**FINDINGS, COMMENTS and RECOMMENDATIONS**

**of Coroner McTaggart following the holding of an inquest under the *Coroners Act* 1995 into the death of:**

# Roger Paul Corbin

# Contents

# Record of Investigation into Death (With Inquest)

*Coroners Act* 1995

*Coroners Rules* 2006

Rule 11

I, Olivia McTaggart, Coroner, having investigated the death of Roger Paul Corbin with an inquest held at Hobart in Tasmania make the following findings.

**Hearing Dates**

24, 26, 27 and 28 April 2023, with closing submissions completed on 12 September 2023.

**Representation**

Counsel Assisting the Coroner: M Wilson SC

Counsel for John Osborne: K Cuthbertson SC

Counsel for Rotor-Lift Aviation and Allana Corbin: M Quartararo

Counsel for Australian Transport Safety Bureau (ATSB): P Hornby

Counsel for Andrew Harrison: T Green

**Introduction**

1. Roger Paul Corbin was a highly respected, skilled and prominent Tasmanian helicopter pilot. He was the owner of the helicopter business, Rotor-Lift Aviation, and played a major part in the establishment of helicopter rescue operations in Tasmania. In his business, Mr Corbin occupied the roles of managing director, Chief Pilot and Chief Flying Instructor. He was also engaged in operational flying and instructing.

2. On Tuesday 7 November 2017, Mr Corbin was instructing a student, John Osborne, in emergency procedures in a Eurocopter AS350BA Squirrel single engine helicopter. They were nearing the end of the training flight and were returning to the Hobart Airport to undertake a simulated hydraulics failure with a run-on landing. During the landing phase of the simulation, the aircraft crashed on the western side of the runway at the Hobart Airport. Mr Osborne survived the crash but, tragically, Mr Corbin died instantly.

**The coroner's functions and scope of inquest**

3. The *Coroners Act* 1995 *("*the *Act")* sets out the legislative framework for the Coroner's Court in Tasmania.

4. Section 24 of the *Act* sets out the jurisdiction of the coroner to hold an inquest into a death. As Mr Corbin died as a result of an accident or injury in his place of work, a public inquest is mandatory by virtue of section 24(1)(ea) of the *Act*.

5. The coroner's role under the *Act* in investigating any reportable death is inquisitorial. A coroner must investigate the death and determine the matters required by section 28(1) of the *Act*. Those matters include: the identity of the deceased, how the deceased died, the cause of death, and where and when the person died. This process requires a coroner to make factual findings about the death without finding legal liability or apportioning moral blame for the death. A coroner does not charge people with criminal offences, or punish or award compensation to anyone, as such functions are for other courts. A coroner conducting an inquest holds an inquiry into a death with the benefit of oral testimony and documentary evidence to make the required findings.

6. As identified above, under section 28 of the *Act* a coroner must find, if possible, *how the death occurred.* The obligation to find *how death occurred* refers not only to the manner of death but the circumstances surrounding the occurrence of the death. It is a matter for the coroner to determine and investigate those matters that should properly be considered to be relevant, or potentially relevant, to the circumstances surrounding the death. Notions of common sense and ordinary principles of causation must be applied to consider any significant causal role of such circumstances in the death. [1]

7. The standard of proof applying to inquests is the ordinary civil standard of proof, namely, that findings of fact may only be made if the coroner is satisfied of a particular matter upon the balance of probabilities.[2]

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[1] *Re The State Coroner; ex parte Minister for Health* (2009) 38 WAR 553 per Buss JA at [42]; *Atkinson v Morrow* [2005] QCA 353. *March v E. & M.H. Stramare Pty. Limited and Another* [1990 – 1991] 171 CLR 506.

[2] A coroner must also adhere to the high standard of satisfaction required by *Briginshaw v Briginshaw* (1938) 60 CLR 336 (see in particular Dixon J at page 362) in the case of serious factual findings against any individual.

8. Importantly, the role of the coroner is also critical in identifying matters contributing to or connected with any individual death with a view to making comments and recommendations for the prevention of further deaths.

9. The *Act* sets out in section 28 these important functions as follows:

> *"(2) A coroner must, whenever appropriate, make recommendations with respect to ways of preventing further deaths and on any other matter that the coroner considers appropriate.*
>
> *(3) A coroner may comment on any matter connected with the death including public health or safety or the administration of justice."*

10. A coroner, pursuant to the powers under the *Act*, may make comments and recommendations about matters which have sufficient nexus to a death, even though the matter the subject of the comment of the recommendation cannot be necessarily found to be a matter which would, if it had been present, have averted death.[3]

11. In my function of determining the circumstances and factors contributing to the crash, the following issues were specifically considered at inquest:[4]

    a. The experience of Mr Corbin and Mr Osborne so far as it related to the circumstances of death;

    b. The condition of the aircraft at the time of the crash;

    c. The weather conditions at the time of the crash;

    d. The effect, if any, of wake turbulence upon the crash;

    e. The suitability of conducting training at the helicopter training area known as Area X-ray;

    f. Discussions between Mr Corbin and Mr Osborne on the day of the crash in relation to hydraulic failure training, including whether Mr Corbin undertook a pre-flight briefing (or sufficient pre-flight briefing) with Mr Osborne;

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[3] See, for example, *Doomadgee & Anor v Deputy State Coroner Clements & Ors* [2005] QSC 357.
[4] I have summarised the original inquest scope document for convenience.

g. Whether an intermittent fault in the hydraulic cut-off switch contributed to the crash;

h. The optimal procedure for hydraulic failure training, the process and conditions prescribed by the aircraft's flight manual, and the risk associated with the exercise;

i. The practices of Rotor-Lift instructors, including Mr Corbin, in teaching simulated hydraulic failure; whether such practices complied with the aircraft flight manual; any risk associated with such practices; and the instruction provided to Mr Osborne about simulated hydraulic failure; and

j. Relevant changes at Rotor-Lift following the death of Mr Corbin.

**Evidence at inquest**

12. I am satisfied that a thorough investigation has taken place into Mr Corbin's death. The documentary evidence comprised Exhibits C1 to C53 itemised in the exhibit list annexed to this finding and marked "A".

13. Additionally, evidence was called from the following witnesses in this order:

- **Timothy Dalton:** Experienced air traffic controller and holder of a commercial fixed wing pilot's licence. Mr Dalton held the position of Unit Tower Supervisor at the airport. Mr Dalton was in the Hobart Tower at the time of the crash and was a witness to events.

- **Anthony Gunton:** Experienced air traffic controller at the airport. Mr Gunton was working in the Hobart Tower at the time of the crash and was a witness to events.

- **Brett Maloney:** Sub-Station Officer with Aviation Rescue Firefighting Services (a division of Air Services Australia). Mr Maloney was working as a firefighter at the Fire Control Centre at the airport at the time of the crash. He was a witness to events and participated in the rescue.

- **Gerard McShane:** Experienced private helicopter pilot and owner of the helicopter involved in the crash. Mr Corbin was Mr McShane's principal flying instructor and friend.

- **Stephen Davis:** Highly experienced helicopter pilot and instructor. Mr Davis knew Mr Corbin well, flew with him and provided evidence regarding his practices. He also provided expert opinion about the circumstances of the crash.

- **Andrew Harrison:** Experienced helicopter pilot and instructor employed by Rotor-Lift. Mr Harrison instructed Mr Osborne for most of his training on 6 and 7 November 2017.

- **John Osborne:** The pilot under instruction in the helicopter with Mr Corbin at the time of the crash.

- **Peter Ayre:** The investigator in charge of the Australian Transport Safety Bureau investigation. Mr Ayre is an experienced rotary wing pilot, flight instructor and safety investigator.

- **Susan Stanley:** General Manager of Rotor-Lift and personal assistant to Mr Corbin. Ms Stanley provided evidence about the business and about Mr Corbin's habits and his movements on the day of the crash.

- **Peter McKenzie;** Current Chief Pilot at Rotor-Lift. Mr McKenzie provided evidence about practices at Rotor-Lift and expert opinion about the circumstances of the crash.

- **Allana Corbin:** Mr Corbin's wife, helicopter pilot and co-owner of Rotor-Lift at the time of the crash. Mrs Corbin provided evidence about the business and Mr Corbin's flying abilities.

**Roger Corbin**

*Personal background*

14. Roger Paul Corbin was born at Invercargill, New Zealand on 21 May 1960 and he was 57 years of age at his death. He was the sixth of eight children to Valerie and Walter Corbin. He commenced flying when he was about 18 years of age and started his own

business, Garden City Helicopters, in Christchurch. He moved to Australia when he was 20 years of age and spent time flying in New Guinea, Burma and the United States. He flew for Westpac Rescue in Sydney during his twenties and thirties and began operating Rotor-Lift in the early 1990s in New South Wales undertaking scenic flights and fire season work. Mr Corbin was also a flight instructor.

15. Mr Corbin met his future wife, Allana, in 1995 and they became business partners in buying and selling aircraft. They obtained the rescue contract for Tasmania and moved to this state in 2000. They built the Rotor-Lift Facility at the Hobart Airport.[5]

16. Mr Corbin married Allana (Mrs Corbin) in 2002.

17. Mrs Corbin herself gained fixed wing qualifications at an early age. She suffered serious injuries in the crash of a rescue plane in 1990 involving the deaths of four other passengers. Despite this, she gained her commercial helicopter licence in 1995. In 1997, she became the first woman to circumnavigate Australia solo in a helicopter.

18. Following Mr Corbin's death, Mrs Corbin became the sole owner of Rotor-Lift. Her current role involves overseeing the management of the business, including participating on its advisory board.

19. Their twin daughters, Isabella and Indiana, were born in 2005. Mr Corbin also has a daughter, Sophia, from his previous marriage.[6]

20. In evidence, Mrs Corbin described Mr Corbin as *"extreme"*. She said he was *"… extremely intelligent, extremely annoying, he was extremely generous as well"*. She described him as "*committed to everything he did with an uncanny photographic memory, and he would always be studying"*. Mrs Corbin stated that *"Every time he was in the aircraft, he was nowhere else but in the aircraft. That was his favourite office and that was where he was happiest"*.[7]

*Flying experience*

21. Mr Corbin had 30 years' experience in flying helicopters and had accumulated 14,200 flying hours. He had accumulated over 1000 flying hours on the AS350 helicopter. He

[5] C10 Allana Corbin
[6] C10 Allana Corbin
[7] Transcript p486-487.

was a dedicated contributor to this state's rescue services over a lengthy period and, in this capacity, played a critical role in saving many lives.

22. He was described in evidence as being a talented pilot who was driven, safety conscious and pushed people's abilities. [8] There was no evidence that he would take undue risks.

*23.* Mr Corbin is described by Mrs Corbin, as having "*abilities as a pilot second to none… His cockpit management was meticulous. Roger always thought ahead… Roger was always about safety. He would properly brief his students. Nothing was left to chance."*[9]

*24.* Another witness, Joseph Cleary, is a commercial helicopter pilot who had previously been employed by Rotor-Lift and had been trained by Mr Corbin. He described him as "*one of the most skilled and knowledgeable pilots and instructors he had flown with. He was very confident instructing emergency situations in all types of aircraft he flew."*[10]

*25.* Steven Davis, one of the experienced flight instructors giving evidence, knew Mr Corbin and flew with him. Mr Davis said that he "*found Roger to be nothing other than extremely methodical and professional in his approach to everything that he did and pursued".*[11] He said that the thoroughness in which Mr Corbin approached each flight was *"extraordinary"*[12] and in the opinion of Mr Davis, Mr Corbin's briefing technique was unparalleled.[13]

26. Andrew Harrison, a flight instructor with Rotor-Lift, explained in his witness interview that Mr Corbin had vast experience instructing in emergency training.[14]

*27.* Gerard McShane, the owner of the helicopter involved in the crash, was also of the view that Mr Corbin's flying abilities were *"second to none"* and that *"as a trainer he was always prepared."* He described Mr Corbin as a straight talker who *"was never shy to tell*

[8] Transcript Gerard McShane p81, Andrew Harrison p220,255, C41 ATSB Report p3.
[9] C10 Allana Corbin
[10] C15 Joseph Cleary
[11] Transcript Steven Davis p124.
[12] C26 Statutory declaration Steven Davis
[13] Ibid.
[14] C20 p8

*you what you were doing wrong".*[15] In evidence he said that "*You had confidence in him every time you went with him. You knew that…you were safe".*[16]

*Health*

28. Mr Corbin was generally physically and mentally well throughout his life.

29. Dr Robert Walker, Mr Corbin's main treating general practitioner in the Lindisfarne Clinic, provided a report for the coronial investigation. Dr Walker reported that Mr Corbin had undergone a cholecystectomy (gall bladder removal) at the age of 36 years due to suffering gallstones. There is no subsequent evidence of health conditions that caused any issues for obtaining his flight medical certificates.[17]

30. On 26 September 2017, approximately six weeks prior to his death, Mr Corbin presented to the Emergency Department of the Royal Hobart Hospital suffering abdominal pain. At that time, he was admitted to the ward for further testing but was discharged the following day. The hospital medical staff formed the impression that Mr Corbin had biliary tree pathology, pancreatitis or abdominal sarcoidosis. Liver function tests showed transient obstruction. However, a magnetic resonance cholangiopancreatography study was completed the following day which did not show any obstruction. By that time, Mr Corbin's pain had eased and his liver function tests were improving. He was deemed fit for discharge, was in fact discharged, and scheduled for follow-up consultation with the hospital surgical team.[18]

31. Dr Walker formed the view that the passage of a biliary stone seemed the most likely event, which would not have likely caused any disabling recurrence in the near future. Dr Walker, who had previously been an aeromedical examiner, obtained blood results for Mr Corbin with no evidence of any cardiac issues. Dr Walker asked Mr Corbin to attend his follow-up appointment at the hospital, although after his death he received notification that Mr Corbin had cancelled the appointment because *"it was no longer required"*.[19]

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[15] C23 Gerard McShane and see Transcript Gerard McShane p95.
[16] Transcript Gerard McShane p81.
[17] C9 Medical records indicate that sarcoidosis, hypothyroidism and some joint issues were ongoing but well-managed.
[18] C9.0 Report of Dr Walker.
[19] Ibid.

32. In relation to his mental health, Dr Walker also provided counselling support to Mr Corbin in the course of his regular consultations. The evidence indicates that Mr Corbin had experienced a number of adverse events throughout his lifetime (including three helicopter accidents), was prone to stress and irritability at work and was working long hours. Dr Walker had also prescribed him fluoxetine for approximately three years before his death which benefited him.

33. Mr Corbin was referred by Dr Walker to psychiatrist Dr William Kenyon in May 2017. Mr Corbin told Dr Kenyon that he was working approximately 80 hours per week at that time. There was no evidence that Mr Corbin had suicidal ideation. In general terms, Mr Corbin's mood was stable. [20]

34. Mr Corbin held the required current Class 1 and Class 2 Civil Aviation Medical Certificate.[21] His licence indicates that his last medical examination took place in March 2017.

35. It was reasonable for Mr Corbin's treating practitioners to consider that his hospitalisation in the weeks before his death was an isolated medical issue which was investigated appropriately. There is no evidence to indicate that his flying was directly affected by any physical or mental health conditions on the day of his death.[22]

**Mr Osborne**

36. At the time of the accident, Mr John Osborne was an experienced helicopter pilot working within his family business, Osborne Aviation Services. At the time of the inquest, Mr Osborne was the Managing Director of Osborne Aviation Group. The business specialised in helicopter operations - precision long line, aerial application and fire-fighting work, together with other aerial operations for both government and private clients.

37. Mr Osborne completed his pilot training in America to obtain his private and commercial helicopter licences and instrument rating. He had also worked as a flight instructor, training students for their private and commercial licences. At the time of

[20] C9.4 Dr Kenyon report.
[21] C36
[22] C8 Medical Records of Roger Corbin, p4-15

the crash, Mr Osborne had held his licence for 6 years and had approximately 1200 hours of flying experience.[23]

38. Mr Osborne sought to obtain an endorsement to fly the AS350 Squirrel helicopter, as that aircraft formed part of the operations of Osborne Aviation Services. Mr Osborne was already endorsed to fly five other types of helicopter. [24] In the weeks before undertaking the formal endorsement training, he had gained some experience in one of the AS350 Squirrels operating in his business with a qualified pilot employed by Osborne Aviation Services. He had not undertaken a simulated hydraulics failure with landing in this aircraft,[25] although he had done so in other types of aircraft.

39. Mr Osborne was medically fit to fly helicopters and held the appropriate medical certificate.[26]

40. Mr Osborne chose to undertake the endorsement training at Rotor-Lift due to Mr Corbin's good reputation and the fact that he had previously worked with Rotor-Lift flight instructor Andrew Harrison. Mr Osborne had previously flown with Mr Harrison but had not flown or trained with Mr Corbin and had not previously trained through Rotor-Lift.[27]

41. All of the evidence at inquest indicates that Mr Osborne was a competent helicopter pilot. I should make it clear at this point that no criticism of Mr Osborne's actions as a student pilot or otherwise is made in this finding, nor is there any cause to do so.

**Circumstances surrounding death**

42. On the morning of 6 November 2017 Mr Osborne arrived at the Rotor-Lift premises at Holyman Drive to commence the scheduled training syllabus. The endorsement training was scheduled for both 6 and 7 November and comprised a theory component and three flying sorties. Mr Harrison conducted all of Mr Osborne's training except for the final sortie, being emergency flight sequences, scheduled for 7 November 2017. [28]

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[23] C11.3 Affidavit John Osborne, dated 24/4/2023 and Transcript John Osborne p294-295.
[24] C35 - Flight Crew Licence for Mr Osborne, page 3.
[25] C11.3 - Affidavit of John Osborne, paragraph 7.
[26] C35 - Civil Aviation Medical Certificate, page 2.
[27] C11.3 - Affidavit of John Osborne, page 1.
[28] C11.3 - Affidavit John Osborne [11]-[26]

43. Mr Harrison, in his interview for the investigation, was complimentary of Mr Osborne's ability to fly the aircraft in the initial two training sorties. Mr Harrison said that he was surprised at how Mr Osborne picked it up, stating that he did not over-control the aircraft and neither did he allow it to *"wander around".*[29] He commented that Mr Osborne "… *seemed to have the right sort of time size movements"*[30]. He had encouraged Mr Osborne to verbalise when he had carried out various checks[31] but noted that he picked most things up *"quite happily"*[32] and that he was drawing on his *"vast experience".*[33]

44. There was no issue at inquest regarding the quality of Mr Harrison's instructing or training of Mr Osborne. All evidence indicates that Mr Harrison taught the required syllabus and was thorough in his approach to the theory and flight components of the training.

45. On 6 November 2017, Mr Osborne completed the scheduled theory and the first flying sortie. The aircraft used for the training was a Eurocopter AS350BA Squirrel, registered VH-BAA, owned by Gerard McShane. I will, from now on, refer to this aircraft as "the aircraft" or "the helicopter". The aircraft was on temporary hire to Rotor-Lift for the purpose of Mr Osborne's training.

46. The following morning, Tuesday 7 November 2017, Mr Harrison took Mr Osborne for the second sortie, involving pinnacles, low-level flying, slopes and run-on landings. Upon their return to the Rotor-Lift premises, Mr Harrison gave Mr Osborne a "board briefing" for approximately two hours on the theory of emergency procedures relevant to the third training sortie. In that briefing, Mr Harrison took Mr Osborne through the AS350 procedures for emergencies, including for hydraulics failure. The third and final sortie was scheduled for 3.00pm that afternoon and was to be conducted by Mr Corbin.

47. The process and instructions for training for loss of hydraulics in the AS350 were specified in sections of the aircraft's comprehensive flight manual ("the Manual");

[29] C20 - p21
[30] C20 - p21
[31] C20 p 27, 28
[32] C20 p33
[33] C20 p33.

Supplement 7 of the Manual for the training procedure itself and Section 3 for emergency procedures for management of the aircraft without hydraulics.[34]

48. Basic safety instructions contained identically in both Section 3 and Supplement 7 of the flight manual specified: (i) make a flat final approach over clear and flat area, nose into wind; (ii) perform a slow run-on landing around 10 knots and (iii) do not hover or taxi without hydraulic pressure[35].

49. I mention at this point that one significant issue in this inquest was whether Mr Corbin and Mr Osborne deactivated the hydraulics in flight (as is required by the exercise), in a manner that varied from the specified procedure set out in Supplement 7. This issue centred around whether the hydraulic test switch (or "test switch") had been set in a position ready to restore hydraulics *before* or *after* the activation of the hydraulic cut-off switch (or "cut-off switch").

50. Each of the two switches individually when activated will by themselves remove hydraulics from the aircraft, although using different methods. However, hydraulics cannot be restored using only one of the switches if the other switch is in an hydraulics-off position. Both the test switch *and* the cut-off switch must be selected to the correct position for restoration of hydraulics.

51. Consequently, the question arose as to the safety of the procedure undertaken before the crash and whether the part of the procedure that may have varied from Supplement 7 contributed to or increased the risk of the crash. This issue is explained and considered later in this finding, together with other aspects of the training exercise that departed from the specifications in Supplement 7 of the Manual.

52. Mr Corbin himself spent the evening of 6 November 2017 at home with his family. Mrs Corbin said in her affidavit that he went to bed at about 10.00pm-10.30pm.

53. At 7.30am the following morning, 7 November 2017, Mr Corbin left home to commence his work day. Mrs Corbin described him as *"pretty well and happy".*[36]

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[34] C41 ATSB Report p4; The Amendment Record Sheet shows that Supplement 7 was added to the Flight Manual for the Squirrel AS 350 -VH BAA, on 20 July 2004.
[35] C41.3 ATSB Slideshow, slide 33. C46, page 4
[36] C10a Affidavit of Allana Corbin, p2.

54. At 8.30am Mr Corbin met with Susan Stanley from Rotor-Lift at Abundance Café in Bellerive. This was their normal morning routine to discuss business matters. Mr Corbin then ran some errands in the city and returned to Rotor-Lift at 11.30am to instruct two students. The instruction ran over the allotted time and Mr Corbin was then running late for the second briefing with Mr Osborne scheduled for 3.00pm.

*55.* There was no evidence that Mr Corbin was particularly tired, stressed or distracted on the day.[37] However, his workload was very high with the various roles he performed in the business and he was running behind in his schedule.

*56.* Mr Corbin ultimately met with Mr Osborne shortly after 4.00pm for the third sortie to undertake emergency flight sequences.[38] Mr Corbin spoke briefly to Mr Harrison who explained what he had done with Mr Osborne and then *"left them to it".*[39]

57. Ms Stanley last saw Mr Corbin at 4.15pm when she delivered to him his bag, kneeboard and helmet for the flight. Ms Stanley observed Mr Corbin get into the left side of the helicopter and Mr Osborne get into the right side.[40] This was the usual position for instructor and student, with the helicopter having dual controls.

58. Ms Stanley did not notice anything untoward in the short time she observed the interaction between Mr Corbin and Mr Osborne.[41]

59. The evidence of Mr Osborne at inquest and in his police interview and affidavit was sound and credible in relation to most of the flight, except the seconds before the crash, which he cannot remember. I accept his account in finding the following circumstances.

60. The training flight commenced at 4.22pm, as shown by the aircraft's log, with Mr Osborne and Mr Corbin flying to Pawleena, east of the airport, for training exercises. These exercises included low-level flying, torque turns, confined area landing, aborted take-off, recovery from a vortex ring state and recovery from loss of tail rotor effectiveness.

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[37] Transcript Susan Stanley, p 427-432.
[38] C11.3 Affidavit of John Osborne [31]-[37]
[39] Transcript Andrew Harrison p224.
[40] C24.1 Affidavit of Susan Stanley, p1.
[41] Ibid.

61. Mr Corbin demonstrated most of these procedures before Mr Osborne was required to perform them. Mr Osborne completed the exercises satisfactorily and as the aircraft flew over Midway Point, Mr Corbin told Mr Osborne he was going to simulate a hydraulic failure, being a component of the course syllabus. At this stage, about 5.15pm, Mr Osborne estimated that the aircraft was approximately one minute's flying time from the Hobart airport.

62. At that time, Mr Corbin requested clearance from Air Traffic Control ("ATC") back into Area X-ray at the Hobart Airport to conduct further operations. Hobart International Airport ("the airport") is located at Holyman Drive in Cambridge.

63. The airport itself has a single runway, oriented in a north-west/south-east direction and is 2.7 kilometres in length ("the runway"). Area X-ray is a grassed area reserved for helicopters and located a distance of 60 metres from the southern end of the runway and on its western side. The main airport terminal and the control tower are also located on the western side of the airport but some distance away from Area X-ray at the northern end of the runway.

64. ATC provided the aircraft with clearance to land and instructed it to join the circuit on left base.[42] The clearance contained a caution regarding wake turbulence from a previously departing jet. The ATC clearance was not responded to by the aircraft and so another identical clearance was issued by ATC. The aircraft was on left base at this stage. [43] The left base of the circuit was at right angles to the runway and also to the final (landing) leg of the circuit.[44] Mr Corbin read back to ATC the repeated clearance as he was required to do. The aircraft crossed the runway whilst on left base and then turned left onto final[45] to make a straight approach parallel to the runway to land on Area X-ray.

65. As will be further discussed, Mr Osborne recalled flying the aircraft without hydraulics to the end of the final approach and had struggled to keep the aircraft low and straight. He did not recall his own movements or Mr Corbin's movements in the final seconds before impact.[46]

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[42] The third leg of an aircraft landing circuit, comprising four legs.
[43] C13 Affidavit Anthony Gunton, p2
[44] C 14 Affidavit Timothy Dalton
[45] The fourth and final landing leg of the circuit.
[46] C 11.1 Interview Transcript pages 34 to 36.

66. The aircraft was observed on final by ATC personnel, including Timothy Dalton, Unit Tower Supervisor. Mr Dalton said the aircraft came into his view at about 1000 feet and was descending. He stated in his affidavit that it appeared to be a slow approach which was not unusual for a student. He commented that at about 500 feet there were a couple more pitch changes as the aircraft was coming in to land. At 200 feet, he said the aircraft was still in control but he then lost sight of the aircraft as his view was obscured.

67. Mr Dalton gave evidence that, at the time, the weather conditions were clear, there was no cloud and there was a south-westerly wind at a direction of 170-200 degrees at a speed of up to 15-20 knots.[47] He stated that, for the landing aircraft, there was a crosswind of up to 80 degrees. He described it as a *"quartering crosswind*". He described the conditions as blustery but not concerning *"as far as Roger was concerned"*.[48]

68. Peter Ayre also provided similar evidence about the wind conditions from the meteorological information available to Mr Corbin and Mr Osborne at the time of the flight.[49] Mr Ayre said, similarly, that at 4.54pm the weather information indicated that the wind was coming from a direction of 200 degrees at a speed of between 15 and 25 knots. This represented a crosswind of 18 knots on a 120-degree landing heading.[50] Mr Ayre gave evidence that the subsequent weather information showed that the wind was dropping in speed. It appears that, at the time of the crash the wind speed may have been as low as 11 knots but still a crosswind from the same or similar direction.[51]

69. Peter McKenzie, a very experienced pilot and credible expert witness, gave evidence about the wind conditions at the time of the aircraft approaching landing. He said that, in addition to the weather information received by the pilots, ATC personnel would have communicated wind direction at the time of giving the aircraft clearance to land. Further, he said that the airport windsock would have been a clear indicator of the speed and direction of the wind. He also indicated that the pine forest close to Area X-ray had the effect of shielding the wind.

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[47] Transcript Timothy Dalton at p12
[48] C-14 Affidavit – Timothy Dalton, page 2.
[49] Primarily the ATIS
[50] And a maximum crosswind of 25 knots. Transcript Peter Ayre p250 line 25.
[51] Transcript Peter McKenzie page 474; C 32b BOM report.

70. Mr McKenzie said from his own experience of similar wind conditions that *"by the time you get to the touchdown quite often there is no or very little wind at all …".* Mr McKenzie was clearly knowledgeable about the local wind conditions. I am also in no doubt that Mr Corbin, with his vast experience, was also fully aware of the conditions. Further, he had a particular duty as pilot in command and instructor to be aware of changes in the weather conditions.

71. Air traffic controller Anthony Gunton was in the tower and saw the aircraft approaching close to Area X-ray at about 400 feet. Mr Gunton said at that point it looked like a fast approach. He then saw the aircraft pitch forward and to the left at about 200 feet and knew something was wrong. He said that it was a quick pitch over and then it struck the ground at speed.[52]

72. Joseph Cleary, a commercial helicopter pilot, was watching the helicopter from the domestic terminal whilst waiting for his flight to Sydney with his family. He said in his affidavit that, when he first sighted the helicopter, it seemed particularly slow for an AS350 Squirrel. He assumed that the aircraft was performing an hydraulics-off approach and it looked well under control. He lost sight of it when it was at an altitude of 100-200 feet and parallel to the runway.[53]

73. Mr Brett Maloney a firefighter with Aviation Rescue Firefighting services also saw the crash. He saw the aircraft coming from the north and operating apparently as normal. As it came in, he saw it hovering over Area X-ray and it remained hovering facing south parallel to the runway. He said he then looked away briefly. When he resumed looking, he saw the helicopter facing forwards at a 45-degree angle to the ground, continuing to descend forward and to the ground at that same angle. He then saw it impact on the ground in Area X-ray. Mr Maloney, who was located in the Fire Control Centre, witnessed the crash at a closer point than the ATC personnel.

74. The final stages of the flight and crash were captured by the airport closed circuit television (CCTV). I will further discuss the circumstances of the crash with reference to analysis of this footage and the opinions of experts. However, the footage confirms the observations of the eyewitnesses, all of whom are experienced observers of aviation within the airport.

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[52] C-13 Affidavit – Anthony Gunton p2
[53] C 15 Affidavit – Joseph Cleary p2.

75. Notably, the footage confirmed Mr Maloney's observations that the aircraft had entered into a hover, a dangerous state for an aircraft in an hydraulics-off landing. It also confirmed the eyewitness evidence that it pitched forward from a low altitude and went nose first into the ground.

76. As a result of the crash, Mr Corbin, who was seated on the left side of the aircraft, died from his injuries. Mr Osborne was seated on the right and was trapped in the aircraft before being freed by Aviation Rescue Firefighting Services personnel, who responded very quickly.[54] The airport was closed and the scene contained.

77. The attending paramedics received the emergency call at 5.25pm and arrived at the aircraft at 5.44pm. They found that Mr Corbin was unresponsive. They noted that his pupils were fixed and dilated, there was no respiratory effort, no palpable pulse and he was in asystole. Although they commenced CPR, he remained unresponsive and was determined to be deceased.[55]

78. Mr Osborne was noted by the attending paramedics to be conscious and responsive. He told them that he could not recall the crash and may have had a period of loss of consciousness. He did not appear to have serious injuries but had right ear and nose pain. He sustained cuts and bruising to his face and legs. He was transported to the Royal Hobart Hospital for treatment. He recovered fully.

**Investigation of the crash and Mr Corbin's death**

*Scene observations*

79. Specialist Tasmania Police officers, including crash investigators and forensics officers, attended the scene shortly after the crash. They conducted a survey of the wreckage and the scene and a thorough forensic examination.

80. Investigating officers observed that the crashed helicopter was a distance of 17.2 metres from the western edge of the runway. It was resting on its right side. The tail fuselage had broken and was folded forward onto the body of the helicopter. The three rotor blades were damaged and had caused gouge marks in the dirt and grass surrounding the area of impact. There was significant damage to the front left side of the helicopter. Left side cabin intrusion had occurred, this being the seat occupied by

[54] C 12 Statutory Declaration of Brett Maloney
[55] C7 VACIS record.

Mr Corbin as instructor. The right front door window was broken and white feathers had adhered to dried blood. The origin of the feathers was later identified as the filling of Mr Corbin's vest and not a bird strike.

81. Once Tasmania Police officers had inspected, documented, photographed and processed the scene, the wreckage was removed so that the airport could re-open.

82. The following day, 8 November 2017, two investigators of the Australian Transport Safety Bureau ("ATSB") attended the scene.

83. The ATSB is an independent Commonwealth Government statutory agency established by the *Transport Safety Investigation Act* 2003 to investigate transport accidents and safety occurrences with the aim of improving transport safety for the benefit of the public. The investigations conducted by ATSB investigators are aimed at determining the factors leading to an accident or safety incident without apportioning blame. The requires reporting of transport safety matters and gives its investigators considerable powers in investigations, including access to the crash site and retaining confidentiality of witness statements obtained by them.

84. In this case, the ATSB investigators spent a period of four days examining the scene and wreckage, obtaining records and documentation, and obtaining statements from witnesses. ATSB investigators also relied upon the scene survey and evidence collected by officers of Tasmania Police.

85. I note that the ATSB did not issue a certificate under section 60(5) of the *Transport Safety Investigation Act* releasing its witness statements for the benefit of the coronial investigation. However, I have had access to its full report and am grateful for the considerable assistance from ATSB throughout the inquest. Through this process, I am satisfied that there are no material inconsistencies or differences between the statements taken by the ATSB and those taken by Tasmania Police that could have affected the coronial investigation. Similarly, counsel for the ATSB confirmed that there was no evidence emerging at inquest with that would have led the ATSB to reconsider the conclusions in its final report.

*Autopsy*

86. A full autopsy upon Mr Corbin was conducted by forensic pathologist, Dr Donald Ritchey, on 9 November 2017 at the Royal Hobart Hospital. During autopsy, Dr

Ritchey observed blunt trauma to the head and neck, thorax and arms and legs. He noted that the autopsy revealed multiple abrasions, contusions and abraded contusions that were confined predominately to the face. There were no scalp contusions or skull fractures. There was a basal subarachnoid haemorrhage surrounding the brain stem where there had been complete transection of the brain stem at the level of the medulla oblongata. There was a complete separation of the base of the skull from the vertebral column. Additionally, in the chest, there was a three-centimetre laceration of the aorta causing severe internal bleeding and there was a transverse fracture of the anterior body of the third thoracic vertebra. I accept Dr Ritchey's opinion that these injuries resulted in near instantaneous death on impact.[56]

87. There was no evidence of any acute medical event at autopsy that may have affected Mr Corbin's control of the aircraft. Dr Ritchey did note the presence of moderate heart disease, as well as widespread granulomas (collections of inflammatory cells) due to the disease sarcoidosis. Dr Ritchey indicated in his report that this disease was responsible for Mr Corbin's hospitalisation before his death. I accept his opinion. It is possible that this condition may have caused him to feel generally unwell.

*Police investigation for the coroner*

88. The coronial investigation was undertaken by Senior Constable Kelly Cordwell, an experienced crash investigator who completed it on 28 July 2021.[57] Senior Constable Cordwell provided a very helpful summary of the witness evidence and was assisted in her investigation by the expert opinion contained in the ATSB report. The investigation conducted by Tasmania Police did not conflict in any material way with that conducted by the ATSB.

*ATSB report*

89. The investigator in charge of the ATSB investigation, Peter Ayre, is a very experienced helicopter pilot, flight instructor and safety investigator.[58] In coming to its conclusions, the ATSB investigation team also relied upon opinions from a variety of other qualified

[56] C5 Forensic Pathology Report, p 11
[57] A Tasmania Police crash investigator has expertise and training in vehicle crashes.
[58] C 41. 3 Mr Ayre has accumulated 3200 flying hours, 640 hours in an AAS 350, 500 hours flight instruction, together with qualifications and experience in safety incidents and investigations.

experts, including a Licensed Aircraft Maintenance Engineer, an air traffic controller and a materials engineer.

90. On 22 July 2020, the full ATSB report was completed. The report detailed the circumstances of the crash from the evidence collected and reached conclusions about why the crash occurred. Mr Ayre gave helpful evidence at inquest to further explain the report and the investigation and to provide expert evidence.

91. The main conclusions of the report were as follows:

1) The aircraft approached the landing in Area X-ray without the assistance of hydraulics, as the hydraulic system had been deactivated as required for the training procedure in question.

2) The aircraft made the approach and landing in a crosswind and not *into* the wind as specified by the flight manual for the training procedure.

3) The aircraft was appropriately controlled during the early stages of the approach. However, as it slowed towards landing control was lost. This was evidenced by its drift and its variations in pitch[59] and yaw.[60]

4) A delay in restoration of the hydraulic system prevented the crew from regaining control before collision with the terrain.

5) For a three second period, the aircraft slowed to a hover and there appeared to be no positive control of the aircraft.

6) After the aircraft came to a hover and yawed left, a positive input was made and the aircraft climbed.

7) Given the nature of the aircraft movement and proximity to the ground, there was little opportunity at that point to restore control.

8) The procedure used to simulate a hydraulics-off landing did not match the requirements of the flight manual.

[59] Rotation around the vertical axis; put simply, the nose swerving from side to side.
[60] Rotation about the lateral axis; put simply, up and down movements of the nose.

9) Light bulb analysis of the hydraulic system fault warning light indicated that it was probable that the hydraulic fault light was not illuminated at the time of impact with terrain, indicating there was no issues with the hydraulics of the helicopter.

10) It was likely that the hydraulic test switch and the hydraulic cut-off switch were both moved to restore hydraulics prior to impact.

11) It is possible that an intermittent fault in the hydraulic cut-off switch may have delayed restoration of hydraulic pressure and therefore control of the aircraft.

12) A pre-flight brief was not conducted between Mr Corbin and Mr Osborne. The absence of a pre-flight brief may have led to confusion over aircraft control and may have delayed restoration of the hydraulic system.

92. In the report, the ATSB Report found that there were four contributing factors to the crash, and these were as follows:

(i) The hydraulic failure emergency procedures in the manual were not followed. Specifically, the final approach was flown with significant right crosswind and the helicopter was allowed to slow to a high hover;

(ii) The hydraulic failure training exercise was allowed to progress to a point where control of the aircraft was no longer assured.

(iii) Hover flight without hydraulic assistance led to loss of control of the aircraft;

(iv) The hydraulic system was restored too late in the sequence to recover control of the aircraft. The reason for late restoration could not be determined.[61]

93. In performing my functions as coroner, I am required to consider all of the evidence before me and am not bound to follow the ATSB's conclusions. However, the ATSB report is thorough and logical and my findings do not differ substantially in crucial aspects. I emphasise that I did not have regard to exactly the same evidence as the

[61] C41 ATSB Report p22.

ATSB and I had the benefit of several days of oral testimony from key witnesses and a number of additional experts.

*Footage of crash and expert comment*

94. From the CCTV footage of the crash and other factual evidence[62] the ATSB investigators produced a reconstructed photograph depicting the final movements of the aircraft before the crash ("the photo"). There are six points marked on the photo delineating notable changes in the aircraft's movement. There was considerable evidence at inquest given by the experts with reference to the photo, which is annexed to this finding and marked "B".

95. The CCTV footage itself shows the aircraft entering the frame of the camera and, 30 seconds later, crashing into the ground.

96. The analysis of the CCTV footage by the ATSB over the 30-second period is summarised as follows:

> *Point 1*: The aircraft enters the camera frame at a heading of 120 degrees travelling at about 20 knots.
>
> *Point 2*: At the 12 second point, the aircraft exhibits variations in pitch and yaw as it slows to about 11 knots. The approach flattens and the aircraft begins to yaw left.
>
> *Point 3*: At the 18 second point, the aircraft changes heading to about 40 degrees after its yaw to the left. It comes to a hover and is slowly drifting.
>
> *Point 4*: At 21 seconds, the aircraft climbs, pitches forward, crosses the runway and continues to yaw left, travelling in a circular motion to a heading of 300 degrees. As the yaw continues to the left the aircraft pitches further forward to about 50 degrees with a left roll developing. It has accelerated to a speed in excess of 20 knots.
>
> *Point 5*: At 28 seconds, it is heading in the direction of 240 degrees, sliding outwards in a left turn and pitching down at an angle of 45 degrees and a roll of around 50 degrees.

[62] Air traffic control data and airport photographs.

*Point 6*: At the 30 second point, the aircraft is heading at 120 degrees, is pitched down at 40 degrees and the roll has increased to about 80 degrees. The aircraft impacts with the ground.

97. In his statements and evidence, Mr Osborne described the flight and had a good recollection until the final stage of the hydraulic failure simulation when the aircraft was at an altitude of 40 to 50 feet.[63]

98. In his video record of interview, Mr Osborne described coming down on the descent path seeking a shallow approach. However, he described struggling with the collective[64] and maintaining the aircraft at a low enough altitude to keep the correct approach profile. He described "*fighting to keep it down"* which he said he may have mentioned to Mr Corbin at the time.

99. Mr Osborne recalled the nose of the aircraft wanting to move left as he came to the bottom of the approach, and that the aircraft was starting to lose speed over the rotor. He recalled thinking he needed to keep a lot of pressure on the right pedal to keep the aircraft straight. He also remembered thinking that he needed to keep the aircraft moving.[65]

100. He said that he then lost memory. He did not recall the aircraft turning left in the circular motion and it does not appear that he recalled the aircraft in a hover. However, he said that he had a "flash" memory just before they crashed, where the aircraft was pointing nose down to the left at a maximum altitude of 30 feet.[66] Mr Osborne recalled thinking *"that's bad",* and Mr Corbin saying *"fuck".* [67]

101. Mr Osborne said in his interview about the possible cause of the crash:[68]

> *"…it could well be a case of hydraulics on the hover being very hard to control and as we turned the wind could have caught it and it could have become very difficult to control, there could have been a huge force on the cyclic that ripped it out of my hand and if Roger didn't have hands on it then it's over in a second or even if he did um or*

[63] Transcript p298, line40.
[64] The lever to the left of the pilot which increase or decreases all rotor blades equally. The primary effect is to cause the aircraft to ascend or descend.
[65] C 11.1 page 34 on page 35.
[66] C11.1 page 37
[67] C 11.1 page 36
[68] C 11.1 p36

*it's possible one of us reactivated the hydraulics. I think it would have had to have been me, I'm pretty sure he didn't have that switch on his collective."*[69]

102. In his interview, Mr Osborne further speculated that if the hydraulics had been restored just before the crash, then the aircraft's controls would become suddenly lighter. In that case, there was a risk of unnecessary pressure remaining applied to the controls and the aircraft reacting dramatically to the harsh control inputs.[70]

103. Mr Osborne's evidence of the aircraft movements is consistent with the CCTV footage and expert evidence. It would seem from his evidence, however, that he was not aware of the extent of the left-hand yaw before impact. This would tend to indicate that his memory was lost after Point 3 on the photo, before the aircraft crossed the runway in a circular motion and was not under control. If that is the case, Mr Osborne does not have a memory of the final 12 seconds the flight.

104. The footage of the aircraft flying between Points 1 and 2, showed that it was initially well under control and descending at a consistent heading. No significant criticism was made by the experts at inquest about its speed, angle or rate of descent between these two points until it came close to Point 2.

105. Mr Davis commented that the approach during this phase, from Point 1 to Point 2, was *"perfect",* being shallow and stabilised.[71] However, Mr Ayre gave evidence that there were signs that the aircraft controls had become heavy, with pitch and yaw variations occurring close to Point 2. [72] Mr Harrison testified that the angle of approach was steeper than what he would have wanted for a running landing.[73]

106. The flight instructor witnesses gave evidence regarding the appropriate point of intervention by Mr Corbin as instructor. Mr Ayre said he would have intervened at Point 2. Mr Harrison said that he would have intervened shortly after Point 2, when the aircraft decelerated at a greater rate than it should have. He said he would have implemented a *go around*[74] and then reset for another approach.

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[69] Ibid.
[70] Ibid.
[71] Transcript Steve Davis p154-155.
[72] Transcript Peter Ayre p374-375.
[73] Transcript Andrew Harrison page 236, line 30.
[74] An aborted landing.

107. Mr Davis gave evidence that he would have taken steps to intervene and control the aircraft at Point 2.7, being about *"two thirds of the way along from point 2 to point 3…"*.[75] He further gave evidence that by Point 3 the aircraft had *"won the battle"*, meaning that it was unable to be controlled.[76]

108. Therefore, the experts at inquest agreed generally that a recovery operation should have taken place between Points 2 and 3. However opinions varied, not surprisingly, as to exactly when in that sequence it would have been reasonable for the instructor to intervene.[77]

109. Mr Davis, in his second affidavit for the investigation, explained that a hydraulics-off approach by a student is not expected by an instructor to be perfect and some movement of the aircraft is normal. He said that it is important that the student learns to experience such movement and to make necessary adjustments and corrections in the approach. Therefore, there are sound learning reasons for an instructor not to intervene too early. [78] I fully accept Mr Davis's evidence in this regard.

110. Mr Harrison, in evidence, also emphasised the need for an instructor to observe the student without interfering. He said that in a flight test, as opposed to an instructional teaching flight, an instructor may leave the student longer to determine if the student is able to fix the problem themselves.

111. In the case of the flight in question, Mr Osborne and Mr Corbin were engaged in an instructional teaching flight, which was not examinable.[79] I am satisfied that, in accordance with Mr Corbin's own practice and the usual instruction practices, Mr Corbin would have been constantly communicating to Mr Osborne throughout this training exercise and giving him guidance with the aim of making necessary corrections and completing the exercise.[80]

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[75] Transcript Steven Davis page 186, line 25
[76] Ibid.
[77] Peter Ayre said at 2 (Transcript p374), Andrew Harrison said at 2.25 (Transcript p237) and Steve Davis at 2.7 Transcript 186, 193).
[78] C 26b, paragraph 22.
[79] Transcript Andrew Harrison page 239 lines 15 to 40.
[80] C 26 b, Affidavit of Steven Davis, paragraph 24.

112. Once the aircraft entered into a hover at approximately Point 3 on the diagram, it was unable to be controlled.[81] The aircraft then crossed over the runway, which was active, without ATC clearance. I agree with Mr Ayre's evidence that this further indicated that the aircraft was uncontrolled or uncommanded and that recovery of control was necessary.[82] The further and final movements included a continuing turn to the left, nose pitching down, altitude increasing and a sudden diving to the ground.[83]

113. Both Mr Davis and Mr Ayre both gave evidence that when hydraulics are off, the aircraft becomes very heavy to control. Mr Davis said that keeping control of the pedals[84] and of the collective requires around 20 to 25 kilograms of force and therefore controls become less responsive and harder to maintain.[85]

114. Mr Davis, who has trained pilots in this exercise in excess of 1000 occasions, said he has seen on many occasions insufficient force applied to the collective. In such a situation, he said that the nose of the aircraft *"naturally wants to pitch up"*. Consequently, there is a dramatic loss of airspeed and the felt control force feedback rapidly increases.[86] The footage depicts this scenario.

115. I accept the ATSB's conclusion that the hydraulic system was restored before the aircraft crashed. Both the test switch and cut-off switches were in the normal flight configuration (that is, hydraulic systems were activated) when examined following the crash. Also, during an inspection of the airframe, some residual pressure was found in the accumulators, indicative of the hydraulic system being restored prior to the aircraft impacting with the ground. [87]

116. Despite hearing from knowledgeable witnesses, I am unable to make a positive finding regarding a particular point on the footage where hydraulics had become operational.[88] In any event, the restoration was too late to have any impact upon the control of the aircraft.

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[81] C41 ATSB Report p19-20; C41.3 ATSB Slideshow, slide 15; Transcript Peter Ayre p353-354, 380; Peter McKenzie p442; Steven Davis p144 (who indicated that in his opinion the aircraft was about to go into a hover between point 2 and 3). Transcript Steven Davis 195-196.
[82] Transcript Peter Ayre page 353, line 10.
[83] C 26b Affidavit of Steven Davis, paragraph 17
[84] Pedals control yaw as the primary effect,
[85] Ibid., paragraph 19.
[86] Ibid., paragraph 20.
[87] C41 ATSB Report p20, Steven Davis p142-143.
[88] Mr Davis and Mr Ayre were questioned about this issue but, ultimately, it was speculative.

**Consideration of causes or contribution to the crash**

*The condition of the aircraft at the time of the crash*

117. The helicopter was manufactured in France in 1987. It was first registered in Australia on 4 April 2000. At the time of the crash, the aircraft's total service time was 5612 hours. On 6 and 7 November 2017, the helicopter had logged 2.5 hours in the training role before the flight involving the crash. During this training time, neither Mr Harrison nor Mr Osborne reported problems with the performance of the helicopter or its operation.

118. I am satisfied that the aircraft was in sound mechanical condition.[89] At the time of the accident the aircraft was overdue for maintenance for lubrication of the main rotor blade pins. I am satisfied that this fact did not contribute to the crash. [90]

*Intermittent fault in the hydraulic cut-off switch*

119. As noted above, the ATSB experts found that the hydraulic cut-off switch examined after the crash was prone to intermittent operation. If this fault in the switch existed prior to the crash, the switch may have required multiple applications to successfully re-activate the aircraft's hydraulic systems. If this was the case, it may have delayed the restoration of the hydraulic system.

120. However, it could not be determined whether the intermittent operation was due to impact-induced damage.

121. The inspection revealed that the cut-off switch had a level of wear, corrosion, contamination and internal damage. These characteristics existed before the crash.[91]

122. There were no reported anomalies or intermittent issues with the cut-off switch prior to the accident. In fact, it had been used and it was in working condition.[92] Further, the filament analysis on the hydraulic system fault warning light bulb indicated that it was not illuminated at the time of the crash. This is also suggestive that there were no faults in the hydraulic system.

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[89] Transcript Gerald McShane p77, Andrew Harrison P221.
[90] C41 ATSB Report p6, Transcript Peter Ayre p334.
[91] ATSB Final Report, p.14

[92] Transcript Gerard McShane p77-78, John Osborne p313, Andrew Harrison p276.

123. It therefore seems more likely that the intermittent failure of the cut-off switch was due to impact damage. I do not consider that a fault in the cut-off switch contributed to the crash. [93]

*The involvement of wake turbulence*

124. The term *wake turbulence* refers to the disturbed air, including vortices, descending from a heavy aircraft in flight. Wake turbulence is most likely to be encountered by a smaller aircraft such as a helicopter flying just below the flight path of a heavy aircraft. Thus, wake turbulence may render a small aircraft uncontrollable. In the context of the landing or departure of a jet, wake turbulence may persist for up to two minutes. Its effect is more severe on calm days. A crosswind of reasonable strength, such as that on the day of the crash, will more quickly dissipate any wake turbulence.

125. This issue of whether the control of the helicopter was affected by wake turbulence on the final approach arose because the ATC clearance contained a caution regarding wake turbulence. The affidavits and evidence from the ATC personnel indicated that a large jet had departed runway 12, although well before the helicopter came within the area, however potentially affecting it.

126. ATC is required to issue a wake turbulence caution to aircraft following larger jets where they might enter the wake turbulence envelope within a three-minute period.[94] ATC witnesses were confident that the helicopter did not and could not have been affected by wake turbulence on its approach into the airport, and that the caution provided within the clearance to land was issued to create vigilance in the pilots. The ATC witnesses and ATSB did not consider wake turbulence to be a contributing factor in the crash, having regard to the timing of the departed jet[95] and the movements of the helicopter. Mr Davis also considered this issue and gave evidence that the possibility of wake turbulence having anything to do with the outcome of the crash was *"extremely remote".*[96]

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[93] Transcript Peter Ayre p358.
[94] Transcript Timothy Dalton page 16.s
[95] No accurate time of departure for that jet was given in evidence, although it was universally agreed that the entry of the helicopter was outside the three-minute separation. It is reasonably likely that the jet was airborne at 5.16pm in accordance with Mr Dalton's evidence (Transcript page 15). This is 6 minutes before the crash.
[96] Transcript Stephen Davis page 147 line 10.

127. None of the counsel appearing at the inquest submitted that wake turbulence was involved in the circumstances surrounding the crash. I am positively satisfied that wake turbulence from a departing jet was not experienced by the helicopter during the simulated hydraulics failure and therefore I am satisfied upon the evidence that it was not a factor in the crash.[97]

*The suitability of conducting training at Area X-Ray*

128. At inquest, opinions were sought from a number of knowledgeable witnesses about whether Area X-ray was a suitable location for undertaking helicopter training exercises. The area was visible to ATC personnel and its use was managed by ATC which scheduled access according to arrivals and departures on the runway. The evidence indicated that it is commonplace to conduct helicopter exercises in similar locations close to runways at other interstate airports. There is no suggestion that there have been previous incidents bringing the location of *A*rea X-ray into question. Further, its proximity to the airport's emergency services made it a desirable location to undertake training exercises.[98]

129. I am satisfied that there are no issues regarding the location or suitability of Area X-ray that are connected with the crash.

*Pre-flight briefing*

130. The requirement in training for a pre-flight briefing, especially where non-normal operations are conducted, is well established.[99] The instructor's briefing should cover the planned procedures for the flight and how they are to be executed. Further, it should cover threat and error management, what to do in an actual emergency and how that is to be communicated.[100] During pre-flight briefing/s, it is important to establish the responsibilities during the flight of the instructor and student respectively, to revise the handover techniques and to discuss the circumstances in

[97] Transcript Timothy Dalton at p16,17; Anthony Gunton p41-44; C11.3 Affidavit John Osborne [91], Transcript Steve Davis p147.
[98] Transcript Timothy Dalton at p17-20, 22-23; Anthony Gunton at p45-47; Brett Maloney at p59-60; Gerard McShane at p75-76; C11.3 Affidavit John Osborne [92], Transcript Steve Davis p150.
[99] C41 ATSB Report p21.
[100] Transcript Andrew Harrison p271ff; Steven Davis p127-128 (PUI to go through the sequence, CFI to communicate how the sequence to be introduced), 168-173.

which the exercise may be aborted.[101] It is also important to reinforce essential knowledge and significant airmanship points.[102] This is critical to developing a common understanding between the instructor and student.

131. Mr Ayre gave evidence about the pre-flight briefing of threat and error management for hydraulic failure training in the following terms:

> *"..you look at the expected events and risks and you also look at unexpected events and risks and you define what these are, how we're going to handle them, you know, what they look like, what the student can expect and through the evidence that's been presented, for the hydraulic failure training sequence – so we've spoken about difficulty in restoring the hydraulics because there's only one switch. That is absolutely ah something that needs to be discussed between the instructor and the student. We've talked about the risk of an inadvertent hover and that being induced by oscillations in airspeed, Mr Davis took us through that. Again, that's an expected event or risk in this sequence. We've spoken about ah the importance of early intervention. We can as instructors expect students to do strange things sometimes."*[103]

132. Mr Ayre went on to say that the discussion relating to managing threats and errors should also incorporate on the part of the instructor any planned deviations from the flight manual. The instructor should explain the amended procedure, why it was safer, and the risks involved in deviating from the prescribed procedure. For example, in the case of a crosswind, the risks to the aircraft and to the student's workload should be discussed. [104]

133. Mr Davis said that in his experience of being examined by Mr Corbin, Mr Corbin's pre-flight briefs were thorough, and he would often spend *"too much time"* on them.[105] No witness suggested that Mr Corbin was prone to being lax in his briefing practices.

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[101] Transcript Andrew Harrison p234, 244, 248, 249, 254-255: C41 ATSB Report described it as such; *"Such a briefing reaffirms standard operating procedures, promotes predictable behaviour and sets expectations among crew".*
[102] C41.3 ATSB Slideshow slide 58, Peter Ayre p362-364.
[103] Transcript page 362, line 30, (pause-fillers removed)
[104] Transcript p363 line 5.
[105] Transcript Steven Davis p 124.

134. It is recommended that when instructing a student in emergency procedures, two briefings take place prior to flight: a classroom brief and a pre-flight brief.[106] Mr Ayre, in his evidence at inquest, particularly emphasised the need to develop a clear understanding and co-ordination in the pre-flight brief between instructor and student concerning known hazardous activities such as a simulated hydraulic failure.[107]

135. Pre-flight briefings are generally conducted in the classroom or at the aircraft but should not occur in flight.[108] I accept Mr Ayre's evidence at inquest that it is best practice to conduct a pre-flight briefing in the classroom.[109] I also note his evidence that CASA[110] recommends that 18 minutes is spent on the pre-flight briefing.[111]

136. It is plain upon the evidence that, as a matter of course, an instructor provides to the student information and instructions in flight.[112] I have no hesitation in accepting the unchallenged evidence that Mr Corbin continuously provided his students with a high level of quality instruction in a training flight.

137. Importantly, I must consider the evidence indicating the extent of any pre-flight briefing between Mr Corbin and Mr Osborne. I rely particularly upon the affidavit and oral evidence of Mr Osborne in this regard. Whilst he could not recall the moments before the actual crash, he gave credible evidence on all other matters and was forthcoming about those matters he could not remember. Based upon Mr Osborne's evidence as well as that of the other witnesses, the following facts can be found:

    - At about 2.00pm on 7 November 2017, after Mr Osborne had completed the theory component for emergency procedures with Mr Harrison. Mr Corbin briefly introduced himself to Mr Osborne to arrange a time for the flight. Mr Corbin, at that point, did not engage in any instructions or briefing of Mr Osborne.

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[106] C41 ATSB Report p3. Note this relates to the CASA guidelines for commercial pilot licence training but the guidelines are useful as a general guide: Transcript Peter Ayre p377, Steve Davis p176-179.
[107] C 41.3, PowerPoint presentation pages 58 and 59
[108] Transcript Andrew Harrison p244.
[109] Transcript Peter Ayre p364.
[110] Civil Aviation Safety Authority.
[111] Transcript Peter Ayre, p400.
[112] Transcript Steven Davis p124. Note also Transcript Steve Davis p125 to the effect that a "full board brief" of 30-60 minutes to be undertaken in the classroom before the sequence is flown. Subsequently, the PUI would only need a "thumbnail brief" in respect of the sequence. Further "remedial" instruction could also be given in flight, especially in the case of redoing the sequence.

- In his affidavit, Mr Osborne indicated that the flight was arranged for 3.30pm, although Ms Stanley said that Mr Corbin was to meet Mr Osborne at 3.00pm for a briefing. [113] There may not be conflict regarding this 30-minute discrepancy in timing, because Mr Corbin was likely to have put aside time to brief Mr Osborne at 3.00pm with the flight to commence at 3.30pm.

- Mr Corbin was running late for the meeting with Mr Osborne and met with him in the classroom at a time between 4.00pm and 4.15pm, again briefly, before leaving to obtain his gear from Ms Stanley. Mr Corbin told Mr Osborne that he would meet him at the aircraft whilst he collected his things. [114] Accepting the evidence of Mr Osborne, together with the timing provided by Ms Stanley, there was no briefing or instruction provided by Mr Corbin to Mr Osborne in the classroom at that time.

- Mr Corbin and Mr Osborne met at the aircraft, likely shortly before 4.15pm. Whilst at the aircraft, Mr Osborne asked Mr Corbin whether he could undertake a low-level flight test as this was required by CASA as part of the transfer of his American licence to an Australian licence. Mr Corbin agreed. I accept the evidence of Mr Osborne that there was no other discussion or briefing about how the proposed flight would be conducted.[115] Mr Osborne, of course, was already aware of the sequences and training procedures proposed for the flight.

- In the aircraft itself (on the ground before the flight) Mr Corbin and Mr Osborne conducted pre-flight checks. During the pre-flight hydraulics checks, Mr Corbin explained to Mr Osborne the reason for the checks being completed in the Manual's prescribed order was because this mirrored what would occur during a real hydraulics failure in flight. Mr Corbin stated that when the hydraulic test switch is applied (to de-activate hydraulics) there is sufficient pressure retained in the

[113] C 24.1 Affidavit of Susan Stanley, page 1.
[114] C 11.3 Affidavit of John Osborne
[115] C 11.3 Affidavit of John Osborne,[35]

accumulators to drive the servos to enable a reasonable number of movements in the controls (assisted by hydraulics) in order to achieve the desired safety speed range. Mr Corbin took Mr Osborne through the next pre-flight test procedure involving activation of the hydraulic cut-off switch on the collective, demonstrating the ability to safely de-activate the hydraulics in the safety speed range before proceeding to a hydraulics-off landing.[116] I accept Mr Osborne's evidence and am satisfied that no other discussion occurred about the emergency hydraulics failure training exercise at that time.

- Once the flight was underway, the numerous scheduled procedures as earlier described were undertaken, with Mr Corbin himself demonstrating most of them.[117] Whilst the aircraft was on the dam wall at Pawleena, Mr Corbin said to Mr Osborne that he would declare what he was about to do before commencing any simulated emergency procedure and that if he did not declare it as a simulation, it was a genuine emergency. In that event, he said, Mr Osborne should take any action he thought appropriate in response; and that he, Mr Corbin, would step in where necessary.[118]

- Mr Osborne did not recall any other in-flight instruction from Mr Corbin regarding the proposed simulated hydraulics failure procedure, including managing threats and errors associated with it. Mr Osborne also gave evidence that he would have expected Mr Corbin to cover additional pre-flight briefing matters but the effect of his evidence was that this did not occur.[119] If it had occurred, I am satisfied that Mr Osborne would have recalled it.

138. Based upon the above findings, I can confidently determine that Mr Corbin did not conduct a pre-flight briefing with Mr Osborne in respect of the emergency hydraulics failure procedure. I have come to the same conclusion as Mr Ayres that, in the

[116] C 11.3 Affidavit of John Osborne [37]; note the evidence of Peter Ayre that the primary function of the hydraulic cut-off switch is to equalise the pressure across the controls in the event of a genuine hydraulic failure.
[117] C 11.3 Affidavit of John Osborne [41]
[118] C 11.3 Affidavit of John Osborne [40]
[119] Transcript page 308 - 311

timeframe presented on the evidence, it could not have been conducted sufficiently in the time that they had together.[120] Mr Corbin's announcement in-flight relating to simulated and genuine emergencies did not satisfy the requirements, nor did the instruction about the test switch in the pre-flight hydraulic checks.

139. Counsel for Rotor-Lift, Ms Quartararo, submitted that a conclusion that no pre-flight briefing occurred was an oversimplification of the evidence at inquest. In summary, she submitted that the board briefing in relation to emergency procedures occurring that same day with Mr Harrison should be taken into account, together with Mr Osborne's previous training and level of experience.[121] I accept that the manner and time occupied in any pre-flight briefing would necessarily be adjusted to the experience and needs of the student. Often students are already experienced pilots. This fact, however, should not negate the requirement for a briefing between the student and the instructor which allows adequate time to discuss the particular exercise, including the threats and errors involved. It is also to be noted that Mr Osborne had not previously conducted this particular exercise in the same model aircraft.

*Lack of a demonstration*

140. It is standard practice that the flight instructor would demonstrate the sequence before asking the student to perform it.[122] Mr Corbin did not demonstrate the hydraulics-off landing on 7 November 2017.[123]

*Crosswind*

141. I have already found that there was a crosswind at the time of landing the aircraft at Area X-ray. [124] Further, I have found that the speed and direction of the wind was known to Mr Corbin and Mr Osborne at the time of commencing the flight and during the flight. In particular, the wind speed and direction was known to them upon final approach to land. Both pilots were also aware of the direction in the Manual to

[120] Transcript Peter Ayre, p400.
[121] Transcript Andrew Harrison p244; Mr Corbin was also entitled to take into account the PUI's training and level of experience and where they were in their training sequence, Transcript Steven Davis p125.
[122] Transcript Steve Davis p181.
[123] C11.3 Affidavit John Osborne [51].
[124] C41.3 namely 220 degrees, 11 knots.

conduct this exercise *into wind*, necessarily meaning that it should not be conducted in a crosswind.

142. In the wind conditions presented to Mr Corbin and Mr Osborne, strict adherence with the direction to conduct a run-on landing *into wind* would require an approach perpendicular to and crossing over the runway. This would require ATC to give clearance to do so. It would be a highly unusual request and manner of approach.[125] Mr McKenzie gave evidence that he had never crossed the runway to land and would not be inclined to do so given the narrowness of Area X-ray approaching from that direction.[126]

143. In any event, no such clearance was sought by Mr Corbin or Mr Osborne. I am satisfied that Mr Corbin did not intend the aircraft to be landed directly into wind.

144. Crosswind changes the airflow across the main rotor; as the aircraft slows the crosswind becomes the dominant flow. This creates unpredictable changes in the direction and magnitude of cyclic input[127] required.

145. These difficulties are most pronounced when the crosswind is variable, as it was on the day of the crash. They are exacerbated in an hydraulics-off landing due to the effort required in controlling the aircraft's movements. Mr Ayre gave evidence that the helicopter performing this exercise may increase the pilot's workload to the point of rendering a helicopter uncontrollable. [128]

146. In the case of a crosswind deemed unsafe for a hydraulics-off landing, the exercise may be aborted and rescheduled for another day.[129] A failure to complete the exercise gives rise to potential scheduling issues, cost, inconvenience and the possibility of delaying the student's endorsement to a later date.

147. From the evidence at inquest, it appears that experienced instructors regularly tolerate an approach into crosswind, if it is considered that there are not any significant risks involved. Mr Davis, for example, stated that the prevailing weather

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[125] Transcript Peter Ayre p388-389, at p390 Mr Ayre considered that proposition to be "highly impractical"
[126] Transcript Peter McKenzie at p439.
[127] The cyclic stick controls direction of travel.
[128] C41 ATSB Report p19, Transcript Peter Ayre p338-341.
[129] Transcript Peter Ayre p372.

conditions were likely to affect the control of the aircraft but only minimally and would not be enough for an instructor to abort the procedure.[130] Peter McKenzie stated that he did not consider that conducting the emergency hydraulic failure training in a south-westerly crosswind at about 200 degrees and wind speeds of 18-25 knots to be problematic.[131]

148. Certainly, Mr Corbin did not consider that the conditions on 7 November 2017 posed an unacceptable risk. If he had, he would not have allowed Mr Osborne to perform the exercise, particularly without a demonstration by him.

149. Mr Ayre emphasised that the research indicated that the aircraft performing the exercise could not be sufficiently controlled in a crosswind and questioned why pilots would be intentionally non-compliant with the flight manual.[132]

150. In this case the crosswind, whilst dropping in speed, was one factor that led to increased difficulty controlling the aircraft in the landing phase. This conclusion is unavoidable on the evidence.

*The progression of the exercise to a point where control could not have been regained*

151. I have already covered the movements of the aircraft and its control with reference to the points on the photo and the expert evidence. I have found that the aircraft was showing signs of being difficult to control at Point 2 and then increasingly so until it came to a hover at Point 3.

152. Section 3 of the Manual carried the following caution; *"Do not attempt to carry out hover flight or any low speed maneuver. The intensity and direction of the control feedback forces will change rapidly. This will result in excessive pilot workload, poor aircraft control, and possible loss of control"*[133].

153. Mr Ayre stated that if the requirements of the Manual are followed then control is assured.[134]

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[130] Transcript Steven Davis p146, 183.
[131] Transcript Peter McKenzie at p437,477 (and that the wind speed was decreasing to 11-13 knots and would not have presented as a serious issue for the deceased).
[132] Transcript Peter Ayre p370.
[133] C41 ATSB Report p6.
[134] Transcript Peter Ayre p352.

154. Both Mr Corbin and Mr Osborne were aware of the critical importance of not entering a hover. The entry into the hover state was unintentional and increased the force on the controls. It seems likely that, just before and at the time of the hover, the controls had become unmanageably heavy and Mr Osborne could not manoeuvre the aircraft back to a controlled state.

155. Mrs Corbin gave evidence that she believed Mr Corbin would have tried to save the situation, stating:

> *"….the only comment I can – I can pretty confidently make is that Roger would never have given up. He would have strangled that thing um to the ground and from whatever point it was out of control um I would almost – I'd go as far as saying that if Roger couldn't recover and land that helicopter from that point there nobody else would have been able to either."*[135]

156. I accept her evidence. I have no doubt that Mr Corbin, as pilot in command, would have been actively trying to save the aircraft and their lives to the extent that he could in those final seconds.

157. I heard evidence at inquest that the preferable way to recover from a real emergency would be to accelerate the aircraft straight ahead to return it to 40-60 knots and climb to about 500 feet before activating the hydraulics.[136] In this case, the aircraft did not travel straight ahead or climb but the hydraulics were restored. This may have been the only option available at that point in time.[137]

158. I conclude that Mr Corbin misjudged the time at which it was necessary for him to intervene to ensure that the aircraft was under control. I cannot determine why he did not intervene shortly after Point 2 as he should have done. No doubt he was expecting Mr Osborne to regain control.

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[135] Transcript p489.
[136] Transcript Peter Ayre p400, Peter McKenzie p482, Andrew Harrison p237, Steve Davis p193, 210 (Note: Mr Davis differs from the other experts as to when in the sequence to deactivate the cut-off switch in the collective to restore hydraulics, with Davis restoring hydraulics first).
[137] Transcript Peter McKenzie p482; other possibilities are that the hydraulics were restored accidentally or in a panic.

*The hydraulic failure simulation procedure*

***The manufacturer's instructions***

159. As previously stated, Supplement 7 of the Manual sets out the recommended sequence for emergency hydraulic failure training.[138] The sequence is set out in the following paragraph.

160. The test switch is activated by the instructor in flight, with this fact being known to the student. Upon activation of the test switch, an audible alarm sounds in the aircraft together with illumination of a red *hydraulics fail* light on the warning panel of the aircraft. Pressure then ceases to be provided to the accumulators,[139] but the residual pressure in the accumulators will allow time for the student to take action to decrease the speed of the aircraft to achieve the safety speed of 40 to 60 knots. By that stage, the aircraft has been flown to the required altitude with the assistance of some residual hydraulic pressure in the controls.

161. Once the safety speed has been achieved by the student, the test switch is then reselected by the instructor to its original position. The time between the selection and reselection of the test switch is approximately 10 to 12 seconds.[140] Immediately following the reselection of the test switch, the student is required to activate the cut-off switch. [141]

162. Once the cut-off switch is activated, all hydraulic pressure to the aircraft is instantly lost, resulting in significantly increased felt force feedback. This means that the controls become very heavy and the aircraft difficult to manage. The activation of the cut-off switch is important in the exercise to depressurise the whole hydraulic system uniformly across the three blades. In evidence, Mr Davis explained that if the hydraulic pressure continues to be drained more slowly, without the cut-off switch, an asymmetric scenario may result where there is different amounts of pressure within individual rotor blades. This would result in a situation that would become *"incredibly difficult for the pilot to control".*[142]

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[138] Transcript Steven Davis p132-133 clearly sets out the sequence in Supplement 7.
[139] Pressure vessels in the aircraft for storing extra hydraulic fluid under pressure, and providing that fluid in times of peak demand or emergency.
[140] Transcript Stephen Davis, page 135
[141] Transcript Peter Ayre p355, Steve Davis p134-135, 209.
[142] Transcript Steven Davis, line 15.

163. If the test switch button has not been re-selected by the instructor, it will have no bearing on the training exercise *except* if there arises the need to restore hydraulics for any reason. In this case, both the test switch and the cut-off switch will each need to be pressed in order to restore hydraulics to the aircraft. This may result in a delay in the restoration of the hydraulics.

164. The activation of both switches at height would unlikely pose any issues but could be problematic in attempting to restore hydraulics in the landing phase in an emergency. Mr Davis also gave evidence that the test switch was easy to locate to reselect[143] but the cut-off switch is located on the collective on the pilot's flying side of the aircraft. He said that there is no cut-off switch on the instructor's side. [144] In an emergency, several seconds may elapse to restore hydraulics in this manner.

165. Without hydraulics, the student is then required to perform a slow run-on landing at about 10 knots without hover. As specified by Supplement 7, this should be completed over a clear and flat area with a flat final approach and nose into wind.

***The usual teaching practice by Mr Corbin and Rotor-Lift instructors***

166. Mr Corbin and Mr Harrison, as instructors delivering emergency hydraulic failure training at Rotor-Lift, were aware of sequence for the test switch and cut-off activation as specified in Supplement 7 and as described in the above section.

167. Mr Harrison gave evidence that Mr Corbin's usual practice for the exercise was to deactivate the test switch *after* the activation of the cut-off switch and not beforehand as required by the Manual. Mr Harrison stated that he had discussed this technique with Mr Corbin and it was the standard procedure at Rotor-Lift. Mr Corbin had directed that that sequence be used[145].

168. Mr Harrison described the sequence that he followed when instructing pilots in emergency hydraulics failure procedures.[146] He justified the divergence from the switch sequence in the Manual on the basis that it enabled the instructor to keep his hands on the controls at time critical periods of flight. He indicated that when the hydraulic test switch is pressed the horn will sound and it is very loud. It can startle

[143] Being on the console, Transcript page 141.
[144] Transcript Steven Davis p137-139.
[145] Transcript Andrew Harrison p230, 250.
[146] Transcript Andrew Harrison p228.

the student and make it difficult to communicate. By delaying the deactivation of the test button, it enables the instructor to keep his hands on the controls and to make control inputs to help slow the aircraft to the safety speed and provide assistance when the cut-off switch is activated on the collective[147]. Mr Harrison said that Mr Corbin had provided these reasons for changing the switch sequence.[148] Mr Harrison did not consider that the deviation would have any impact upon the landing phase of the exercise.[149]

169. Mr McShane gave evidence that, when performing the exercise with Mr Corbin on multiple occasions, Mr Corbin did not reselect the test switch at any time before the aircraft had landed. His evidence was firm on this point and it is difficult to discount.[150]

170. Mr Davis, on the other hand, had witnessed Mr Corbin to *only* follow the switch sequence specified in Supplement 7. He told the court that Mr Corbin had never suggested to him that he (Mr Corbin) had adopted or was proposing to adopt a different sequence. [151]

171. Mrs Corbin, at inquest, said that it did not make sense to her that Mr Corbin had adopted a procedure that altered from that specified in Supplement 7. However, she heard Mr Harrison's evidence and thought it possible that Mr Corbin may have developed a procedure that differed from that specified in the Manual.

172. I also accept the submission of counsel assisting, Ms Wilson SC, that the conflict in the evidence about Mr Corbin's general procedure is not able to be easily resolved. Mr Harrison's evidence about the varied procedure was convincing. It is quite plausible that Mr Corbin adopted varying procedures over the years with regards to reselection of the test switch.

***The switch sequence taught to Mr Osborne***

173. Mr Harrison taught Mr Osborne a variation of Supplement 7 for emergency hydraulic failure training. The extent of the variation was that the test button was not reselected by the instructor until after the student had activated the cut-off switch on

[147] Transcript Andrew Harrison p230-231.
[148] Transcript Andrew Harrison page 231.
[149] Transcript Andrew Harrison p232, 264.
[150] Transcript Gerard McShane p81- 87, 96-99, 103, 109.
[151] Transcript page 142

the collective.[152] Mr Harrison's teaching of Mr Osborne was consistent with his evidence that he (Mr Harrison) used a varied procedure following discussions with Mr Corbin.

174. Mr Harrison did not indicate to Mr Osborne that this was a departure from the requirements of Supplement 7.[153] Mr Osborne does not recall Mr Harrison making reference to the term Supplement 7 during his instruction.[154] Further, Mr Osborne did not read Supplement 7 but accepted the teaching of Mr Harrison regarding the test and cut-off switch sequencing for the exercise. Mr Osborne gave evidence confirming the sequence taught by Mr Harrison and that he expected the same sequence to occur in the training flight with Mr Corbin.[155]

***The switch sequence used in the flight on 7 November 2017***

175. I have already noted that the test and cut-off switches were found to be in the normal flight configuration (hydraulics system on) during post-crash examination; and that I am satisfied that both switches were moved by either Mr Corbin and/or Mr Osborne to restore hydraulics prior to impact.

176. Mr Osborne was not able to recall when or if, in the flight, Mr Corbin reselected the test switch. Understandably, he said that this was not a matter within his sphere of responsibility. I am in no doubt that his full concentration would have been required in controlling the aircraft for stable flight at the appropriate height and decreasing speed. This is particularly the case as it was his first hydraulics-off landing in this aircraft type.

177. If Mr Corbin had adopted the Supplement 7 procedure by deselecting the test switch before Mr Osborne selected the cut-off switch, I think Mr Osborne would have recalled this event. Firstly, the deactivation of the test switch would have stopped the horn sounding. Secondly, Mr Osborne would likely have registered this occurrence as a departure from the sequence taught to him by Mr Harrison.

178. On balance, I find that Mr Corbin did not deselect the test switch before Mr Osborne activated the cut-off switch during this particular flight. I make this finding regardless of

[152] C11.3 Affidavit of John Osborne [19]-[22] and Transcript John Osborne p307- 312; Andrew Harrison p228-229, 249-250.
[153] Transcript Andrew Harrison p249.
[154] Transcript John Osborne p308.
[155] Transcript John Osborne page 315 line 15.

whether Mr Corbin adopted varying procedures as instructor in previous training flights regarding this exercise.

179. I cannot determine at what stage in the flight the test switch was deselected as a step in restoring the hydraulics.

180. I am able to find that hydraulics had not been successfully restored at the time of the hover, 12 seconds before the crash.

181. There was collective input (from either Mr Corbin or Mr Osborne) seen on the footage immediately prior to crossing the runway 9 seconds prior to the crash. Mr Ayre did not consider it likely that hydraulics had been restored at that point because of the "gross" nature of the aircraft movement.[156] The hydraulic system was likely restored at a point between 9 seconds and 4 seconds before impact.

182. As identified during the investigation of past similar accidents, delays in restoration of the hydraulic system can prevent control recovery. I note the evidence that the hydraulics are effectively restored about three seconds following the switch activation by the pilots. The aircraft then requires further stabilising. In the seconds available to Mr Corbin at that stage, the aircraft could not be controlled.

183. It may well have been that Mr Corbin deselected the test switch well back in the sequence shortly following the activation of the cut-off switch. In such a scenario, the failure to follow the Supplement 7 procedure would have had no effect at all upon the happening of the crash.

184. However, the test switch may have been left in its activated position either deliberately by Mr Corbin or through distraction. This would possibly lead to a delay of some seconds - because when the cut-off switch was deselected in the emergency situation, the hydraulic system would not have responded. Time would then be needed to diagnose the problem and deselect the test switch. This issue, if it occurred, could also have led to confusion between Mr Corbin and Mr Osborne regarding the restoration of the hydraulics.

185. Additionally, the cut-off switch for this aircraft was located on the collective of the seat usually occupied by the pilot in command (that is, the right-hand side of the

[156] Transcript Peter Ayre, page 391, line 30.

aircraft). In the case of an actual emergency, this creates difficulties for the instructor (seated in the left-hand side of the aircraft) to select the cut-off switch on the collective, given that he would have his hands on his own controls at that time and would need to remove one of his hands to deactivate the cut-off switch on the student's collective.

186. Another possible source of confusion that may arise in an emergency situation (particularly for the student) is the difficulty of determining visually whether the test switch or the cut-off switch is activated, given that the hydraulic failure light is illuminated by the activation of either switch.[157]

187. Thus, material risk arises in the event that the deactivation of the hydraulic test switch is forgotten, or deactivation is delayed. It is not common practice within the aviation industry to deviate from Supplement 7 in this way.[158]

188. As I cannot determine the point at which the test switch was reselected,[159] it also cannot be determined whether the failure to follow the procedure set out in Supplement 7 in fact contributed to the crash.[160]

***Current teaching practice at Rotor-Lift***

189. Rotor-Lift relied upon the training syllabus from the operations manual approved by CASA which required a class-run element and flight element specifying 3 hours of flight time. The training program delivered by Rotor-Lift to Mr Osborne was appropriate.

190. Since the crash, Rotor-Lift has reviewed its teaching practices and materials to ensure that Supplement 7 of the Manual is adhered to in instructing emergency hydraulic failure training[161].

[157] Transcript John Osborne p316-317.
[158] Transcript Steven Davis p140-141.
[159] Transcript Steve Davis p143.
[160] C41 ATSB Report p20
[161] Transcript Andrew Harrison p276. Note that Peter McKenzie who is currently employed at Rotor-Lift as Head of Flight Operations was not qualified to instruct in the AS350 at the time of the accident.

**Conclusion and comments**

191. Emergency hydraulic failure training in an AS350BA helicopter is a procedure that Mr Ayre described as having a *"famously high rate of accidents".*[162]

192. Mr Ayre gave evidence about the evaluation conducted in 1997 by the RAAF Aircraft Research and Development Unit (ARDU). The evaluation focused upon the handling characteristics of the AS350BA in flight without hydraulic assistance. ARDU found that a 30-knot wind from 30 degrees to the front right (a 15-knot crosswind component) caused lateral cyclic forces to vary continuously, and that satisfactory lateral control of the aircraft could not be achieved.

193. The ARDU evaluation concluded that, without hydraulics, the control forces in primary flight controls were at an unacceptably high level. It also concluded that controllability of the aircraft below a 15-knot airspeed was not reliable and that hover flight could lead to loss of control.

194. Following the evaluation, ARDU recommended the following when conducting hydraulic failure training:

- Use only one hydraulic switch at a time to simulate failure of the hydraulic system;
- Maintain over 15 knots during the run-on landing;
- Do not use over 30 degrees angle of bank;
- Conduct run-on landings into wind.[163]

195. These recommended risk mitigation measures are largely reflected in the clear cautions contained in Supplement 7 issued subsequently. [164] I note, though, that ARDU determined that the lowest safe speed for a run-on landing in this exercise to ensure controllability of the aircraft was 15 knots, and not 10 knots as specified in the Manual.

196. On this particular point, Mr Ayre gave the following answers to questions at inquest:

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[162] Transcript Peter Ayre p368, Steve Davis p195.
[163] C 41.1 ATSB report, page 18.
[164] C 46

> *"….if in this circumstance the landing had been conducted at 15 knots instead of 10 knots, would that be a basis for criticising the way it was done because it's not in accordance with the manual?..... Um look ah we probably y wouldn't be here.*
>
> *Because it is safer?..... so the finding, "Control was lost after the aircraft came to a hover," that was a contributing factor. So if you remove that by running it on at 15 knots and not coming to a hover, well it's likely the accident wouldn't have occurred as it did."* [165]

197. In his evidence, Mr Ayre spoke of analysing the significant number of accident reports in similar cases where high-level and experienced pilots have reported that they were unable to move the controls in this exercise.

198. The experienced instructors at inquest acknowledged the risks of the exercise. Mr Davis, for example, said "*I'm well aware as an experienced instructor, every time I go and train for these things it's a possible accident. There's literally only one to two seconds between sure peril and a safe outcome".*[166] Mr Harrison also agreed that there was inherent risk in the exercise. [167]

199. Notwithstanding the risks, it is important, and probably crucial, for a student to be trained to land the aircraft without hydraulics. It was not suggested by any party at inquest that it would be appropriate to endorse a student for the aircraft without them demonstrating that they can land without hydraulics.[168]

200. The aircraft manufacturer, Airbus, has issued safety notices in respect of this aircraft advising of the need to comply with the provisions of the Manual (including Supplement 7) in conducting the exercise.[169] Such notices emphasise the issues concerning control of the aircraft. However, Mr Ayre was critical of Airbus, which he said had failed to acknowledge the extent of the forces, causing immovable controls, that may be encountered by pilots in this exercise.

201. The manufacturer, Airbus, was not an interested party in this inquest and it is therefore not appropriate to delve in detail into this issue. Nevertheless, I comment

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[165] Transcript Peter Ayre page 384-385, passage edited to remove pause fillers and repetitions.
[166] Transcript Stephen Davis page 216, line 5
[167] Transcript Andrew Harrison p265, line 25.
[168] Transcript Peter Ayre, page 415, line 30
[169] For example, C 47 Airbus safety notice 2014 and C 41.1 ATSB report containing Airbus safety notice 2019, page 27

that Airbus may wish to consider whether Supplement 7 of the Manual should specify the run-on landing to be undertaken at *around 15 knots* instead of *around 10 knots.*[170]

202. Ultimately, however, the contributing factors and possible contributing factors in this crash are more complex than the issue of the Manual's specification of landing speed.

203. It would appear from the evidence of the experienced pilots and instructors at inquest that a prevailing crosswind is regularly deemed acceptable to proceed with this exercise. This may be due to the fact that a crosswind is often encountered and it may be particularly difficult to schedule this exercise for a direct *into wind* landing. The decision to conduct the exercise in a "suitable" crosswind may also reflect the confidence of an experienced instructor in being able to take control of the aircraft, if necessary, in a timely and safe fashion. It is always the case that the exercise can be aborted, despite potential inconvenience in doing so.

204. Therefore, it was not unusual at the time of Mr Corbin's death for an experienced instructor to proceed with the exercise in the level of crosswind prevailing on the day in question. Indeed, Mr Corbin and other instructors had vast experience in instructing this exercise successfully in crosswind conditions.

205. Mr Osborne was struggling with the heavy controls prior to landing and may have articulated this to Mr Corbin. Even if he did not, Mr Corbin would have been aware that this was the case considered that Mr Osborne was nevertheless capable of controlling the aircraft himself. However, Mr Osborne's inability to maintain control led to an unacceptable slowing, yaw and, finally, a hover. I am satisfied that the crosswind contributed to the inability to control the aircraft and, in turn, to the irrecoverable hover state.

206. Despite Mr Corbin's skill and his ability to judge when intervention was required, his judgement erred on this occasion. This fact contributed to the crash and his tragic death. As I have said, it cannot be determined what happened in the final seconds before the crash. I am confident that Mr Corbin attempted to do everything possible to regain control of the aircraft, and that both switches were ultimately configured to enable restoration of the hydraulics.

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[170] C 46, page 4.

207. A pre-flight briefing of the exercise with Mr Osborne could only have enhanced Mr Corbin's judgement as instructor and Mr Osborne's understanding of the exercise. It would also have developed a shared understanding of the particular roles of the instructor and student, and the requirements and risks of the exercise.

208. Further, Mr Corbin and Mr Osborne had also not benefitted by the process of Mr Corbin demonstrating the exercise. If this had occurred, with Mr Corbin articulating the process to Mr Osborne, a further shared understanding of risks and requirements for communication would have likely developed between them.

209. It is not possible to find that the crash would not have occurred had there been a pre-flight briefing and a demonstration. Nevertheless, the chance of preventing the outcome by these steps was good. These established practices are critically important in this exercise and should not ever be omitted by instructors.

210. I have also considered whether the omission of both the demonstration and pre-flight briefing was a product of Mr Corbin being behind schedule and significantly late to meet Mr Osborne. Mr Corbin's workload in his business was heavy and his well-being had suffered because of it. His state of physical health may have also caused him ongoing issues.

211. I do not suggest that Mr Corbin would consciously compromise the safety of a student. He was aware Mr Osborne was an experienced pilot and had received a report from Mr Harrison concerning the competence of Mr Osborne in respect of his current training. Mr Corbin appeared to have a considerable degree of confidence in Mr Osborne's skill and clearly deemed it appropriate and safe to proceed with the training flight as he did. There was no evidence that Mr Corbin was under time pressure, but it is possible that Mr Corbin's schedule, workload and stress levels may have subconsciously affected his decision-making.

212. The newer versions of the AS350 aircraft operate a dual hydraulic system, whereby there are two separate hydraulic systems capable of supporting the aircraft independently. This, therefore, removes the need to undertake emergency hydraulic failure training. Nevertheless, there are many AS350BA aircraft still in operation and the requirement for vigilance remains.

213. Since the crash, Rotor-Lift has employed a safety manager and reviewed its safety management systems. It has also introduced *Air Maestro*, an electronic database that

documents, inter alia, safety notices issued in respect of aircraft. The organisation has also been restructured to avoid key person dependence and work overload[171].

214. In the immediate aftermath of Mr Corbin's death, the Rotor-Lift training school operations manual was updated to include directions to perform the AS350 sequences in accordance with the aircraft flight manual- thereby ensuring compliance with Supplement 7.[172]

215. Mr Corbin's death has highlighted the concerning issues of risk surrounding a hydraulics-off landing exercise in the AS350BA Squirrel helicopter. Despite the easy handling qualities of the aircraft with hydraulics on, there are greatly increased control forces with which a pilot must contend when flying without hydraulics. The inability to control the aircraft without hydraulics has had catastrophic consequences in many cases.

216. The most important learning from the circumstances of the tragic death of Mr Corbin is the critical need to closely follow the provisions of the flight manual and adopt best instructing practice for an hydraulics-off training exercise in this aircraft.

217. I do not consider that it is appropriate to make any recommendations in this case pursuant to section 28(2) of the *Act*.

**Findings required by section 28(1) of the *Act***

218. I make the following formal findings pursuant to section 28 (1) of the *Act:*

a) The identity of the deceased is Roger Paul Corbin, born 21 May 1960;

b) Mr Corbin died accidentally in a helicopter crash in the circumstances set out in this finding;

c) Mr Corbin died from multiple injuries; and

d) Mr Corbin died on 7 November 2017 at Hobart in Tasmania.

[171] Transcript Susan Stanley p421, 424, Peter Ayre p364, 365.
[172] Transcript Andrew Harrison p276, Peter Ayre p364.

**Acknowledgements**

219. I acknowledge the thorough work of counsel assisting, Ms Wilson SC, and the assistance of the other counsel. I am also grateful to Senior Constable Kelly Cordwell and the Coroner's Associates for their role in the investigation and preparation of the inquest. Finally, I appreciate the efforts of the ATSB in assisting in this case.

220. I convey my sincere condolences to Mr Corbin's family.

**Dated:** 27 June 2024 at Hobart in the State of Tasmania

**Olivia McTaggart**
**Coroner**

## A – Exhibit List

| | TYPE OF EXHIBIT | NAME OF WITNESS |
|---|---|---|
| C1 | REPORT OF DEATH | Senior Constable Kelly Cordwell |
| C2 | LIFE EXTINCT AFFADAVIT | Dr Elliam Hodges |
| C3 | IDENTIFICATION AFFIDAVIT | Constable Joshua Tringrove |
| C4 | IDENTIFICATION AFFIDAVIT | Anthony Cordwell |
| C5 | AFFADAVIT OF FORENSIC PATHOLOGIST AND INTERIM FINDINGS | Dr Donald Ritchey |
| C6 | AFFADAVIT OF FORENSIC SCIENTIST | Miriam Connor |
| C7 | AMBULANCE REPORT (VACIS) | Ambulance Tasmania |
| C8 | MEDICAL RECORDS (5X DISCS) | THS – RHH |
| C9 | MEDICAL REPORT & RECRDS | Dr Robert Walker (The Lindisfarne Clinic) |
| C10a-c | AFFIDAVIT (8/11/17) & AFFIDAVIT (21/3/23) | Allana Corbin - wife of Mr Corbin |
| C11 | INTERVIEW TRANSCRIPT (& DISC) & AFFIDAVIT | John Osborne - Pilot |
| C12 | STATUTORY DECLARATION | Brett Maloney - Firefigher |
| C13 | AFFIDAVIT | Anthony Gunton – Air Traffic Controller |
| C14 | AFFIDAVIT | Timothy Dalton – Air Traffic Controller |
| C15 | AFFIDAVIT | Joseph Cleary – Pilot & witness to incident |
| C16 | AFFIDAVIT | Constable Andrew Lockley – Police Officer & witness to incident |
| C17 | AFFIDAVIT | Inspector John Ward |
| C18 | AFFIDAVIT | Senior Constable Kelly Cordwell |
| C19 | AFFIDAVIT | Senior Constable Adam Hall |
| C20 | INTERVIEW TRANSCRIPT | Andrew Harrison |
| C21 | AFFIDAVIT | Matthew Cocker – Crash Footage |

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| **C22** | **AFFIDAVIT** | **Andrew Johnston – Property from scene** |
| **C23** | **AFFIDAVIT** | **Gerard McShane – Pilot & Owner of the AS 350 Squirrel** |
| **C24** | **AFFIDAVIT (27.5.21) & AFFIDAVIT (25.6.21) & CORRESPONDENCE** | **Susan Stanley - General Manager Rotor Lift** |
| **C25** | **AFFIDAVIT (27.5.21) & 2x SUPPLEMENTARY AFFIDAVIT'S (28.06.21 & 23.04.23)** | **Peter McKenzie Chief Pilot - Rotor Lift** |
| **C26a & b** | **AFFIDAVIT (5.7.21) & AFFIDAVIT (18.4.23)** | **Steven Davis - Pilot & Expert Witness** |
| **C27** | **AFFIDAVIT & PHOTOGRAPHS** | **Constable Matthew Streat – Forensic Services** |
| **C28** | **AFFIDAVIT & PHOTOGRAPHS** | **Constable Rebecca Turner – Forensic Services** |
| **C29** | **AFFIDAVIT & PHOTOGRAPHS** | **Constable Robin Wilson – Forensic Services** |
| **C30** | **FOOTAGE OF CRASH (HDD & Disc)** | **Hobart Airport** |
| **C31** | **SCENE SURVEYS** | **Senior Constable Adam Hall** |
| **C32a-c** | **WEATHER REPORT, AUTOMATIC & DAILY WEATHER OBSERVATION & HOBART AIRPORT TERMINAL AERODOME FORECAST** | **Bureau of Meteorology** |
| **C33** | **AMBULANCE REPORT (VACIS) - JOHN OSBORNE** | **Ambulance Tasmania** |
| **C34** | **FSST LABORATORY REPORT & BLOOD PAPERS – JOHN OSBORNE** | **Miriam Connor** |
| **C35** | **STUDENT INFORMATION (INCL. PILOT LICENCE) - JOHN OSBORNE** | **Rotor Lift** |
| **C36** | **PILOT LICENCE & MEDICAL CERTIFICATE – ROGER CORBIN** | **Civil Aviation Safety Authority** |
| **C37** | **FSST FEATHER LABATORY REPORT** | **Michael Manthey – Forensic Scientist** |
| **C38** | **HYDRAULIC SWITCH TEST RECORDING AND PHOTPOGRAPHS** | **Australian Transport Safety Bureau** |
| **C39** | **PHONE/IPAD EXAMINATION (DISC) Forensic Report** | **Digital Evidence Unit – Tasmanian Police** |
| **C40** | **MAINTENANCE DOCUMENTS & EMAILS** | **Gary Meiklejohn Engineer - Rotor Lift** |
| **C41** | **AUSTRALIAN TRANSPORT SAFETY BEAURU (ATSB) TRANSPORT SAFETY REPORT (INCL. DIAGRAM** | **Australian Transport Safety Bureau** |

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| | **OF HYDRAULIC SWITCH SEQUENCES)** | |
| **C42** | **TRAINING SYLLABUS** | **Rotor Lift Aviation** |
| **C43** | **EUROCOPTER SYSTEMS MANUAL (CH. 10)**<br>**HELICOPTER EMERGENCIES & HAZARDS (CH.11)** | **EuroSafety International**<br>**https://dokumen.tips/documents/chapter-11-helicopter-emergencies-and-hazards.html** |
| **C44** | **FLIGHT INSTRUCTOR TRAINING MANUAL – EXTRACT (4 pages)** | **CASA Australia & CAA New Zealand** |
| **C45** | **COMMERCIAL PILOT** | **Lesson planner** |
| **C46** | **FLIGHT MANUAL - Supplement 7** | **Eurocopter** |
| **C47** | **SAFETY NOTICE 2630-S-29** | **Airbus** |
| **C481-3** | **AIRBUS SUBSCRIPTION RECORD**<br>**AIRBUS HELICOPTERS COPY OF SUPPLEMENT 7 AS DISTRIBUTED**<br>**MANUAL REVISION NOTICES** | **Airbus / Eurocopter** |
| **C49** | **RESEARCH SUMMARY** | **Aircraft Research & Development Unit** |
| **C50** | **AIR CANADA CRASH REPORT** | **Transportation Safety Board of Canada** |
| **C51** | **PROPERTY PROTECTION AND SEIZURE** | **Australian Transport Safety Bureau** |
| **C52** | **POLICE INCIDENT REPORT & ESCAD 183-07112017** | **Tasmania Police** |
| **C53** | **CHECKLISTS & PROCEDURES 20.1.23** | **Rotor-Lift Aviation** |

## B – The Photo