



AIRCRAFT ACCIDENT REPORT
OCCURRENCE NUMBER 01/2053
PACIFIC AEROSPACE CRESCO 08-600
ZK-TMO
25 KM WEST OF GISBORNE
14 JUNE 2001

Glossary of abbreviations used in this report:

CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
CPL(A)	Commercial Pilot Licence (Aeroplane)
E	east
ELT	emergency locator transmitter
ENT	ear, nose and throat
ft	foot or feet
hp	horsepower
kg	kilogram(s)
km	kilometre(s)
m	metre(s)
M	magnetic
MCTOW	maximum certificated take-off weight
NZST	New Zealand Standard Time
OAAI	Office of Air Accidents Investigation
S	south
UTC	Coordinated Universal Time
VHF	very high frequency

AIRCRAFT ACCIDENT REPORT

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Aircraft type, serial number and registration:	PAC Cresco 08-600, 012, ZK-TMO
Number and type of engines:	One Pratt & Whitney Canada PT6-34AG
Year of manufacture:	1996
Date and time:	14 June 2001, 1145 hours ¹ (approx)
Location:	Te Aroha Station, 25 km west of Gisborne. Latitude ² : S 38° 38.0' Longitude: E 177° 41.8'
Type of flight:	Agricultural - topdressing
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	49 years
Pilot-in-command's total flying experience:	7300 hours, 261 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr J A Daley

¹ Times are NZST (UTC + 12)

² NZ Geodetic Datum 1949 co-ordinates

Synopsis

The Civil Aviation Authority was notified of the accident shortly after 1200 hours on Thursday 14 June 2001. The Transport Accident Investigation Commission was in turn notified, but declined to investigate. A CAA site investigation was commenced next day.

The aeroplane was engaged in topdressing operations from a farm property near Gisborne. Shortly after it had taken off, the loader driver noticed a plume of black smoke beyond the end of the airstrip. On investigation, he found the burning wreckage of the aircraft a short distance from the strip. The pilot did not survive the accident.

1. Factual information

1.1 History of the flight

- 1.1.1 On 13 June 2001, Cresco ZK-TMO arrived at Te Aroha Station, 25 km west of Gisborne, to carry out topdressing of that property. Before operations started, the property owner briefed the pilot, and two observation flights over the areas to be sown were made. The owner also cautioned the pilot against turning left after take-off from the airstrip. Spreading commenced at 1600 hours, and 14 flights with 1800 kg loads were completed that day. The loader driver reported that no difficulties were experienced during those operations.
- 1.1.2 Spreading recommenced at 0720 hours on 14 June 2001, again with 1800 kg loads, in an area to the left (east) of the airstrip. On the third flight after a refuel later in the morning, the loader driver noticed that the pilot made a partial load jettison after take-off; this resulted in a reduced duration of that sortie. However, on return, the pilot did not indicate to the loader driver that he required a reduced load.
- 1.1.3 About 1145 hours, the aircraft was reloaded and commenced take-off. The loader driver watched about half the take-off roll, then continued preparing for the next load. He did not sight the aircraft again before a pall of black smoke attracted his attention. After making a radio call to the aircraft and hearing no response, the loader driver ran towards the smoke, which was to the left of and below the elevated strip.
- 1.1.4 On reaching the site he found the aircraft inverted in a small stream and burning fiercely. The loader driver could see the pilot inside the aircraft but he and the property owner were unable to reach him because of the intense heat of the fire.
- 1.1.5 The accident occurred in daylight, at approximately 1145 hours NZST, at Te Aroha Station; latitude S 38° 38.0' longitude E 177° 41.8', at an elevation of approximately 770 feet. Grid reference 260-X18-190750.

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 A farm gate and a section of fence were destroyed by aircraft impact.

1.5 Personnel information

1.5.1 The male pilot, aged 49, held a New Zealand Commercial Pilot Licence (Aeroplane) endorsed with Flight Radio Telephone Operator, Grade 1 Agricultural, and Chemical ratings. He had flown a total of 7300 hours, including 3460 on agricultural operations.

1.5.2 He held a Class 1 medical certificate, valid until 27 October 2001. Restrictions entered on the licence were:

- Half spectacles must be readily available;
- Subject to medical surveillance as specified in assessor's letter dated 27 October 2000;
- Exemption: Hearing/ENT standard.

1.5.3 The pilot had first obtained his CPL(A) in 1979, and subsequently trained as an agricultural pilot. He continued flying on agricultural operations in New Zealand until 1988.

1.5.4 From 1988 until 1994, the pilot flew in Australia, where he accrued approximately 3350 hours on a variety of light twin-engined air transport aircraft. In addition, he passed a basic gas turbine knowledge examination on 4 March 1990.

1.5.5 The pilot did not fly again until the year 2000, when he made one flight in a Fletcher FU24 aircraft, in New Zealand. He renewed his licence in January 2001, and undertook type rating training on the Cresco in March 2001. Up to his last logbook entry on 8 June, he had accrued 261 hours on type.

1.5.6 The pilot was reportedly in apparent good health and spirits on the day of the accident.

1.6 Aircraft information

- 1.6.1 Cresco 08-600, serial number 012 was manufactured in New Zealand by Pacific Aerospace Corporation in 1996, and registered as ZK-TMO. The Civil Aviation Authority in due course issued the aircraft with a non-terminating airworthiness certificate in the agricultural category.
- 1.6.2 The aeroplane was powered by a Pratt & Whitney Canada PT6A-34G gas turbine engine, driving a Hartzell constant-speed, full-feathering, reversing propeller. Up to 1 June 2001, the aeroplane and engine had accrued 5,466.08 hours total flight time and 64,887 cycles. The propeller had accrued 2,350.33 hours since overhaul, having been installed on 3 May 1999.
- 1.6.3 The most recent scheduled maintenance was a 100-hourly inspection carried out on 30 May 2001, after which the aircraft was released to service.
- 1.6.4 The aircraft was fitted with a standard type hopper, for which the prescribed maximum structural load was 1860 kg. There were no other devices fitted to the aeroplane to dispense agricultural chemicals.
- 1.6.5 The all-up weight of the aeroplane on its last take-off was calculated to be approximately 3360 kg; this included up to 200 litres of Jet A-1 fuel. There was no physical evidence to indicate that the centre of gravity was outside the prescribed limits.

1.7 Meteorological information

- 1.7.1 The Gisborne area was under the influence of a slowly weakening ridge of high pressure, giving an easterly flow over the North Island. The Meteorological Service general aviation forecast for 14 June indicated that occasional drizzle could be expected in the east and about the Gisborne ranges. Forecast winds were light to moderate north-easterlies.
- 1.7.2 The actual wind conditions at the airstrip were described by the loader driver as a light northerly drift, and he described the smoke from the wreckage as going “straight up”.

1.8 Aids to navigation

- 1.8.1 Not applicable.

1.9 Communications

- 1.9.1 Although there were VHF communications available between the loader and the pilot, no relevant transmissions were heard prior to the accident.

1.10 Aerodrome information

- 1.10.1 The grassed airstrip was 425 m long and had a 3% down-slope in the take-off direction of 130° M. The strip surface was firm and smooth.

- 1.10.2 To the left of the strip heading, and within about 400 m from the departure end, the ground rose steeply to about 300 ft above strip level. This was the basis for the property owner's advice to the pilot (see 1.1.1) not to turn left after take-off.
- 1.10.3 The alignment of the high ground and the strip heading formed an acute angle of about 50°. For the pilot to reach that part of the property lying to the north of the airstrip, he had essentially three choices: one was to climb on the airstrip heading until reaching a safe height before turning left; the second was to turn right after take-off and continue the turn through about 310°; and the third option, which was the one counselled against, was an early left turn at low level, through about 150°.
- 1.10.4 The pilot of a Fletcher FU24 operating off the strip in May 1985 had attempted a left turn immediately after take-off, but the proximity of the terrain and the steep angle of bank required for terrain avoidance degraded the aircraft performance to the point where it was unable to maintain height and collided with the ground about 140 m from the end of the strip, about 100 m left of the extended centreline (see OAAI Accident Brief 85-045).

1.11 Flight recorders

- 1.11.1 Not applicable.

1.12 Wreckage and impact information

- 1.12.1 Prior to impact, the aeroplane had turned left off the airstrip and descended. A superphosphate trail, consistent with the hopper contents being jettisoned, commenced some 200 m from the end of the strip, at which point the aeroplane had turned through about 90°. The trail continued across the face of the high terrain, the width of the trail decreasing with reducing terrain clearance as the aeroplane descended, until the initial ground impact marks, which were made by the left wing.
- 1.12.2 After scraping the ground for 13 m on a track of 340° M, the left wing struck a gatepost and gate, tearing off the outboard wing section. At this point the aeroplane appears to have cartwheeled, the nose striking the ground after a further 13 m, where the propeller and its reduction gear case separated and came to rest. The aeroplane continued some 24 m, colliding with the steep bank of a small stream and coming to rest inverted. After impact, an intense fire consumed much of the centre section.
- 1.12.3 All extremities of the aircraft were accounted for at the site. Although all control surfaces were present and functioned normally, pre-impact integrity of their respective control runs could not be completely verified because of fire damage to the cockpit controls. The flaps were found at the normal take-off setting of 20°.
- 1.12.4 The hopper outlet was found in the normal spreading position, albeit with damage to its control run. The superphosphate pattern on the ground was consistent with the jettison function having operated correctly, but evidently there had been insufficient time for the hopper to empty completely, as a considerable quantity of superphosphate remained aboard at impact.

1.12.5 The engine had been largely protected from fire damage by its immersion in the stream, and together with the propeller, was removed from the site for later examination.

1.13 Medical and pathological information

1.13.1 The post-mortem report concluded that the pilot died from head injuries sustained on impact.

1.13.2. There was no evidence of any pre-existing condition that would have affected the pilot's ability to operate the aircraft normally.

1.14 Fire

1.14.1 An intense fire erupted after impact and consumed most of the centre section fuselage, the left wing, and the inboard section of the right wing. Virtually all of the non-ferrous materials in these areas were melted or reduced to ash.

1.14.2 At the time of the accident there was up to 200 litres of fuel on board. It is likely that one or more fuel lines ruptured during ground impact and while the ignition source could not be established, there was enough disruption to the electrical system to have caused arcing at some point in the impact sequence.

1.15 Survival aspects

1.15.1 Although the pilot was restrained by a full harness, impact forces and the loss of occupiable space combined to render the accident unsurvivable.

1.15.2 An Artex ELT-110 emergency locator transmitter was fitted to the aircraft, but no ELT signal relating to this accident was reported as received. The ELT was not found in the wreckage and was presumed to have been destroyed by fire.

1.16 Tests and research

1.16.1 A sample of Jet A-1 fuel taken from the fuel tanker used at the airstrip was laboratory tested and found to be of acceptable quality with no apparent impurities.

1.16.2 The engine investigation was carried out by Pratt & Whitney Canada, under the supervision of an investigator from the Transportation Safety Board of Canada. It was found that the engine displayed contact signatures to its internal components characteristic of developing power at impact, probably in a high power range. There were no indications of any pre-impact anomalies or distress that would have precluded engine operation prior to impact.

1.16.3 The propeller assembly was dismantled and inspected at an overhaul facility. Blade and hub damage patterns indicated that the propeller was in the normal power-on operating range at initial impact.

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

- 1.18.1 Although the maximum standard category take-off weight limit specified in the aircraft Flight Manual is 2925 kg, the aeroplane was being operated in accordance with Flight Manual Supplement 1, which permits operation in the restricted category up to a maximum take-off weight of 3742 kg.
- 1.18.2 The basis for Supplement 1 is rule 137.103 *Maximum take-off weight*, which is read in conjunction with Appendix B to Part 137. Rule 137.103 provides, in part:
- (a) Notwithstanding part 91 ... each pilot performing ... an agricultural aircraft operation may take-off at a weight greater than the MCTOW prescribed in the aeroplane's flight manual if the pilot complies with the procedures listed in Appendix B.
- 1.18.3 Part 137 Appendix B prescribes the methodology for determining the percentage increase to the MCTOW, and lists the following factors to be taken into account by the pilot when considering whether to operate up to the new maximum take-off weight:
- (1) the pressure altitude of the aerodrome:
 - (2) the ambient temperature of the aerodrome:
 - (3) the runway surface type and condition:
 - (4) the runway slope in the direction of take-off:
 - (5) the headwind or tailwind in the direction of the take-off:
 - (6) any other factors that may affect the performance of the operation.
- 1.18.5 In any event, the calculation of any increased maximum take-off weight will be limited by the maximum structural hopper load of 1860 kg, which is prescribed in Section 2 *Limitations* of the Flight Manual.

1.19 Useful or effective investigation techniques

- 1.19.1 Nil.

2. Analysis

- 2.1 On-site and subsequent examination of the wreckage disclosed no pre-impact defect or condition in either the airframe or the engine that could have led to the accident. Similarly, there was no indication of any pre-accident condition affecting the pilot, although the post-mortem examination was somewhat limited by the effects of the post-impact fire.
- 2.2 There was nothing to indicate that the left turn after take-off was other than intentional. The flight path achieved suggests that the turn was commenced at

low level and that the aeroplane had not yet accelerated to a speed at which a steeply-banked level or climbing turn could be sustained.

- 2.3 It was calculated that, at a take-off weight of 3360 kg, stalling speed would be approximately 90 knots in a 60° banked turn. The Flight Manual recommends a lift-off speed (normal category) in the range 65-70 knots, and that the airspeed be allowed to increase to 75-80 knots before climb is commenced.
- 2.4 Although the loader driver's recollection was that conditions were calm when he saw the smoke from the accident, the possibility of a tail wind component during the aircraft's last departure off the strip could not be ruled out. The wind was described as a northerly drift, and if there had been a momentary tail wind component, the aircraft may have drifted closer to the terrain than the pilot had anticipated, necessitating the late load jettison and a steeper turn than expected.
- 2.5 The property owner's caution against a left turn was founded on a previous accident involving a Fletcher FU24, which descended and collided with the terrain after take-off. The proximity of terrain to the departure end of the strip precluded a left turn immediately after take-off; other options were to climb ahead to a suitable altitude then make a left turn, or to make a right turn through about 270°.
- 2.6 The aeroplane was being operated in the agricultural category, with loading beyond the normal category MCTOW permitted by Part 137 and Flight Manual Supplement 1. The pilot had evidently experienced no performance difficulties during the series of flights made prior to the accident flight, except the penultimate flight had required a partial load jettison after take-off. It is not known in which direction the aircraft was turned on that occasion.
- 2.7 There was nothing to suggest that the provisions of Part 137 and Flight Manual Supplement 1 had contributed to the accident, although some issues were identified for further consideration outside the scope of this investigation.
- 2.8 In light of the pilot's apparent disregard, for whatever reason, of a well-founded caution against turning left off the strip, no specific safety recommendations or actions resulted from this investigation.

3. Conclusions

- 3.1 The pilot was appropriately licensed, rated and fit for the flights being undertaken.
- 3.2 The aircraft had a valid airworthiness certificate and had been maintained in accordance with current requirements.
- 3.3 No pre-accident defect was found with the aircraft.
- 3.4 The pilot had turned left after take-off from the strip, against the advice of the property owner.
- 3.5 The advice was given in light of a previous accident in virtually identical circumstances.

- 3.6 There was insufficient space available after take-off for the aeroplane to accelerate to a speed at which the bank angle necessary to clear the terrain could be sustained in level flight or a climb.
- 3.7 The accident was not survivable.

Report written by:

Authorised by:

(Signed)

J Alan Daley
Safety Investigator
6 March 2003

(Signed)

Richard White
Manager Safety Investigation