Australian Government
Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Aviation Occurrence Investigation – AO-2007-037
Preliminary

Collision with terrain
24 km S Tully, Qld – 16 August 2007
VH- XMN
Pacific Aerospace Corporation Cresco 08-600

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Collision with terrain – 24 km S Tully, Qld, 16 August 2007, VH-XMN, Pacific Aerospace Corporation Cresco 08-600

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Figure 1 satellite image of accident location courtesy of Google Earth

Figure 2 photograph of VH-XMN courtesy of Nick Dean.

Figure 3 last radar return image provided by Airservices Australia PC-replay

Abstract

The aircraft was reported missing and was subsequently discovered to have collided with terrain

The investigation is continuing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

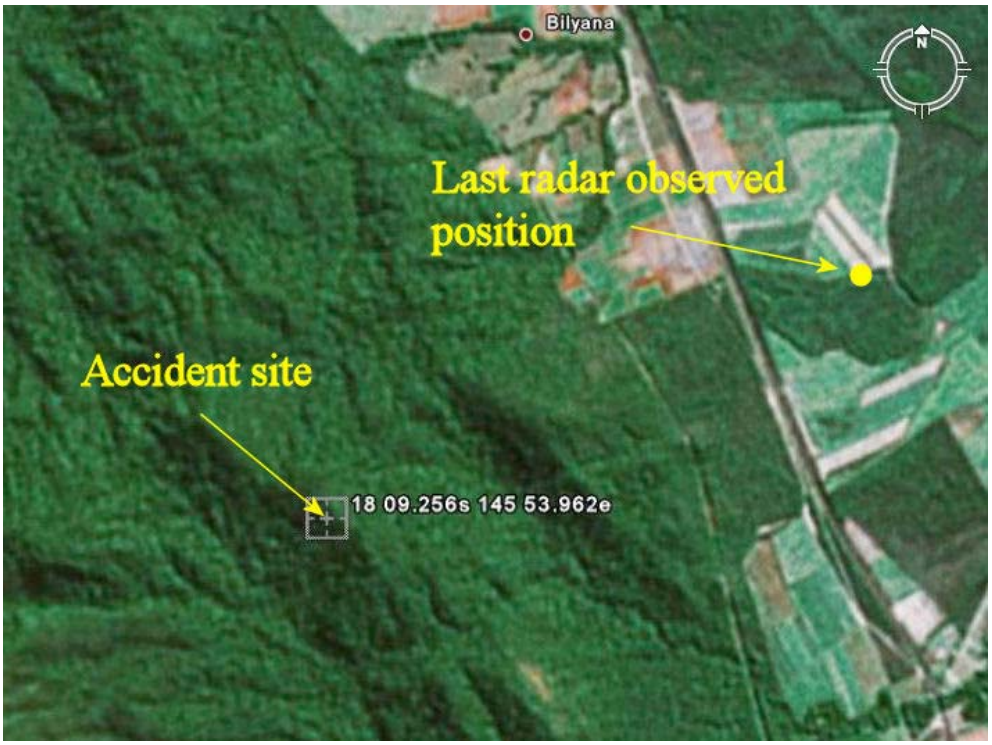
FACTUAL INFORMATION

History of the flight

On 16 August 2007 at about 1445 Eastern Standard Time[1], the pilot of a Pacific Aerospace Corporation Cresco 08-600 (Cresco) aircraft, registered VH-XMN, departed Ingham, Qld on a private flight to Tully, Qld.

The purpose of the flight was to return the aircraft to the operator's base at Tully after completion of some non-scheduled aircraft maintenance. The aircraft was being operated under the visual flight rules (VFR) in non-controlled airspace and the pilot was the sole occupant. The aircraft did not arrive at Tully and the pilot and aircraft were not reported missing until 17 August. Subsequent searches located the aircraft wreckage on the morning of 18 August. The aircraft had impacted mountainous terrain in a state forest 24 km south of Tully (Figure 1). The pilot was fatally injured and the aircraft was destroyed.

Figure 1: Satellite image of accident location



1 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST), as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

Aircraft information

The aircraft was manufactured in New Zealand in 2004 and was first registered in Australia in July 2004. It was powered by a single Pratt and Whitney Canada PT6A-34 turboprop engine and was fitted with a three-bladed Hartzell propeller. The total time in service for both the airframe and engine prior to the accident flight was 2,617 hours.

The aircraft had been maintained in accordance with the aircraft manufacturer's specifications and there were no outstanding or overdue maintenance requirements. The aircraft had a valid maintenance release that permitted day VFR operations only.

The aircraft had been equipped with the type of instrumentation required for a private category flight under the instrument flight rules (IFR). There were two global positioning system (GPS) receivers on board the aircraft. One was a panel mounted receiver and the other was a portable receiver, which was located in the pilot's bag.

The non-scheduled maintenance carried out at Ingham consisted of work to service and replace parts to correct a reported nose wheel shimmy. Also completed at that time was a scheduled dynamic propeller balance, which was found to be within specified limits.

The aircraft was refuelled at Tully prior to being flown to Ingham for the maintenance. It was reported that there was 422 litres of fuel on board at that time. The aircraft had a maximum usable fuel capacity of 499 litres. Flight time between Ingham and Tully was reported to be approximately 22 minutes.

Figure 2: VH-XMN

Pilot information

The pilot had been issued a Private Pilot (Aeroplane) Licence (PPL) in November 2003 and he had obtained an endorsement on Cresco aircraft in October 2006.

At the time of the accident, he had accumulated 397.1 total flying hours with 138.9 hours in Cresco aircraft, including 24.9 hours in VH-XMN. The logged Cresco hours had also included about 55 hours under supervision.

The majority of the pilot's flying hours had been gained while conducting parachute jumping operations. The pilot was also an experienced parachute instructor and was reported to have made over 10,000 jumps.

The pilot's licence allowed for day VFR operations only. The only entry in the pilot's log book for any instrument flying training was for 2.4 hours, as part of his PPL training, in 2003.

The pilot held a current Class 2 medical certificate and was reported to have appeared to have been fit, healthy and well rested on the day of the accident flight.

His logbook indicated that he had flown the Ingham to Tully route only once before, in a Cessna 182, in November 2006.

The pilot did not submit a flight plan for the flight, nor was there any requirement to do so. There was also no record of the pilot having provided any other flight notification such as a SARTIME[2] or Flight Note. The *Aeronautical Information Publication* (AIP) required pilots of VFR flights operating within a Designated Remote Area (DRA) to submit one of those two forms of notification. A flight from Ingham to Tully was within a DRA.

Recorded information

The aircraft was fitted with a serviceable Mode 3A and Mode 3C secondary surveillance radar (SSR) transponder. Later examination of the aircraft wreckage determined that the transponder had been selected to ALT (altitude), which allowed the transmission of altitude information. The AIP advised that unless assigned a discrete code, civil VFR flights outside of controlled airspace should squawk code 1200.

During the initial stages of the search for the missing aircraft, a review of Airservices Australia recorded radar data was conducted. While low-level radar coverage between Ingham and Tully was limited, one unidentified code 1200 radar track was observed for a short period in the area. Based on the time of that radar track and witness reports, it was considered that this was probably VH-XMN.

That return first appeared on radar at 1511:22, 11.7 NM (21.7 km) south of Tully on a westerly heading. The aircraft then appeared to commence a turn, initially towards the south and then onto a south-westerly heading. The aircraft disappeared from radar and the last observed radar return at 1512:26 (Figure 3) was later calculated to be 1.8 NM (3.3 km) from the accident site (Figure 1) with an approximate groundspeed of 113 kts.

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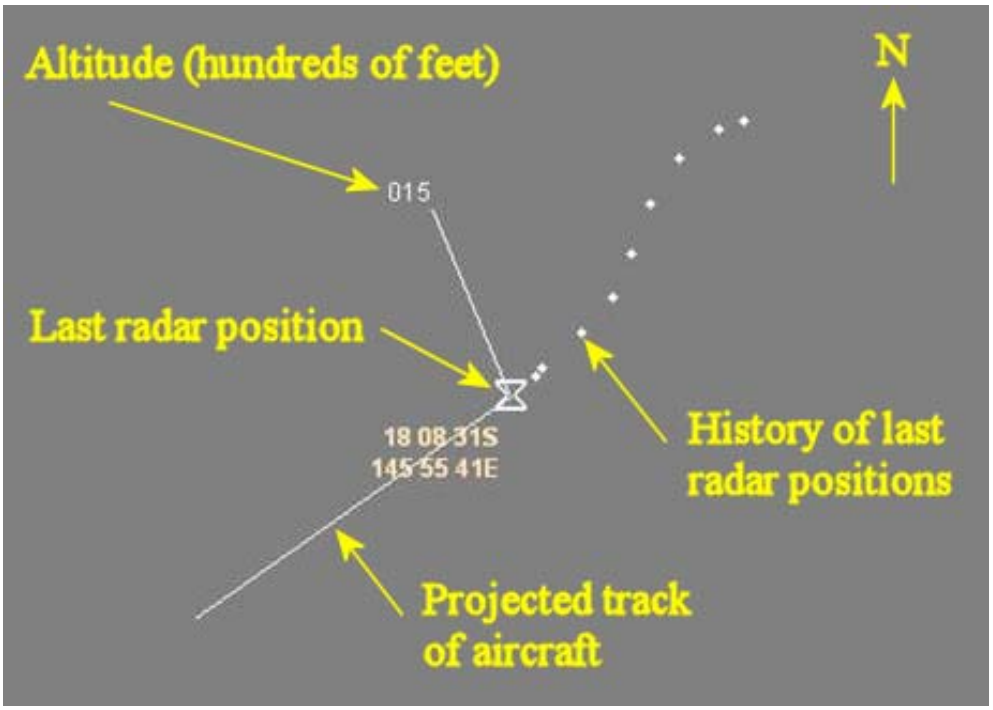
2 The time nominated by a pilot to Air Traffic Services staff for the initiation of search and rescue action if a report has not been received by the nominated unit. An alternative is to leave a Flight Note containing relevant flight information with a responsible person, to alert search and rescue staff if the flight is overdue.

While the aircraft's Mode C altitude had not been verified[3], the aircraft's radar returns indicated an initial climb from 1,800 ft above mean sea level (AMSL) to 2,400 ft before a descent to 1,500 ft. The descent rate was calculated to be about 1,800 ft/min before the aircraft disappeared from radar.

Figure 3: Last radar position of unidentified aircraft at time 1512:16

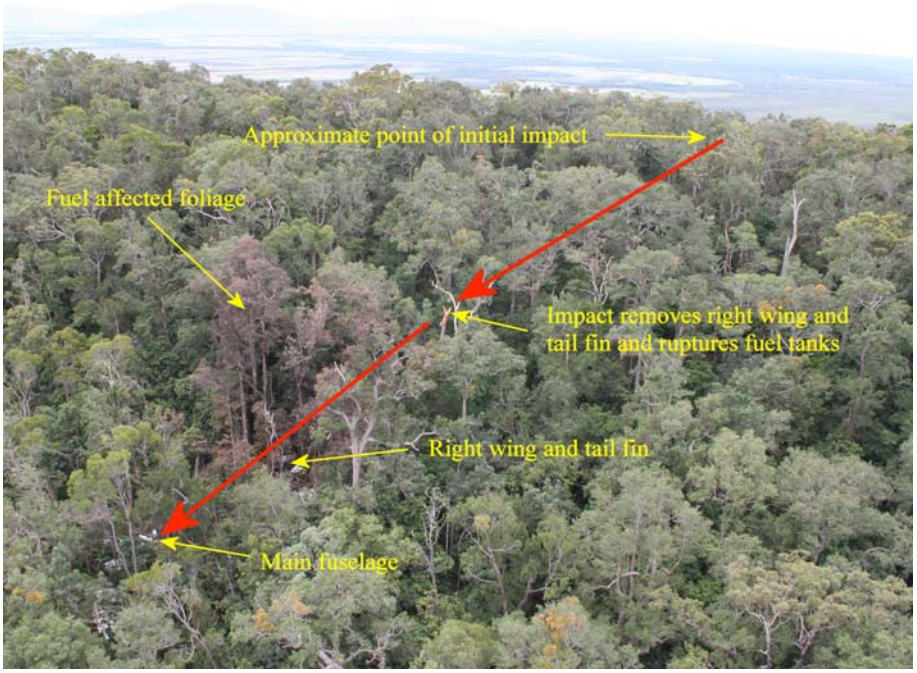


Wreckage and impact information

The aircraft initially impacted large trees near the top of a ridge line at an elevation of 1,279 ft AMSL. The outer section of the left wing was separated and the aircraft continued forward on a bearing of approximately 260 degrees magnetic. It collided with a number of smaller trees, causing additional damage, before impacting with another large tree. At this point, the outer and middle sections or the right wing, together with the tail fin separated from the fuselage. The impact forces also ruptured the fuel tanks and distributed fuel forward over a large section of the forest (Figure 4).

3 Verification is the process of Air Traffic Services staff checking the observed Mode C pressure altitude-derived level information with a pilot report of the altimeter-derived level information to ensure its accuracy.

Figure 4: Wreckage trail



The final impact angle was calculated to be approximately 45 degrees. The forward section of fuselage together with the engine, inner section of both wings, horizontal stabiliser and rudder came to rest on a large rock (Figure 5).

Figure 5: Forward fuselage and engine resting on a large rock

Examination of the aircraft wreckage accounted for all major parts of the aircraft, including all flight control surfaces on-site. Continuity of the flight control systems was established. All fracture surfaces showed evidence of impact overloads and there was no evidence of fatigue cracking, corrosion or any pre-existing defect. There was no evidence of any pre-existing defect with the aircraft that would have contributed to the accident.

The engine was inspected on site and there was no evidence of any pre-impact defect. Continuity of the engine controls was established. Examination of the power turbine blades indicated that they had fractured in overload due to the blade tips coming in contact with the power turbine shroud (Figure 6). Approximately two-thirds of the blades were missing and the remainder were broken at the tips. There was also evidence of rotational damage to the power turbine shroud. The power turbine and shroud damage were indicative of the engine producing significant power at impact.

Figure 6: Damage to power turbine blades

The propeller and forward section of the engine reduction gearbox were located approximately 15 m from the main fuselage (Figure 7). One blade had fractured in overload at the propeller hub and it was located approximately 30 m back along the wreckage trail. All of the blades had approximately 25 cm sections missing from their tips and the fracture surfaces of the missing tips showed evidence of overload due to rotational impact forces. All blades exhibited significant bending due to rotation impact damage. There was no evidence of any pre-existed propeller defect. The large amount of rotational damage to the propeller indicated that the engine was producing significant power at the time of impact with terrain.

Figure 7: Propeller showing blade bending and missing tip section

There was evidence of smoke and fire damage to some parts of the wreckage and trees forward of where the second major tree impact occurred. This was consistent with small post-impact fires within the area covered by the fuel spray. No other sections of the wreckage displayed any evidence of smoke or fire damage.

The aircraft was fitted with an emergency locator transmitter (ELT) as required by the Civil Aviation Regulations. No reports of ELT transmissions were received by AusSAR[4] as a result of the aircraft accident. Inspection of the ELT fitted to the aircraft indicated that it had been activated by the impact forces. The external ELT antenna had sustained impact damage.

Visual Meteorological Conditions

The AIP described the visual meteorological conditions (VMC) required for take-off, en route and landing. In non-controlled class G airspace, aeroplanes operating at or below 3,000 ft AMSL or 1,000 ft above ground level (AGL), whichever is the higher, required the pilot to maintain a flight visibility of 5,000 m and to remain clear of cloud and in sight of the ground or water.

The AIP section titled Visual Flight Rules in part stated:

> VFR flight may only be conducted in VMC and provided that, when operating at or below 2,000 ft above the ground or water, the pilot is able to navigate by visual reference to the ground or water

4 AusSAR (Australian Search and Rescue) is responsible for the conduct of SAR for missing aircraft, aircraft reported crashed, and distress beacon searches for civil aviation operations.

Weather information

On the day of the accident, a large high pressure system with a central pressure of 1026 hectopascals was located offshore from New South Wales and extended persistent south-east winds along the Queensland coast. A trough was situated over inland Queensland, well to the west of the area. The effect of the increasing pressure along the coast was fresh to strong south-east winds. Those winds resulted in generally cloudy conditions and showers about the coast. They were noted by the Bureau of Meteorology (BoM) to present a low cloud issue for aviation during the morning.

At 1343, the BoM issued an amended area forecast for area 45 (Appendix A). That forecast covered an area north of the approximate mid-point position of the flight (abeam Cardwell) and included the following information:

> Cloud: Broken[5] stratus with a base of 800 ft and tops of 2,000 ft at sea and on the coastal ranges, associated with precipitation. Scattered cumulus base 1,800 ft tops 12,000 ft at sea and on the coastal ranges. Broken stratocumulus base 3,500 ft tops 12,000 ft.
>
> Weather: Showers of rain, rain, drizzle.
>
> Visibility: 2,000 m associated with the showers of rain and drizzle, 4,000 m associated with the rain.

A meteorological observation at Cardwell, located approximately 9 NM south-east of the accident site, recorded the following at 1500:

> Temperature 22.4 degrees Celsius, relative humidity 93%, mean sea level pressure 1016.6 hectopascals, wind east north-east at 22 km/h, weather slight rain, horizontal visibility 4000 m, cloud cover 8 oktas at 240 m [787 ft], cloud type cumulus of moderate or strong vertical extent.

Witness reports

Witness reports from the area around the time of the accident included reports that the cloud cover was considered to be overcast, with some estimating it to be as low as 300 ft AGL. Those witnesses closest to the accident site also recalled the weather to be ‘wet and miserable with misty rain’.

One witness reported hearing what he believed to be the same aircraft several times over a period of about 30 minutes. That witness also reported sighting the aircraft at about 1515, at very low level. He reported that within about 5 minutes of that sighting, the local weather conditions had changed to a ‘heavy wet fog’.

Another witness located close to the last radar observed position reported sighting the aircraft tracking in a westerly direction towards the mountains. He commented that the mountains would normally be clearly visible but at that time were completely obscured from view. The aircraft disappeared from the witnesses view behind some large trees, but appeared to fly straight into the fog and rain. The witness recalled that he could still hear the engine noise for a short time before the

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5 Cloud amounts are reported in oktas. An okta is a unit of sky area equal to one-eighth of total sky visible to the celestial horizon. Few = 1 to 2 oktas, scattered = 3 to 4 oktas, broken = 5 to 7 oktas and overcast = 8 oktas.

engine noise stopped suddenly. He did not hear any other sound and considered that the aircraft must have ‘gone around the corner’.

Further investigation

The investigation is continuing and will include:

- further examination of recorded information, including radar data
- further assessment of forecast and actual weather conditions, together with witness reports
- a review of the pilot’s post-mortem results.

APPENDIX A

Amended area forecast area 45 issued by BoM at 1343. Times provided in the forecast are Coordinated Universal Time (UTC).

AMEND AREA FORECAST 160400 TO 161700 AREA 45

AMD OVERVIEW: FIRM RIDGE ALONG EAST COAST. ISOLATED SHOWERS. AREAS OF RAIN SW OF CHERY TO YGTN. DRIZZLE AREAS E SEA COAST RANGES S OF YCKN FROM 15Z. ISOLATED AREAS OF SMOKE.

SUBDIVISIONS:

A: N OF HANKY TO YMBA

B: S OF HANKY TO YMBA

WIND:

2000 5000 7000 10000 14000 18500

A. 110/35 090/30 070/20 070/15 PS09 060/20 PS01 040/20 MS06

B. 140/20 140/20 050/10 030/10 PS11 030/20 PS02 030/20 MS07

CLOUD: BKN ST 0800/2000 SEA COAST RANGES, BASE 1000 LAND, IN PRECIPITATION. SCT CU 1800/12000 SEA COAST RANGES, 3500/12000 INLAND. BKN SC 3500/12000. BKN ACAS ABOVE 9000 SW OF CHERY TO YGTN.

WEATHER: SHRA, RA, DZ, SMOKE.

VISIBILITY: 2000M SHRA, DZ. 4000M IN RA. 8KM SMOKE REDUCING TO 2000M IN THICK SMOKE.

FREEZING LEVEL: 15500

ICING: MOD IN ACAS.

TURBULENCE: ISOL MOD BELOW 8000 TENDING OCNL BELOW 6000.

MOD LARGE CU, AC. MOD THERMALS TO 8000 LAND DURING DAYLIGHT HOURS.