CIVIL AVIATION AUTHORITY OF NEW ZEALAND

AIRCRAFT ACCIDENT REPORT

CAA OCCURRENCE NUMBER 08/5163

PACIFIC AEROSPACE CRESCO 08-600

ZK-LTC

TARATA, NEAR INGLEWOOD

14 DECEMBER 2008

Photograph courtesy of Rob Tucker Photography

FOREWORD

Aviation safety investigations are conducted in New Zealand pursuant to New Zealand's international obligations under the Convention on International Civil Aviation 1944, commonly known as the Chicago Convention. Pursuant to Articles 26 and 37 of the Convention, the International Civil Aviation Organisation (ICAO) has issued Annex 13 to the Convention setting out International Standards and Recommended Practices for the investigation of aircraft accidents and incidents. Paragraph 3.1 of Annex 13 describes the sole objective of the investigation of accidents and incidents:

> *3.1 The sole objective of the investigation of an accident or incident shall be the* ***prevention*** *of accidents and incidents. It is* ***<u>not</u>*** *the purpose of this activity to* ***apportion blame or liability****.*

This philosophy of prevention for the future promotion of aviation safety is reflected in New Zealand domestic law through the provisions of the Civil Aviation Act and Part 12 of CARs.

CAA accident investigations are conducted in accordance with ICAO guidelines. The objective of investigations is the prevention of accidents by determining the contributing factors or causes and implementing appropriate preventive measures – in other words, restoring safety margins to provide an acceptable level of risk.

The focus of CAA safety investigations is to establish the causes of the accident on the balance of probability. Accident investigations do not always identify one dominant or 'proximate' cause. Often, an aviation accident is the last event in a chain of events or factors, each of which may contribute, to a greater or lesser degree, to the final outcome.

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Glossary of abbreviations used in this report:

amsl	above mean sea level
ARA	Annual Review of Airworthiness
CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
CPL	Commercial Pilot Licence
E	east
ELT	Emergency Locator Transmitter
GPS	Global Positioning System
Hrs	hours
kg	Kilogram(s)
m	Metre(s)
MHz	Megahertz
NZDT	New Zealand Daylight Time
S	south
UTC	Coordinated Universal Time
VHF	Very high frequency
WGS 84	World Geodetic System 1984

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AIRCRAFT ACCIDENT REPORT

CAA OCCURRENCE No. 08/5163

Aircraft type, serial number and registration:	Pacific Aerospace Corporation Limited Cresco 08-600, 020, ZK-LTC
Number and type of engines:	1 Pratt & Whitney Canada PT6A-34AG
Year of manufacture:	1997
Date and time:	14 December 2008, 1155 hours[1] (approximately)
Location:	Tarata Latitude[2]: S39° 08.169' Longitude: E174° 21.710' Elevation 410 feet amsl
Type of flight:	Agricultural – Topdressing
Persons on board:	Crew: 1
Injuries:	Crew: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot's licence:	Commercial Pilot Licence (Aeroplane)
Pilot's age:	48 years
Pilot's total flying experience:	12,100 hours (approximately)
Information sources:	CAA field investigation
Investigator in Charge:	Mr C P Grounsell

[1] Times are NZDT (UTC + 13 hours)

[2] WGS 84 co-ordinates.

Synopsis

The CAA was notified of the accident at 1300 hours on Sunday 14 December 2008. The Transport Accident Investigation Commission was notified shortly thereafter but declined to investigate. A CAA site investigation was commenced the next day.

The aircraft was engaged in topdressing operations from a farm property near Tarata, approximately 14 nautical miles south-east of New Plymouth Aerodrome. The aircraft loader driver became concerned when the aircraft had not returned to the airstrip after the usual flight duration of approximately three minutes. The loader driver tried to call the pilot on the radio but received no response. He then went in search of the aircraft and, after climbing a small hill, saw that the aircraft had suffered an accident approximately 600 metres from the departure end of the airstrip. A farm worker who was first on the scene found that the pilot had not survived the accident.

1. Factual information

1.1 History of the flight

1.1.1 On Sunday 14 December 2008, the aircraft departed from Stratford Aerodrome at 0630 hours for a transit flight to a farm airstrip near Tarata. Shortly after becoming airborne the pilot noticed the engine chip detector warning light[3] on the instrument panel was illuminated. He diverted to the company maintenance base at Wanganui aerodrome for the defect to be rectified. The aircraft engineer found a light metallic fuzz on the engine magnetic (mag) plug. The fuzz was cleaned off and the mag plug refitted. The aircraft was released to service with a condition that a further inspection of the mag plug was to be performed after 10 hours flight time.

1.1.2 The topdressing job, which involved the spreading of 450 tonnes of lime, had commenced on Thursday 11 December 2008 and continued on Friday 12 December 2008. No flying took place on Saturday 13 December 2008 due to a local horse-riding event being held on the farm property.

1.1.3 The aircraft arrived at the farm airstrip at 0940 hours on the Sunday morning, and shortly thereafter commenced operations to complete the spreading of the lime. At the time of the accident, 423 tonnes of lime had been spread.

1.1.4 The pilot flew a series of topdressing flights before needing to stop for the first refuel.

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[3] The magnetic field of a chip detector magnetic plug is designed to capture metallic (ferrous) debris particles in the engine oil system which can bridge a gap between two electrodes. This bridging acts as a switch for a "chip" light to warning the pilot of a possible impending mechanical failure.

1.1.5 When interviewed, the loader driver stated that the pilot informed him that he was having some difficulty with the lime product not flowing consistently from the aircraft hopper during the sowing runs.

1.1.6 At approximately 1145 hours the pilot stopped again to refuel. On completion of the refuel, this gave the aircraft an estimated fuel load of 300 litres.

1.1.7 The pilot completed a further two flights.

1.1.8 On the third flight, the aircraft became airborne at the end of the airstrip and then descended 55 feet below the level of the airstrip where the aft fuselage struck a fence line.

1.1.9 A concentration of lime along the aircraft's take-off path indicated that the pilot had initiated an attempt to jettison his load at the end of the airstrip.

1.1.10 Following the collision with the fence, the aircraft remained airborne for a further 450 metres before it impacted the side of a small hill in a slight nose down attitude. The aircraft then came to rest 12 metres to the left of the initial impact point.

1.1.11 The accident occurred in daylight, at approximately 1155 hours NZDT, at Tarata, at an elevation of 410 feet amsl. Latitude: S39° 08.169', longitude: E174° 21.710'.

1.2 Injuries to persons

Injuries	***Crew***	***Passengers***	***Other***
Fatal	1	0	0
Serious	0	0	0
Minor/None	0	0	

Table1: Injuries to Persons

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 Seven metres of fence were damaged by the aircraft.

1.5 Personnel information

1.5.1 The pilot held a valid CPL (Aeroplane) and Class 1 Medical Certificate. He had approximately 12,100 hours total flight time and was experienced on type.

1.5.2 The pilot had flown approximately 110 hours in the previous 90 days.

1.5.3 On the day of the accident, he was reported by the loader driver to be in good spirits and looking forward to completing the work, after which he was scheduled to take an extended leave break.

1.6 Aircraft information

1.6.1 Cresco 08-600, serial number 020 was manufactured in New Zealand by Pacific Aerospace Corporation Limited in 1997, and registered as ZK-LTC. The CAA issued the aircraft with a non-terminating Airworthiness Certificate in the Agricultural category.

1.6.2 The aircraft was powered by a Pratt & Whitney Canada PT6A-34AG gas turbine engine driving a Hartzell HC-B3TN-3D constant-speed, full-feathering, reversing propeller. Up to 14 December 2008 the aircraft had accrued 8220 hours of flight time. The engine had been installed in the airframe on 9 October 2003 and had accrued 3272 hours of flight time and 33,147 cycles. The propeller was installed on 27 July 2006 and had accrued 1375 hours of flight time since overhaul.

1.6.3 The most recent scheduled maintenance was a 100-hour inspection and ARA, which had been carried out on 6 November 2008, after which the aircraft was released to service.

1.6.4 At the time the ARA was carried out, the aircraft had an incorrect type of ELT fitted, this discrepancy was not detected during the ARA process.

1.6.5 The aircraft was fitted with a standard type hopper, for which the prescribed maximum structural load was 1860 kg.

1.6.6 The weight of the aircraft on take-off was estimated to be 3597 kg which is 145 kg below the maximum agricultural overload allowable weight of 3742 kg. This take-off weight included 250 litres of Jet A1 fuel and 1900 kg of lime.

1.6.7 The centre of gravity for the aircraft was determined by calculation to be very close to the aft limit.

1.7 Meteorological information

1.7.1 The Taranaki area was being influenced by a trough of low pressure which covered New Zealand. Low pressure weather systems were located to the west and east of the country. The weather system to the west, with associated strong north-easterly winds and rain, was forecast to move over the country in the early hours of 15 December, the day after the accident.

1.7.2 The actual weather conditions at the airstrip were described by the loader driver as a light north-easterly breeze, good visibility with a few clouds, and a temperature estimated to be between 21 and 25 degrees Celsius.

1.7.3 Meteorological data obtained from New Plymouth Aerodrome indicated that the wind was a light northerly of 10 knots at the time of the accident. The wind direction had changed at approximately 1130 hours from a north-easterly to a northerly. The wind then backed to a north-westerly at 1330 hours. The accident site was located 14 nautical miles to the south-east of New Plymouth Aerodrome, so would most likely have been affected by the wind changes shortly after those times.

1.8 Aids to navigation

1.8.1 Not applicable.

1.9 Communications

1.9.1 Although there were VHF communications available between the loading vehicle and the pilot, no transmissions were heard during the accident flight.

1.10 Aerodrome information

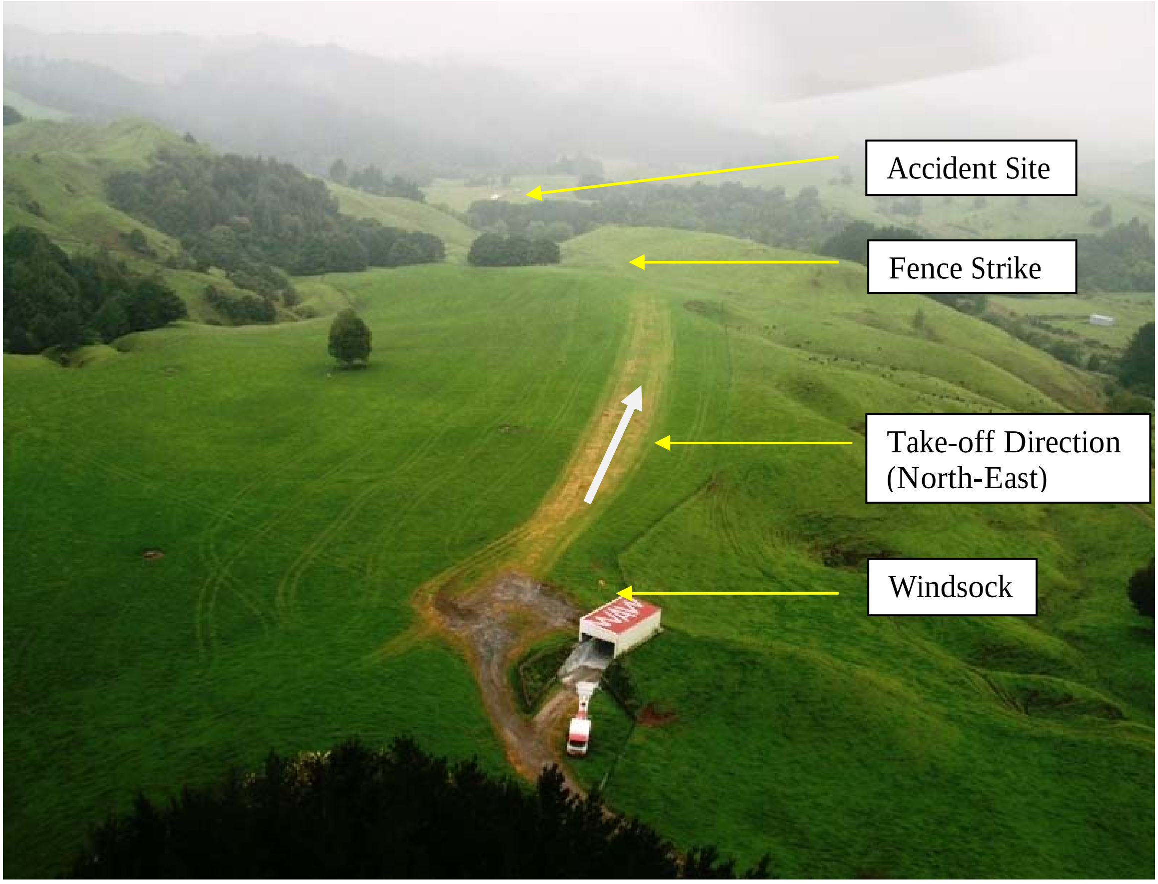

Figure 1: Airstrip Overview

1.10.1 The grassed airstrip runs the length of a small ridge with an elevation of 410 feet amsl. The airstrip is 390 metres in length with a take-off direction towards the north-east. The airstrip surface was generally firm, however some isolated soft patches were observed where the aircraft wheels had broken through the grass layer during the previous flights. The initial 70 metres of the airstrip from the loading area had a down-slope of five degrees. The strip then sloped at a lesser angle to the half-way mark, from where the remainder of the strip was level.

1.10.2 A small windsock had been placed adjacent to the loading area on the southern side of the airstrip to indicate wind direction and velocity to the pilot – see Figure 1.

1.10.3 There is rising ground in the form of a small hill approximately the same height as the airstrip 150 metres from the departure end. There is also rising ground to the north and north-west.

1.10.4 At the departure end of the airstrip the ground sloped downward at an angle of 11 degrees for about 20 metres. The terrain then levelled out before sloping away down a small gully which was orientated 20 degrees to the left of the take-off path. It is common practice when using this airstrip for pilots to turn left after take-off to follow the small gully to avoid the high ground directly off the end of the airstrip.

1.10.5 A seven-strand wire fence which formed one of the boundaries of the airstrip paddock was located 110 metres from the end of the airstrip. Running perpendicular to this, and 40 metres further on, was another fence which the aircraft had struck. This fence was orientated roughly in line with the aircraft's flight path.

1.11 Flight recorders

1.11.1 Although not fitted with a dedicated flight data recorder, the aircraft was equipped with a Satloc SL1500 Swathstar GPS guidance system that recorded GPS-derived track data from the previous flights. The system provided ground speed, altitude, aircraft track, and also indicated when the pilot operated the sowing/jettison lever. Because power was abruptly removed from the unit during the accident, data for the accident flight was not stored on the unit's memory card so it was unable to be recovered for that particular flight. Data for previous flights however was able to be recovered.

1.12 Wreckage and impact information

1.12.1 Prior to the impact with the fence, the aircraft had turned slightly left after descending off the end of the airstrip. A lime trail, consistent with the hopper contents being jettisoned, commenced 15 metres from the end of the airstrip. The trail continued past the initial point of the fence strike and was visible in an irregular pattern to approximately 500 metres from the end of the airstrip.

1.12.2 Along the fence line paint flakes, fibreglass, and small pieces of aluminium were found. The paint flakes and aluminium were identified as coming from the aft lower fuselage of the aircraft just forward of the tail bump stop. The small piece of fibreglass was matched to the tail-cone of the aircraft.

Figure 2: Damage to aft fuselage caused by fence strike

1.12.3 The aircraft remained airborne after the fence strike for some 450 metres until it impacted rising ground.

1.12.4 Photographic evidence taken prior to the aircraft being disturbed by the rescue team showed the airspeed indicator needle stuck at the 80 knots position.

1.12.5 Visible ground impact marks were made by the aircraft's nose section, leading edges, and main wheels. The fuel tanks in the leading edges of the wings had ruptured on ground impact, and extensive fuel spray was evident fanning out from the impact point to a distance of 20 metres in front of the aircraft wreckage.

1.12.6 The hopper box was found separated from the aircraft at the initial impact point with an accumulation of lime in this area. It was not possible to determine the position of the hopper doors at impact due to the extent of damage to the hopper box and associated operating mechanism.

Figure 3: Accident Site

1.12.7 After initial ground impact, the aircraft had slewed to the left by 12 metres before finally coming to rest. The outer wing panels had detached from their rear mounts and had slewed forwards. The engine reduction gearbox with propeller attached had almost completely separated from the engine, and was at a 90 degree angle to the right of the aircraft. The tail section was attached but displaced to the right where the fuselage had buckled forward of the tail assembly, possibly due to being weakened by the fence strike and impact forces.

1.12.8 All parts of the aircraft were accounted for and the integrity of the flight controls and respective control runs was confirmed. The flaps were in the up (retracted) position with the flap lever in the 30 degree (full down) position. Impact marks on the underside and trailing edge of the flaps suggest that they were down at the time of impact. The flaps and associated operating mechanism were damaged by the main undercarriage wheel assemblies during the accident sequence.

1.12.9 Although the pilot had attempted to jettison all or part of the load after take-off, approximately 150 kg of lime product remained in the hopper. The hopper sowing lever was found in the full jettison position.

1.12.10 There was major structural deformation of the fuselage forward of the wing. The occupiable space in the cockpit area between the seat and aircraft firewall had been significantly reduced.

1.12.11 The engine, which had remained attached to the aircraft, was removed from the site with the propeller for further examination.

1.13 Medical and pathological information

1.13.1 Post-mortem report concluded that the pilot died of injuries consistent with a high-energy impact.

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

1.13.3 The results of toxicological testing showed no alcohol or drugs present in the blood.

1.14 Fire

1.14.1 Fire did not occur.

1.15 Survival aspects

1.15.1 Although the pilot was restrained by a full harness and was wearing a helmet, the impact forces were not survivable.

1.15.2 The pilot was wearing a MSA Gallet LH 250 helmet at the time of the accident. During the accident sequence the helmet had come off the pilot's head due to failure of one of the plastic strap attachments on the side of the helmet. The helmet was considered to have provided useful protection to the pilot as evidenced by the impact damage to the helmet shell and lack of any head injury to the pilot.

1.15.3 The aircraft was fitted with an Artex ELT-200 ELT operating on 121.5 and 243.0 MHz, which activated on impact. While not enabling detection by satellite, the ELT was able to be located by the rescue helicopter. In accordance with Civil Aviation Rules, a 406 MHz ELT was required to be fitted from 1 July 2008, this had not been done by the operator.

1.16 Tests and research

1.16.1 A sample of Jet A1 fuel was taken from the left rear aircraft fuel tank and also from the fuel tank on the loader vehicle. Both samples were clean and bright, with no water detected.

1.16.2 The chip detector light bulb was removed and examined under a microscope. It showed no signs of hot stretch and therefore was most probably not on at the time of the accident.

1.16.3 An engine investigation was carried out by the engine manufacturer Pratt & Whitney Canada under the supervision of the Transport Safety Board of Canada.

It was found that the engine was developing power at impact, probably in the mid- to high-power range.

1.16.4 The propeller assembly was dismantled and inspected at a maintenance facility. Blade and hub damage indicated that the propeller was in the low to reverse thrust range at the time of impact.

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

1.18.1 Although the maximum take-off weight limit specified in the aircraft flight manual is 2925 kg, the aircraft was being operated in accordance with Flight Manual Supplement 1, which permits operation up to a maximum take-off weight of 3742 kg under the provisions of CAR Part 137, Appendix B.

1.18.2 Supplement 1 provides the following information:

Maximum Take-off Weight
Caution: The maximum take-off weight is not appropriate for all operations. In determining whether to operate up to the maximum take-off weight the pilot shall take the following factors into account:

1. *Airstrip pressure altitude and ambient temperature*
2. *Airstrip surface condition and slope*
3. *Airstrip wind conditions*
4. *Required post take-off climb gradient*
5. *Aircraft configuration*
6. *Jettison characteristics of the material being dispensed.*

1.18.3 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 Aircraft Flight Manual.

1.18.4 With regard to aircraft take-off performance, the Aircraft Flight Manual Supplement 1 provides the following guidance:

Take-off Performance
The basic flight manual does not contain performance data for weights above 2925 kg. The Maximum Take-off weight permissible under CAR Part 137 is not appropriate for all operations. In determining whether to operate up to the maximum take-off weight, the pilot shall take the following factors into account:
Note: These factors are as listed 1 to 6 in Para 1.18.2 above.

1.19 Useful or effective investigation techniques

1.19.1 Not applicable.

2. Analysis

2.1 Up to the time of the accident, the pilot had spread 423 tonnes of lime. Given the total documented flight time, and the number of flights carried out for the job so far, this indicated an average load of 1950 kg of lime per flight had been carried. The pilot was in the final stages of completing the topdressing job and it was estimated that he had a further 15 flights to spread the remaining lime product. Based on the previous flight times, this would have been completed within an hour.

2.2 At the completion of the topdressing job, the pilot was to return the aircraft to Wanganui Aerodrome. Once this had been completed, the pilot was scheduled for an extended period of leave commencing the following day.

2.3 The meteorological conditions changed during late morning with the wind backing to the north to north-west. Due to the effects of the local terrain, this could have introduced some tail-wind component and turbulence during take-off and climb out. The forecast for the following day was poor with the approach of a low pressure system from the west with associated wind and rain.

2.4 Given that the pilot would have been aware of the deteriorating weather conditions forecast for the next day, and that the wind was going to be less favourable during that afternoon, he could possibly have been under some self-imposed time pressure to get the job completed.

2.5 The Satloc data retrieved from the previous flights carried out within the 45 minutes preceding the accident showed that the pilot had needed to jettison some or all of his entire load on three occasions to achieve the required aircraft performance. Data also showed that on some of those flights the aircraft had descended by 26 feet after take-off before commencing a climb. This could indicate that the aircraft was overloaded for the current conditions. Earlier Satloc data indicated that the pilot had not been having any difficulty with his aircraft's performance as he was achieving a positive rate of climb after take-off and he did not need to jettison any of the load.

2.6 Tyre tracks on the airstrip surface showed that the aircraft had been using the full airstrip length of 390 metres to become airborne.

2.7 Due to the lack of take-off performance data contained in the Aircraft Flight Manual, it was not possible for the pilot to accurately calculate the take-off distance required while operating at take-off weights in excess of 2925 kg.

2.8 The windsock was positioned adjacent to the loading area on the south side of the airstrip. In this location the windsock would have provided very little useful information to the pilot for take-off and landing. Discussions with experienced agricultural pilots indicated that it would have been more useful to have the windsock located approximately one half to two thirds of the way along the airstrip. This position would give the pilot more useful and reliable wind information during the critical part of the take-off and landing phases of flight.

2.9 It was evident from the concentration of lime along the aircraft's take-off path that the pilot had begun to jettison his load from the end of the airstrip. The trail continued to the fence that the aircraft struck, the heaviest concentration of lime being found just prior to the fence.

2.10 The hopper still contained approximately 150 kg of lime at the accident site. This could have been due to:

(a) the pilot manipulating the sowing lever to gain some form of aircraft pitch control,

(b) the aircraft pitching in both negative and positive 'g' manoeuvres after striking the fence affecting the flow of lime,

(c) the lime 'hanging up' in the hopper, or

(d) insufficient time for the hopper contents to empty due to the short flight duration.

2.11 When interviewed, the loader driver stated that the lime being sown would not flow from the hopper evenly. Photographs taken by a professional photographer four days prior to the accident indicate that the lime was not flowing evenly during a heavy spreading sequence. The flow quality of the lime as indicated would have had a detrimental effect on the pilot's ability to effectively jettison the load. It may not have met the requirement for the pilot to be able to jettison 80% of the load within five seconds as required by CAR Part 137.103, but this could not be determined.

2.12 The aircraft damaged approximately seven metres of the fence line, snapping numerous fence battens and two fence posts, including one twenty centimetre round post.

2.13 The collision with the fence damaged the lower aft fuselage, jamming the elevator control cable system with the elevator deflected in an aircraft nose-up position. That would have severely limited the pilot's ability to control the aircraft. There was also major structural damage to the fuselage section immediately forward of the tail fin and elevator.

2.14 With a jammed elevator, the pilot's options for controlling the aircraft in pitch attitude could have included varying the engine power setting, altering the flap position, and possibly reducing the hopper load.

2.15 The aircraft struck rising ground mid-way up a small hillside. To the left of the rising ground was a flat paddock which would have been suitable for an emergency landing. At the top of the small hill was an open area which also could have been used to land the aircraft. This is possibly what the pilot was attempting to do. Due to the damage received in the fence strike, the pilot most likely had insufficient control to achieve a safe forced landing.

2.16 The aircraft was fitted with an unapproved type of ELT. The 121.5/243.0 MHz ELT should have been replaced prior to 1 July 2008 with a 406 MHz type. This discrepancy should have been identified and corrected before the aircraft was released for service when the ARA was completed in November 2008. Technically the aircraft was not serviceable to fly at the time of the accident as it did not comply with CAR 91.529 which required the 406 MHz ELT to be fitted.

2.17 The aircraft's ELT activated correctly on impact but the signal was not detected by satellite as the 121.5 MHz frequency was no longer being monitored. The ELT aerial had broken off in the impact leaving three centimetres above the base. The rescue helicopter was still able to track the weak 121.5 MHz signal as it approached the accident site. The fact that the aircraft had the incorrect ELT fitted, did not on this occassion adversely affect immediate rescue efforts.

2.18 Under the agricultural overload provisions in CAR Part 137, the pilot was able to operate the aircraft up to 28% over the maximum certificated take-off weight of 2950 kg. This gives the Cresco aircraft a maximum take-off weight of 3742 kg. At the time of the accident it was calculated that the aircraft all-up weight was 3597 kg, which was 145 kg below the maximum allowable weight.

2.19 Information gained from the pilot's work diary shows that the average weight of the loads for the work completed up until the time of the accident was 1950 kg. As this is an average of the loads completed, some of the load weights would have been in excess of this figure. This meant that the hopper maximum structural load would have been exceeded. Operating in excess of the maximum structural hopper loading puts excessive stress on the hopper support structure and long term has been shown to lead to fatigue and cracking of the structure.

2.20 Damage to the propeller and engine controls indicated that the pilot had selected Beta (ground range) and possibly reverse pitch prior to impact. This would most likely have been due to the pilot's efforts to slow the aircraft prior to impact with the ground. Supporting evidence for this is a photo taken prior to the aircraft being disturbed by the rescue team which shows the airspeed indicator needle stuck at the 80 knot position.

2.21 The engine was removed and sent to Pratt & Whitney Canada for strip and evaluation. Pratt and Whitney concluded that the engine was operating normally and producing power at the time of impact in the middle to high power range. There were no indications of any pre-impact mechanical anomalies or dysfunction of any of the components that would have prevented full power being produced by the engine.

2.22 When examined, the chip detector light bulb showed no signs of hot stretch which would have been expected to occur if the chip light had been on at the time of impact. This indicates that the pilot did not have a recurrence of the chip light that he had encountered at the start of the day.

3. Conclusions

3.1 The pilot was appropriately licensed, held the appropriate Medical Certificate, was experienced and fit to carry out aerial topdressing operations.

3.2 The aircraft had been operating normally from the airstrip up to the time of the accident.

3.3 The aircraft descended after take-off and struck a fence. The collision with the fence damaged the elevator control cable system which jammed the elevator control surface. This resulted in the pilot being unable to adequately control the aircraft in pitch, and the aircraft subsequently struck the ground.

3.4 The aircraft was loaded with 1900 kg of lime product on the accident flight, this was in excess of the 1860 kg maximum structural hopper load. No variation above the maximum structural hopper load is allowed for in CAR Part 137. The aircraft's all-up weight at the time of the accident was under the maximum allowed under the overload provisions of CAR Part 137 by 145 kg.

3.5 The Aircraft Flight Manual does not provide take-off performance data for operation over the maximum certificated take-off weight and up to the maximum agricultural weight as allowed by CAR Part 137.

3.6 A change in wind direction had occurred in the late morning which may have presented the pilot with a slight tail-wind or possible low level turbulence, including down draught conditions, during and after take-off.

3.7 The windsock was not in the most suitable position to indicate the wind conditions to the pilot.

3.8 Partial or full load jettisons had taken place on previous flights, indicating that the pilot was having difficulty achieving the required aircraft performance during or after take-off.

3.9 On the accident flight, the aircraft was probably overloaded for the prevailing environmental conditions.

3.10 The reported poor flowing qualities of the lime product being spread may have hampered the pilot's efforts to jettison the load after take-off. The effectiveness of the jettison may have also been reduced by the downward flight path of the aircraft on leaving the end of the airstrip. It is unlikely that the pilot could comply with the CAR Part 137.103 requirement to jettison 80% of the load within five seconds.

3.11 The possibility of a pre-existing airframe or engine defect that could have contributed to the accident was eliminated as far as practicable by the investigation.

3.12 The ELT fitted to the aircraft was no longer an approved type, therefore the aircraft was not airworthy in accordance with CARs. The ELT was incapable of being detected by satellite and therefore would not automatically alert rescue services, however, this did not hamper rescue efforts in this accident.

3.13 The accident was not survivable.

4. Safety actions

4.1 In consultation with the agricultural aviation industry the CAA is currently completing an extensive review of CAR Part 137. This review will address, amongst other matters, the performance and operation of agricultural aircraft in an overload condition. The Notice of Proposed Rulemaking and the rewrite of the Advisory Circular and applicable CAR are nearing completion. Once complete, CAR Part 137 will require aircraft performance data to be contained in the Aircraft Flight Manual, and specific aircraft performance requirements to be met when the aircraft is being operated over the maximum certificated take-off weight.

4.2 During the course of the investigation, the non-compliance with CAR 91.529 (ELT) was raised with the operator and Finding Notice 10F845 was issued. Subsequently the operator has advised that all other aircraft operated by the company comply with CAR 91.529.

4.3 CAA Safety Action Recommendation (No. 10A989) was raised on 30 November 2009 for the CAA Rotary Wing Unit to advise agricultural pilots and operators as to the best practice with regard to the placement of the windsock(s) to provide the best possible wind information to pilots when operating from remote airstrips.

Report written by:

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Safety Investigator

Authorised by:

Peter Kirker
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Date: 29 January 2010

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