1.16 Tests and research

- 1.16.1 Nil.

1.17 Organisational and management information

- 1.17.1 The pilot's employer has an in-house check and training scheme for company pilots. The recent spray training was conducted by the company Chief Pilot, and included classroom theory covering (among other topics): the need to keep looking outside during spraying runs; not monitoring instruments until at a safe height; the need to allow plenty of time to line up on runs; and precautions when spraying parallel to wires or trees.

- 1.17.2 The practical aspects of the training comprised an initial demonstration by the Chief Pilot, describing the process as he went. This was followed by approximately two hours of supervised spraying by the pilot using plain water. The Chief Pilot noted that the pilot had an excellent attitude towards his job and his aircraft, and flew sensibly and accurately.
- 1.17.3 The pilot's father, a 21,000 hour agricultural pilot and also an experienced spray pilot, volunteered to act as loader for his son, and in that capacity to supervise and mentor him.

1.18 Additional information

- 1.18.1 The farm property on which the accident occurred was a flat, low-lying area which was normally sprayed by ground vehicle. Because of an exceptionally wet winter, the ground was too soft for vehicle access, and aerial application was utilised for the first time in 11 years.
- 1.18.2 A week prior to the accident the farmer met with the pilot at Thames Aerodrome to deliver the spraying chemical. At this time the pilot took the farmer on an observation flight over the farm property to clarify the property boundaries and the areas to be sprayed.
- 1.18.3 In recent years, in at least two other FU24 accidents, the aircraft have come to rest inverted. In one case, the pilot escaped with little or no injury; in the other, the pilot sustained life-threatening head injuries, but survived. These accidents were 97/2568 (ZK-DIL) and 02/3469 (ZK-EMO). Accident briefs for both are on the CAA website.

1.19 Useful or effective investigation techniques

- 1.19.1 Nil.

2. Analysis

- 2.1 There was no evidence to suggest that there had been a problem with the aircraft, or that the pilot had suffered some incapacity. Given the manoeuvring seen immediately before the accident, it is reasonable to believe that the pilot was in full control of a serviceable aeroplane up to the moment of first impact.
- 2.2 The pilot was flying directly into the sun, parallel with and close to a row of trees to his left. At the end of the paddock there was a farm building and a stockyard, which would have influenced his selected line of flight and pull-up point. It could not be determined if there was spray residue on the windshield before the accident.
- 2.3 It is possible that the pilot simply did not see the nine-metre branch before colliding with it, or if he did sight it, there was not enough time to take avoiding action. Either way, the loss of a section of aileron may have restricted the amount of lateral control authority available, making the subsequent collisions inevitable.

Additionally, even had he sighted the branches ahead, his options of climbing clear or banking to the right may already have been compromised.

- 2.4 Progressive demolition of the left wing outer section and the aileron probably made the outcome inevitable. At some point in the sequence, the rolling forces resulting from the asymmetric wing area would have exceeded any remaining aileron authority, although it appears that the pilot initially was able to maintain some control by keeping a reasonably consistent heading and height until the end of the tree line.
- 2.5 The aircraft struck the ground completely inverted in a level attitude. The canopy together with its light frame structure was destroyed on impact. On this aircraft type and its derivatives, there is no protection available for the pilot's head or upper body in this attitude.
- 2.6 The applicable airworthiness design requirements relating to crew protection provide for minor accidents only, not the catastrophic kind of accident that occurred in this case or in those referred to in 1.18.3. When these standards were applied to the original type certification of the Fletcher FU24 more than 50 years ago, the likelihood of a complete turnover on landing was assessed as not reasonably probable because of the undercarriage configuration of the aircraft. As a result, the Fletcher FU 24 series aircraft does not feature the rollover protection structure typical of most other agricultural aircraft. However, because such a structure is required to be designed for protection in minor accidents only, it is arguable whether the presence of one in this case would have ensured the pilot's survival.
- 2.7 Notwithstanding the long-standing design standards, this accident and those to other Fletcher FU24 series aircraft where the aircraft became inverted on the ground, suggests there may be a case for reviewing the cockpit design with a view to improving protection for the pilot to at least the standard typical of other agricultural aircraft.
- 2.8 There was no evidence to suggest that this accident was anything other than a simple collision with a substantial branch extending from the tree line; the sun conditions at the time would have made timely sighting of the branch difficult, and once the initial collision occurred, there was probably little that the pilot could do to retrieve the situation.

3. Conclusions

- 3.1 The pilot was appropriately licensed, rated and fit to carry out agricultural spraying operations.
- 3.2 The aircraft had been operating normally up until the time of the accident.
- 3.3 While operating into the sun and in close proximity to a line of trees, the left wing of the aircraft struck a substantial branch.

- 3.4 The initial collision damaged the left aileron, and subsequent collisions with further branches progressively demolished the outer wing section.
- 3.5 The aircraft damage resulted in a probably uncontrollable roll, followed by an inverted ground impact.
- 3.6 The accident was not survivable.
- 3.7 The aircraft structure did not feature any rollover protection for the cockpit occupant(s).

4. Safety actions

- 4.1 The CAA is reviewing the cockpit design of the Fletcher FU 24 series aircraft to consider the costs and likely benefits of mandating improved pilot protection against an event where the aircraft becomes inverted on the ground during an accident sequence.
- 4.2 As a result of the high incidence of agricultural aviation accidents over the previous five years the CAA has developed an Agricultural Industry Education Package. This will include articles in the CAA *Vector* magazine, a Good Aviation Practice (GAP) booklet, a series of articles targeting airstrip owners regarding their responsibilities under the Health and Safety in Employment Act, and education posters. A detailed description of the package is featured in the January/February 2004 edition of *Vector* magazine.

Report written by:

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6 May 2004

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