QUEENSLAND COURTS

CORONERS COURT OF QUEENSLAND

FINDINGS OF INVESTIGATION

CITATION:	**Non-inquest findings into the deaths of Pilot 1 and Pilot 2**
TITLE OF COURT:	Coroners Court
JURISDICTION:	SOUTHPORT
DATE:	22 August 2024
FILE NOs:	2020/1430; 2020/1770
FINDINGS OF:	Amanda Bain, Coroner
CATCHWORDS:	CORONERS – Aviation – Recreational Flying – Plane crash – Touch-and-go manoeuvre – Insufficient thrust to maintain a climb

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Background

1. Pilot 1 died on 5 April 2020 at the site of a light plane crash in southeast Queensland (incident location). He was 64 years old when he died.
2. Pilot 2 died on 29 April 2020 at a Queensland Hospital after succumbing to injuries suffered in the light plane crash. He was 60 years old when he died.
3. Queensland Police Service (QPS) reported the deaths of Pilot 1 and Pilot 2 to the Coroner because their deaths appeared to be a violent or unnatural death and fell within the definition of a reportable death under the *Coroners Act 2003*.
4. The role of a coroner is to investigate reportable deaths to establish, if possible, the cause of death and how the person died. The purpose of a coronial investigation is to establish facts, not to cast blame or determine criminal or civil liability.

Circumstances

5. At approximately 9am on 5 April 2020, a Pipistrel Virus SW100 24-8190 light aircraft was being used by Pilot 1 and Pilot 2 at the incident location. Both men were qualified pilots.
6. The aircraft involved was a Pipistrel Virus SW100 24-8190; a single engine, high wing, nose wheel undercarriage recreational aircraft fitted with a 100 horsepower Rotax 912iS fuel injected four-cylinder engine (the aircraft).
7. The aircraft was manufactured on 17 August 2012. Aviation company, X-Air Australia, had an interest in the aircraft from August 2012 until June 2013 when ownership was transferred to a private individual.
8. On 6 October 2017, the aircraft was purchased and operated by a joint syndicate based at an airfield near the incident location. The syndicate comprised of Pilot 1, Pilot 2, and two other men.
9. The airfield had two runways:
    a. ‘Strip 1’ is in a general east west direction and has an operational length of approximately 700 metres and is about 6 metres wide.
    b. ‘Strip 2’ is in a north south direction and has an operational length of approximately 410 metres.
10. The aircraft had been using ‘Strip 1’.
11. Pilot 1 was thought to have been in the left seat of the aircraft with Pilot 2 positioned in the right seat. The left seat is typically the position for the pilot, however, this is not mandatory, and this aircraft could be piloted from either position.
12. On 5 April 2020, Pilot 1 and Pilot 2 were conducting “touch and go” manoeuvres – a manoeuvre where the aircraft lands on the runway, then accelerates and takes off again. As the aircraft was conducting its second “touch and go” manoeuvre, the aircraft took off from the runway in a manner consistent with a normal take-off but then stopped climbing; maintaining level flight at low altitude until it collided with powerlines and crashed into vegetation. An audible change in pitch was heard at the point the aircraft was observed to stop climbing.
13. A witness, who was located on the side of the runway, recalled:

    I could hear the engine and it sounded like it was spluttering. The engine cleared and spluttered and then did it again. The engine did not sound normal. I then

observed the plane clear the end of the runway and continue over the cane field. The plane was not gaining any altitude. I then observed the tail section of the plane snap off and fall to the ground. The impact caused the front of the plane to flip forward and down towards the ground.

14. The aircraft impacted with powerlines located parallel to a nearby road and crashed into dense vegetation. This was approximately 450 metres east of the end of the runway.

15. The aircraft became engulfed with fire upon contact with the ground. Nearby witnesses from the airfield attended with fire extinguishers followed by emergency services.

16. Pilot 1 was within the aircraft and died from his injuries. Pilot 2 was able to extract himself from the aircraft before being transported to a Queensland Hospital. Pilot 2 later died from his injuries on 29 April 2020.

17. Recreational Aviation Australia (RAAus), the Australian Transport Safety Bureau (ATSB) and the Forensic Crash Unit (FCU) of Queensland Police were all notified of the incident.

Autopsy

18. Autopsies were ordered and performed on both Pilot 1 and Pilot 2.

Pilot 1

19. A forensic pathologist performed an autopsy on Pilot 1 which comprised of external and internal examination (to the extent an internal examination was required to determine the cause of death), imaging, document review and toxicology studies. The forensic pathologist found that:

    a. Death was instant and due to incineration associated with smoke inhalation following a light aircraft crash.

    b. There were no associated significant injuries of the internal organs (other than fracture of the sternum and ribs). There was heat effect (particularly on the outer table of the skull) as a result of the fire from the aircraft.

    c. There was evidence of natural disease including significant coronary atherosclerosis in the left anterior descending coronary artery. There was evidence associated with 'contraction bank necroses', which is a characteristic finding of a recent heart attack that was partially reperfused (blood flow blocked and then restored). This could have contributed to the events leading to the light aircraft crash.

    d. There was no evidence of stroke.

    e. Toxicology test results were non-contributory.

20. In the opinion of the forensic pathologist, Pilot 1's cause of death was:

    1(a) Incineration, *due to, or as a consequence of*

    1(b) Light aircraft accident (pilot).

Pilot 2

21. A forensic pathologist performed an autopsy on Pilot 2 which comprised of external examination, imaging and document review.

22. The forensic pathologist found that Pilot 2 suffered from burns to 55% of his total body surface area. There was evidence of treatment including extensive skin and

subcutaneous tissue debridement and skin grafting.

23. In the opinion of the forensic pathologist, based on his review of provided medical notes, Pilot 2's cause of death was:

    1(a) Multiorgan dysfunction, *due to, or as a consequence of,*

    1(b) Polymicrobial sepsis, *due to, or as a consequence of,*

    1(c) Burns (treated), *due to, or as a consequence of,*

    1(d) Light aircraft collision (passenger).

Investigation

24. The deaths of Pilot 1 and Pilot 2 were reported to the coroner in April 2020.

25. Due to the nature of the crash, various agencies were involved in conducting investigations (jointly where possible, with information sharing), including FCU and RAAus, with technical support from the ATSB and other third party experts.

26. The aircraft's engine required independent analysis by a qualified Rotax repairer in Melbourne which was delayed due to COVID-19 restrictions in Victoria. The RAAus also sought assistance from the ATSB in 2022 with respect to the propellor mechanism and audio analysis. The propeller unit was required to be shipped to an approved inspection and repair provider in New Zealand.

27. Investigation reports were received in 2023 and were the subject of further coronial direction and requested clarification; which was ultimately completed and received on 20 May 2024.

RAAus Investigation

28. RAAus is an Approved Self-Administering Aviation Organisation (ASAO) that is certified by the Civil Aviation Safety Authority (CASA) to administer a specific category of light aircraft. The primary functions of RAAus include the issuing of authorisations for instructors to conduct flight training, authorising pilots to act as pilot in command of an RAAus registered aircraft, registration (listing) of aircraft, and authorising people to maintain aircraft. Although investigation of fatal crashes is not a requirement of the *Civil Aviation Safety Regulation 1998* (Cth), the RAAus conducts these investigations to assist police and coroners to improve aviation safety. The ATSB has a standing offer to provide technical assistance to the RAAus where requested and where resources permit.

29. A summary of the relevant RAAus investigative findings are as follows:

Pilot information

30. The two occupants of the aircraft, Pilot 1 and Pilot 2, were co-owners and each held the appropriate certification and endorsements to operate the aircraft at the time of the crash. Neither held the necessary ratings to provide flight instruction, therefore, it should be assumed that one pilot would have been the nominated pilot in command at any single point in time.

31. It is most common for the pilot in command of a recreational aircraft to be seated in the left-hand seat during flight. It is not a mandatory requirement that the pilot in command operates from this position. The purpose of the flight was unable to be determined and the pilot in command at the time of the crash is not known.

32. Pilot 1 was appropriately certificated and endorsed to operate the aircraft. The most recent assessment flight conducted with an RAAus examiner was on 26 May

2019 where Pilot 1 was assessed and recommended issue for a cross country navigation endorsement as part of his RAAus Pilot Certificate privileges.

33. Pilot 1 had accrued 103 hours' flight time in the preceding calendar year and had 230.1 hours total flight experience as of 22 January 2020. Pilot 1 was authorised to carry passengers and held the necessary endorsements to operate the aircraft, including an endorsement to operate an in-flight adjustable propeller system.

34. Pilot 2 obtained his Pilot Certificate from RAAus on 21 October 2012. Pilot 2 had accumulated a total of 228.9 hours total flight experience with 209.4 hours as pilot in command as of 29 April 2020. His last biennial flight review was conducted on 25 May 2019.

35. Pilot 2 was authorised to carry passengers and held the necessary endorsements to operate the aircraft, including an endorsement to operate an in-flight adjustable propeller system. While Pilot 2 had gained a 'High Performance' endorsement as part of his certificate endorsements, this requirement was replaced in 2016 to a more comprehensive type training requirement in the RAAus Flight Operation Manual, which Pilot 2 and Pilot 1 had both met.

Pilot medical information

36. RAAus member's medical requirements vary based on the level of certificate, rating or approval held.

37. Upon commencement of membership with RAAus, the holder of a Pilot Certificate is required to provide a signed medical declaration stating their health standard is the equivalent to the requirements for a private motor vehicle driver licence in Australia. In addition to this stated requirement all pilots must ensure through their own self-assessment that prior to flight they meet these requirements by referencing pertinent human factors such as fatigue, illness, stress, effects of medication or alcohol and dietary sustenance. This is often referred to as the IMSAFE check.

38. Both Pilot 1 and Pilot 2 had previously provided a signed medical declaration and no known medical conditions had been reported to RAAus under section 2.16 of the Flight Operations Manual.

Flights conducted with two pilots aboard

39. The aircraft permitted the pilot in command to operate from either seat. RAAus flight operations only allow one pilot to act as pilot in command at any one time, however, with two qualified pilots on board it is permissible for them to swap the role of pilot in command from one pilot to the other in flight. This must be carefully communicated to reduce the potential for confusion.

40. Pilot 1 and Pilot 2 were known to each other and evidence from Pilot 2's logbook shows two previous flights had been conducted together in the aircraft prior to the crash, on 17 August 2019 and 2 January 2020.

41. Insufficient information is available to determine whether Pilot 1 and Pilot 2 briefed their individual roles and responsibilities prior to the flight, and whether it was determined who would take control of the aircraft in the event of an emergency.

Aircraft information

42. The aircraft was a single engine, high wing, nose wheel undercarriage recreational aircraft fitted with a 100 horsepower fuel injected four-cylinder engine.

Fig 7: File photo of a Pipistrel Virus SW100 24-8190 (Source: RAAus aircraft file)

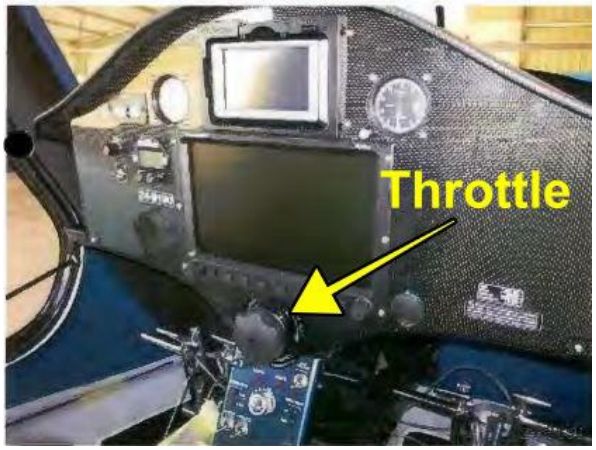

Fig 8: File photo of a Pipistrel Virus SW100 24-8190 (Source: RAAus aircraft file)

43. The aircraft was constructed primarily from composite fibre (carbon and fibreglass). The wings are built utilising a main spar of carbon fibre.

44. The engine is a Rotax 912iS four cylinder horizontally opposed air/liquid cooled 4 stroke, manufactured by Bombardier Recreational Products Rotax in Austria. At the time of the crash the aircraft was fitted with a three blade, electrically adjustable pitch, carbon composite propeller manufactured by Airmaster. The propeller and associated new electrically variable control unit were fitted in 2019.

45. The cockpit is a 2-seater, side by side, layout with a rear baggage hold area. This model utilised a control column for each seat, dual rudder pedals and a centrally mounted throttle.

Maintenance requirements

46. Section 3.1.1 of the RAAus Technical Manual specifies that the operation and conduct of maintenance is the sole responsibility of the owner and an appropriate maintenance schedule must exist for the aircraft.

47. Management of the maintenance of an aircraft, including selection of relevant maintenance schedules and the qualifications and experience of persons who may complete the maintenance is the responsibility of the aircraft owner. The maintenance schedule requirements are provided by the aircraft/kit/engine/component manufacturers.

48. One of the aircraft's other part-owners completed the most recent maintenance inspection work in December 2019, and both Pilot 1 and that other part-owner had shared the maintenance tasks in the preceding three years. Both held the required maintenance approvals to conduct maintenance on the aircraft.

Aircraft occurrence history

49. The aircraft suffered a propeller strike while landing at a different airstrip on 9 February 2019 and was subsequently withdrawn from service, inspected, and the Airmaster propeller system, with an inflight adjustable pitch controller, was then fitted on 7 June 2019.

50. Inspections were conducted by a part-owner on 12 October 2019 and 4 December 2019 in accordance with the Airmaster propeller maintenance manual

requirements. During the second inspection a service bulletin requirement from Airmaster was also carried out. All other maintenance requirements at this time were completed by the other part-owner in October 2019; at a time in service of 181.6 hours.

51. On 27 January 2020, the aircraft's propeller struck a runway landing light during taxiing, rendering the aircraft unserviceable until repairs were completed. Repairs were assessed as 'minor only' as the tip of one blade contacted the landing light at low engine speed, however, a comprehensive disassembly and inspection of both the propeller assembly and the gearbox was undertaken. The propeller unit was shipped to an approved inspection and repair provider in New Zealand. All required parts were replaced and reassembled by an approved maintainer and work completion authorised, and the aircraft was successfully test flown by an aircraft engineer on 25 March 2020.

Airfield information

52. The aircraft was operating at the incident location. The impact site was situated slightly left of the extended centreline of the runway ('Strip 10').

Runway inspection and obstacle clearance heights

53. The runway was inspected following the crash for any debris or evidence of pre-impact separation of aircraft components. No indications or evidence was found.

54. The power and communication lines were clear of the 'runway climb obstacle gradient' as recommended by CASA guidance material.

55. Consequently, foreign object debris, runway conditions and the surrounding environmental conditions were not considered factors in the crash.

Weather

56. Witness information, video footage and observations from the closest aviation weather station indicated that the weather on the day was within Visual Flight Rule (VFR) minimums, which required visibility of 5000 meters and no cloud below 5000 feet.

57. Consequently, weather was not considered to be a contributing factor in the crash.

Performance data

58. The aircraft's Pilot Operating Handbook specifies that:

    a. the required take-off distance to clear a 50ft obstacle from sea level on a 15 degree celsius day is 760ft (230m) from a standing start.

    b. the total runway length required to land from a 50ft height is 930ft (285m) when using airbrakes, and 1460ft (445m) without the use of airbrakes.

59. It is estimated that approximately 820ft (250m) of runway distance remained from the point abeam the primary windsock, where the aircraft is observed in video footage to stop climbing and maintained level flight.

60. Based on the relative position of the aircraft and the end of the runway at the time the aircraft stopped climbing and began to maintain level flight, it is likely that there was insufficient length available for the pilot to respond and land within the remaining runway distance available.

Observed events

61. The crash was observed by a number of witnesses located at:

    a. the front veranda area of a nearby flying club;

b. the grass start up area adjacent to the clubhouse; and

c. a hangar located adjacent to the runway.

62. Witnesses noted the aircraft had been conducting take offs and landings preceding the crash, and these operations appeared normal. On the circuit, following a touch and go, the aircraft was observed to take off and climb initially then a change in sound was noted by witnesses.

63. One witness, who was located on the side of the runway, reported that he heard the aircraft spluttering and surging immediately after take-off. He then witnessed the aircraft continue flight until it impacted terrain.

Video Footage

64. A 360-degree video camera mounted on a parked aircraft was recording at the time of the crash and captured video in the direction of the operating runway.

65. The video was reviewed with the following time stamp related observations:

a. The aircraft first comes into view at timestamp 1:33 in what appears to be a low trajectory climb, consistent with a normal initial take-off.

b. The climb out continues until timestamp 1:39 where multiple changes in aural pitch can be heard from the aircraft within the audio from the recording.

c. From timestamp 1:39 onwards the aircraft appears to maintain level flight at a low altitude.

d. At timestamp 1:51 the aircraft disappears from view behind a hangar.

e. The aircraft engine can be heard operating up until timestamp 2:13 when the impact with terrain can be heard within the audio of the recording. Smoke is then observed in the direction of the crash.

66. The video footage indicates that the aircraft was in the initial stages of take-off as the aircraft enters the camera view. At this point the aircraft appears to climb initially in a consistent manner for a normal take-off and then stops climbing and maintains level flight at low altitude.

67. The aircraft disappears out of sight behind a hangar and people in the surrounding area can be seen running in an attempt to maintain visual sight of the aircraft. The aircraft engine can be heard producing power up until the impact with terrain. Moments following the sound of impact, smoke is observed rising from the direction of the crash.

Wreckage site information

68. A review of the crash site indicated that the aircraft was consumed by post impact fire following the impact with powerlines and the adjacent vegetation.

69. The wreckage footprint was situated in two locations:

a. The outboard right wing had severed and was located 15m away from the final impact site. Evidence showed shearing damage consistent with a wire strike.

b. The majority of the burnt wreckage was located in a small, contained area beneath the tree canopy approximately 20m from the roadside power easement.

70. It was not possible to fully review the wreckage at the scene, due to the extensive fire damage and the presence of hazardous carbon fibre residue. Most relevant components of the airframe, propeller and engine were located and identified on site prior to hazard removal for later inspection.

Wreckage inspection

71. The engine unit, propellor assembly, flight control system linkages and remnants of the airframe and avionics were assessed.

Engine

72. The engine was recovered from the wreckage and, other than post impact fire damage, was essentially intact. A full engine disassembly and inspection did not reveal any evidence of mechanical or lubrication failure. Due to fire damage, some systems within the engine such as electronic components, injectors, throttle body, airbox assembly and sensors could not be tested.

Figure 21: Engine wreckage (Source: RAAus consultant)

Flight control system

73. It was not possible to fully reconstruct the elements of the flight control systems, however, the flap control actuator was identified in the full down position; which was assessed to be operating effectively.

Propeller system

74. The propellor blades, hub assembly and associated components were all identified. One of the blades was fractured mid-section and the remaining 2 blades were sheared at the hub. The propellor hub assembly was partially disassembled and the electrical connections to the propeller blade actuator were confirmed as intact.

75. The propeller electronic controller (mounted in the cockpit for operation by the pilot) allows both automatic and manual operation with pre-selectable program settings for take-off, climb, cruise, and a hold function that allows the pilot to control the propeller pitch within present defined limits.

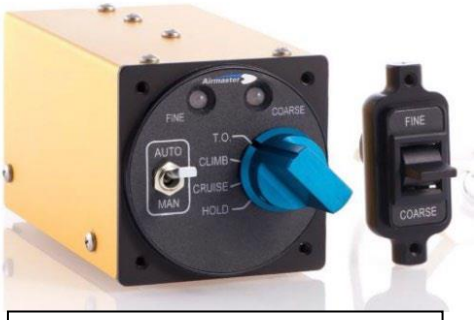

Fig 13: Airmaster AC 200 controller unit (Source: Airmaster AP3 manual).

76. The propeller unit was sent to ATSB for technical assessment and analysis, which determined:

    a. There were indications that the propellor blade pitch angle was not in the position expected for normal flight:

        i. The position of the pitch-change-mechanism corresponded to a “hard-fine-pitch-stop”; a blade pitch angle of approximately 8º (typically used for cruising).

        ii. The position of the pitch-change-mechanism should have corresponded to an “adjustable-fine-pitch-stop”; a blade pitch angle of approximately 18º to 20º (typically used for take off/ climbing).

    b. The manufacturer, Airmaster, was consulted who advised that *“it is possible an 8º pitch would not allow minimum climb depending on the blade and aircraft. The hard stop is not designed as a minimum climb pitch stop (this function is achieved by the adjustable pitch stop)”.*

    c. Airmaster also noted that *“no single failure should lead to blade angle pitch drift”.* In this scenario the control would have to be set to manual (which is not recommended) and there would have to be a failure of the static brake, or some input which started the motor turning in the fine direction with no arresting input from the pilot in the coarse direction.

    d. The position of the pitch-change-mechanism was considered to be strongly indicative of its location just prior to the crash and unlikely to have been affected as a result of the impact with terrain.

    e. Ultimately, the reason for the change in the pitch-change-mechanism was unable to be determined.

77. Due to fire damage, it was unable to be determined whether the propeller unit was set at manual or automatic mode and whether the propeller control unit was selected for take-off. It was unknown whether there had been any attempt to change the propeller settings during the flight.

78. The ATSB also identified a possible electrical connection issue within the propeller system:

    a. A functionality check of the switch revealed an electrical discontinuity between the coarse switch circuit board (and adjacent brass washer) and the red crimp connector connecting the switch to the motor (and its adjacent green crimp connector).

Fig 26: Extract from AE 2022-002 ATSB technical report

    b. The manufacturer, Airmaster, was consulted about the effect of the connection issue on propeller function. The response indicated that if the electrical connection issue was present before the engine started, the three red indicator lights would flash and the propeller would not respond. The

recommended pre-start check could therefore not have been completed. If the electrical connection issue developed in flight the three red indicator lights would flash and the propeller would not respond.

c. ATSB could not determine how or when the residue deposited, or when the electrical connection was interrupted, and that it was possible the post-crash fire may have caused the electrical connection issue to develop.

Video analysis

79. The ATSB used images from the footage to estimate the aircraft position, height, ground speed and climb rate while visible:

    a. The aircraft's climb rate was initially steady at just over 100ft per minute, although this climb rate ceased once the aircraft reached about 25ft.

    b. The ground speed appeared relatively stable at approximately 48 knots, with a corresponding airspeed (which took into the headwind of 5-10 knots) of between about 53 and 58 knots.

Audio analysis

80. An analysis of the audio contained within the video file of the crash was compared with a comparable audio sample from an aircraft with the same engine and propeller combination:

    a. The sound signatures were considered to be very similar; with both containing two dominant fundamental frequencies separated by the same ratio of about 2.45, within expected tolerances for that specific engine.

    b. The aircraft's likely engine speed was at least 25% lower than the example engine. The example engine was between 5,100 and 5,200 RPM, while a corrected analysis revealed that the aircraft's engine was between 3,000 and 3,400 RPM while visible during the flight.

    c. A notable frequency change in the recording occurred during the aircraft's flight. The frequency initially increased from about 50 to 55 Hz in a period of half a second, where it remained for 2 seconds. Following this, the frequency reduced back to 51 Hz before gradually increasing again. This was considered to be consistent with a change to the engine RPM following either a change in propeller pitch towards a fine position, or an increase in throttle. The subsequent reduction in frequency is consistent with the propeller moving to a coarse position, or a decrease in throttle.

81. A 25% reduction in RPM would result in a significant reduction in performance, which may result in insufficient thrust for the aircraft to maintain a normal climb.

82. It could not be determined why the aircraft was likely not producing full RPM during take-off. Possible causes included, but are not limited to, a partial engine failure, incorrect throttle or mixture setting by the pilot, a jammed throttle or a coarse propeller pitch. A full teardown and inspection of the engine following the crash did not identify a mechanical failure likely to have resulted in a loss of engine power, however, some engine systems were destroyed by fire and unable to be inspected.

Medical event

83. It was considered whether an in-flight medical incapacitation could have contributed to the crash. While it is possible that a medical incapacitation may have led to incorrect control management within the aircraft, based on the observed sequence of events, the medical event would have likely occurred very early in the take-off phase.

84. Following take-off, the aircraft is observed to maintain stable flight at low level.

With two pilots on board the aircraft, it is likely that in the event of a medical incapacitation the remaining pilot would be capable of taking control of the aircraft in order to resume safe flight.

85. RAAus considered that it is likely that a medical incapacitation would result in a nonstable flight path, which was not observed, however, medical incapacitation could not be eliminated as a possible contributing factor.

Summary

86. The events were consistent with the aircraft producing insufficient thrust to maintain a normal climb. While the specific cause of a reduction in thrust was unable to be determined, possible factors included propeller pitch and/or engine performance, either due to mechanical failure or pilot mismanagement.

87. The following matters were considered to be contributing factors in the incident:

    a. Following a touch and go, for reasons that were unable to be determined, the aircraft failed to produce sufficient thrust to maintain a normal climb and collided with transmission lines approximately 800 metres from the end of the runway.

88. Other factors that increased risk (unlikely to have been the sole cause of the accident, but may have increased the likelihood) were identified as follows:

    a. The propeller system had recently been overhauled and reinstalled in the aircraft following a propeller strike. Maintenance actions were carried out in accordance with manufacturer requirements and the aircraft was successfully test flown following maintenance.

    b. Based on the relative position of the aircraft and the end of the runway at the time the aircraft stopped climbing and began to maintain level flight, it is likely that there was insufficient length available for the pilot to respond and land within the remaining runway distance available.

    c. The aircraft was observed to conduct multiple normal take offs and landings prior to the crash. It is possible that confirmation bias influenced pilot decision making in attempting to continue flight rather than considering emergency actions.

<u>FCU Investigation</u>

89. QPS Forensic Crash Unit lead the policing investigation into the crash. The examinations and findings did not conclude anything inconsistent with the RAAus investigation report.

90. The FCU investigation included an examination of the airfield on 6 April 2020 and the surface appeared to be in good condition. It had recently undergone a refurbishment in March 2020 which largely consisted of new surface material and compacting.

FCU Opinion of the cause

91. Examinations failed to identify a definitive component failure supporting the causation for the incident. It is unanimous between the respective investigations, that there was insufficient thrust to maintain a normal climb, however it could not be confirmed whether this was due to mechanical failure or pilot error/ mismanagement.

92. Both pilots had considerable experience and knowledge of flying, particularly with this aircraft. There was no evidence to show that either Pilot 1 or Pilot 2 would take

any unnecessary risk in flying the aircraft in a dangerous or unsafe manner. By all accounts they were component and reasonable pilots.

93. The aircraft has contacted powerlines with left side wing. From this it could be inferred that the aircraft was at an angle to bank to the left, either to avoid said powerlines or to fly around for an attempt at the landing strip. The damage is consistent with contacting both the upper and lower section of the powerlines. The component inspection confirmed that the outer tip of the wing has contacted the lower series of wires and the inner section of the wing with the upper series of wires, slicing the wing free from the aircraft.

94. There is evidence that the aircraft was flying above the runaway when the engine RPM's were lower than what would have been expected for the touch and go manoeuvres that were being practised. Had the aircraft experienced any mechanical and engine failure upon approach to the runaway, then it could be surmised that the pilot in command would have made attempts to land the aircraft safely.

95. Consideration was given to an unexpected mid-flight emergency leading to an inability to safely maintain control of the aircraft. The autopsy report for Pilot 1 provided insight to the possibility of a recent heart attack. There was no evidence that indicated that Pilot 1 was aware of or managing a known heart complaint. The aircraft is equipped with dual controls, allowing either the left or right seated person to operate the aircraft in its entirety. The throttle, flaperon and air-brake levers are all centrally located. If Pilot 1 had had an incapacitating medical episode, Pilot 2 would have the controls and functions available to him, to control the aircraft. However, if Pilot 1 had become unconscious or similar, causing him to slump forward, this may have a direct effect on the control of the aircraft. It could not be determined if Pilot 1's medical findings were the result of a medical incident or the crash sequence.

96. Ultimately, a mechanical inspection of the available components of the engine failed to find evidence of a mechanical fault that would have caused the incident. A forensic examination of the pitch-change-mechanism found that it was not aligned with its normal position, however the causation of this could not be established.

97. FCU concluded that there was no evidence of any criminality and it was unable to make any recommendations that would prevent the incident occurring in the future.

Family Concerns

Concerns

98. The family of Pilot 1 raised the following concerns with regards to the incident:

> *"...I have recently been informed that a trench had been dug at the end of the runway, which other pilots have pointed out safety concerns in the event of over running the runway…";*
>
> *"…the recent repairs to the propellor, which we thought had been replaced with a new one, however, we have since learned that a single blade had been replaced a week or so before the accident, which as far as we know still hasn't been located."*

Response - condition of runway

99. The existence of a trench at the end of the runway was not noted in any of the investigative reports and nor was there any findings that environmental conditions were factors in the crash. The airfield was inspected by RAAus and it was

determined that foreign object debris, runway conditions and the surrounding environment or conditions were not factors in the crash. It was also found that the powerlines parallel to the access road were located clear of the 'runway climb obstacle gradient' as recommended in CASA guidance material. Similarly, the airfield was also examined by FCU on 6 April 2020 who found that the surface appeared to be in good condition and had recently undergone a refurbishment in March 2020.

Response - replacement of propellor blade

100. On 27 January 2020, the aircraft struck a runway landing light with the propeller during ground taxiing; rendering the aircraft unserviceable until repairs were completed. A comprehensive disassembly and inspection of both the propeller assembly and the gearbox was undertaken. The propeller unit was shipped to an approved inspection and repair provider in New Zealand. RAAus reported that all required parts were replaced and reassembled by an approved maintainer, work completion authorised, and the aircraft was successfully test flown by the aircraft engineer on 25 March 2020. The aircraft had also been flown on two further occasions without incident between the test flight and 5 April 2020.

101. Although the propellor reinstallation was listed as a factor that may have increased the likelihood of the crash taking place, it was found that the maintenance actions were carried out in accordance with manufacturer requirements and the aircraft was successfully test flown following maintenance.

102. As to the missing propellor blade, FCU opine that, like the other blade which sheared off from the hub, the missing propellor blade likely underwent a significant amount of shearing stress during rotation which caused it to be projected towards the aircraft's fuselage before it was incinerated in the fire.

Conclusion

103. After considering the material obtained during the coronial investigation, I consider that I have sufficient information to make the necessary findings in relation to the deaths of Pilot 1 and Pilot 2. I am not satisfied that it is in the public interest to hold an Inquest as, I am of the view that drawing attention to the circumstances of this death is unlikely to prevent deaths in similar circumstances happening in the future.

104. The remaining uncertainty about who was in control of the aircraft and what caused the failure to produce sufficient thrust to maintain a normal climb is unlikely to be able to be resolved at an inquest. Significant investigations were conducted by the FCU, and the RAAus (in collaboration with the ATSB and other experts). The components of the aircraft that were not incinerated in the crash have already been extensively analysed without any causative failures being identified. It is unlikely that an Inquest will uncover important systemic defects or risks not already known about or that preventative recommendations could be made.

105. On that basis I have determined that an Inquest is not required.

106. Consistent with the findings of RAAus and FCU, the below evidence supports a finding on the balance of probabilities that it is more likely than not that the aircraft produced insufficient thrust to maintain normal climb:

    a. video reveals that the aircraft climbed at a rate of just over 100ft per minute before leveling out at approximately 25ft above ground level;

    b. wreckage inspections revealed that the propellor blade pitch angle was not in the position expected for normal flight; corresponding to a position which

was not designed to achieve minimum climb;

c. analysis of engine audio frequency revealed notable changes at the time the aircraft stopped climbing consistent with changes in propeller pitch or in engine power; and

d. analysis of comparable engine sounds revealed that the aircraft's likely engine speed was at least 25% lower than normal; resulting in a significant reduction in performance, which may have resulted in insufficient thrust for the aircraft to maintain normal climb.

107. Despite extensive investigation by FCU and RAAus (in collaboration with ATSB and other third-party experts), there is insufficient evidence to make findings on the potential cause of the aircraft's insufficient thrust. Investigations revealed that:

a. the aircraft was sufficiently maintained;

b. weather, runway conditions and environmental factors did not play a contributory role;

c. both Pilot 1 and Pilot 2 had considerable experience and knowledge of flying, particularly with this aircraft;

d. there was no evidence that either Pilot 1 or Pilot 2 would take unnecessary risk in flying the aircraft in a dangerous or unsafe manner;

e. the precise settings of the propeller control unit, as entered by the pilot (and information about whether the settings were changed during the last course of flight), could not be determined as the unit was destroyed by fire;

f. it could not be determined whether an electrical connection issue was present prior to the crash and/or whether it had any impact on the aircraft's propellor pitch;

g. there was no mechanical failure identified in the engine and it could not be determined why the engine was likely not producing full RPM's during take-off;

h. there is tenuous evidence about the possibility of medical incapacitation. Autopsy records suggest that Pilot 1 may have recently suffered a heart attack. However, RAAus opine that it is likely that in the event of a medical incapacitation the remaining pilot would be capable of taking control of the aircraft in order to resume safe flight and that any medical incapacitation would result in a nonstable flight path, which was not observed in this incident.

108. I extend my condolences to the family and friends of Pilot 1 and Pilot 2 for their loss.

Findings required by Section 45

Identity of the deceased: Pilot 1 and Pilot 2

How they died: During the course of a recreational flight on 5 April 2020, the aircraft struck powerlines and crashed into the ground, causing fatal injuries to Pilot 1 and Pilot 2. The cause of the crash was a failure to produce sufficient thrust to maintain a normal climb. The available evidence is

insufficient to make positive findings of the potential impact of inflight medical incapacitation or propeller pitch and engine performance, either due to mechanical failure or pilot mismanagement.

Place of death: Pilot 1 died at the incident location.

Pilot 2 died at a Queensland Hospital; 24 days after the crash at the incident location.

Date of death: Pilot 1 died on 5 April 2020.

Pilot 2 died on 29 April 2020.

Cause of death: Pilot 1's cause of death was:
1(a) Incineration, *due to, or as a consequence of*
1(b) Light aircraft accident (pilot)

Pilot 2's cause of death was:
1(a) Multiorgan dysfunction, *due to, or as a consequence of,*
1(b) Polymicrobial sepsis, *due to, or as a consequence of,*
1(c) Burns (treated), *due to, or as a consequence of,*
1(d) Light aircraft crash.

I close the investigations.

Amanda Bain
Coroner

22 August 2024