QUEENSLAND COURTS

CORONERS COURT OF QUEENSLAND

FINDINGS OF INQUEST

CITATION:	**Inquest into the deaths of:** **Wayne Joseph GANTER** **Mark Robert RAWLINGS** **Henry Phillip ROEBIG** **Wayne Anthony BRISCHKE** **Stuart Henry Russell WEAVELL** **("Lockhart River Plane Crash No. 2")**
TITLE OF COURT:	Coroners Court of Queensland
JURISDICTION:	Northern
FILE NO(s):	2020/1178; 2020/1386; 2020/1387; 2020/1389; 2020/1393
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FINDINGS OF:	Nerida Wilson, Northern Coroner
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Publication

1. Section 45 of the *Coroners Act 2003* ('the Act') provides that when an inquest is held, the coroner's written findings must be given to the family of the person in relation to whom the inquest has been held, each of the persons or organisations granted leave to appear at the inquest, and to officials with responsibility over any areas the subject of recommendations. These are my 48 page findings in relation to Wayne Joseph GANTER, Mark Robert RAWLINGS, Henry Phillip ROEBIG, Wayne Anthony BRISCHKE and Stuart Henry Russell WEAVELL. They will be distributed in accordance with the requirements of the Act and published on the website of the Coroners Court of Queensland.

Findings required by section 45 *Coroners Act* 2003

2. Pursuant to s.45 of the *Coroners Act* 2003 I must, if possible, make findings as to:

    a. The identity of the deceased;

    b. How the person died;

    c. When the person died;

    d. Where the person died; and

    e. What caused the person to die.

3. A Coroner may whenever appropriate, comment on anything connected with the deaths investigated at the inquest that relates to:

    a. public health or safety;

    b. the administration of justice; or

    c. ways to prevent deaths from happening in similar circumstances in the future.

4. I must not include within those findings any statement that a person is, or may be:

    a. Guilty of an offence; or

    b. Civilly liable for something.

Standard of Proof

5. The particulars a Coroner must, if possible, find under section 45 (*Coroners Act* 2003), need only be made to the civil standard but on the sliding *Briginshaw* scale. That may well result in different standards being necessary for the various matters a coroner is required to find. For example, the exact time and place of death may have little significance and could be made on the balance of probabilities. However, the gravity of a finding that the death was caused by the actions of a nominated person would mean that a standard approaching the criminal standard should be applied because even though no criminal charge or sanction necessarily flows from such a finding, the seriousness of it and the potential harm to the reputation of that person requires a greater degree of satisfaction before it can be safely made.

6. The paragraph above was specifically contemplated by the Court of Appeal with apparent approval. The Court went on to state:

> *Two things must be kept in mind here. First, as Lord Lane CJ said in R v South London Coroner; ex parte Thompson, in a passage referred to with evident approval by Toohey J in Annetts v McCann: …an inquest is a fact finding exercise and not a method of apportioning guilt … In an inquest it should never be forgotten that there are no parties, there is no indictment, there is no prosecution, there is no defence, there is no trial, simply an attempt to establish facts. It is an inquisitorial process, a process of investigation quite unlike a trial where the prosecutor accuses and the accused defends, the judge holding the balance or the ring, whichever metaphor one choose to use. Secondly, the application of the sliding scale of satisfaction test explained in Briginshaw v Briginshaw does not require a tribunal of fact to treat hypotheses that are reasonably available on the evidence as precluding it from reaching the conclusion that a particular fact is more probable than not."*

Definitions referred to in Findings

LHR – Lockhart River

AWIS – Automated Weather Information System

RNAV – Area navigation

GNSS – Global satellite system

IMC – Instrument Meteorological Conditions

CFIT – Controlled Flight Into Terrain

Issues for Inquest

7. In accordance with section 45 of *Coroners Act* 2003, a Coroner must, if possible, find:

    a. the identity of the deceased person;

    b. how the person died;

    c. when the person died;

    d. where the person died, and

    e. what caused the person to die.

8. The further issues for inquest were agreed as follows:

    a. The circumstances of the flight of VH-OZO on 11 March 2020.

    b. The level and adequacy of the pilot training of Mr Stuart Weavell, and his flying proficiency and experience in conducting RNAV GNSS approaches.

    c. Whether the relevant air operator of the flight, Airconnect Australia, had in place appropriate safety management systems and adequate standard operating procedures in relation to the conduct of flights involving RNAV GNSS approach procedures.

    d. Whether the aviation regulator, CASA, adequately attended to the formulation of a regulatory policy in relation to the installation of a terrain avoidance and warning system ("TAWS**"**) in piston engine aircraft.

    e. Any matters relevant to the prevention of similar accidents in the future.

Conduct of proceedings and witnesses

9. Eleven witnesses in total were called to give evidence at Inquest. They were:

    a. Detective Senior Sergeant Ezard, Forensic Crash Unit;

    b. Dr Michael Walker, Director, Transport Safety, Australian Transport Safety Bureau;

    c. Mr Peter Wells, Manager, Lockhart River Aerodrome;

    d. Mr Grant Sindelar, Former Owner and Chief Pilot, Airconnect Australia;

    e. Mr Cameron Marchant, CASA approved Flight Examiner;

f. Mr Peter Schott, CASA approved Flight Examiner;

g. Mr Rhys Williams, Operations Manager, Independent Aviation Pty Ltd;

h. Mr Mark Carpenter, Trainer, REX Airlines;

i. Mr Scott Watson, Section Manager, Operations Standards, Flight Standards Branch, Civil Aviation Safety Authority;

j. Mr Scott Littleton, Acting Principal Project Manager, Regional Operations, QBuild, Department of Energy & Public Works; and

k. Ms Elizabeth Thomas, partner of Stuart Weavell & Pilot

10. Mr Scott Littleton on behalf of QBuild, spoke to the process undertaken when engaging the services of charter operators, and the travel policies in place affecting decisions as to the selection of an air operator for the transportation of their employees to regional locations.

11. Mr Rhys Williams representing Independent Aviation Pty Ltd, the relevant charter broker engaged by QBuild, gave evidence as to circumstances of how and why Airconnect Australia were engaged to undertake the charter of the QBuild employees to Lockhart River.

12. The Manager of Lockhart River Airport on the day of the accident Mr Peter Wells, gave evidence as to his observations of the weather and the weather services accessible to pilots using the aerodrome and communications facilities available to him to communicate information to pilots on CTAF radio.

13. A number of witnesses were each qualified pilots with significant aviation experience. Much of their evidence was directed to considerations concerning the training and proficiency of pilot Mr Weavell (Issue 2).

14. Three witnesses were qualified flight examiners who had undertaken various proficiency checks and other training directly with Mr Stuart Weavell.

15. Mr Grant Sindelar, the owner and Chief Pilot of Airconnect Australia at the relevant time, gave evidence as to the organisation, systems and procedures of the air operator from its inception in 2016 until 2020 (Issue 3).

16. Mr Scot Watson, CASA's Manager of Operations Standards, gave evidence as the development of initiatives concerning the fitment of TAWS within the avionics of multi-engine piston aeroplanes (Issue 4).

17. The following persons provided statements tendered within the coronial brief although were not called to give oral evidence at inquest:

a. Francis Dineen, Director – General Goods and Services, Queensland Government Procurement, Department of Energy and Public Works;

b. Michelle Catterall, Executive Director, Regional Operations, Department of Energy and Public Works; and

c. Obrad Puskarica, Chief Flight Paths Designer, Airservices Australia.

Introduction and Background

18. At 7.19AM on 11 March 2020 a Cessna 404 aircraft (VH-OZO) departed Cairns en-route to Lockhart River, a distance of 523 kilometres, with an estimated flight time of approximately 1 hour and 45 minutes.

19. The pilot, Stuart Weavell, commenced a first approach to the Lockhart River Airport at 8.59AM and at 9.07AM advised via broadcast that he was conducting a 'missed approach'.

20. At 9.09AM the pilot advised via broadcast, (abridged as follows) *"conducting a missed approach, we will be joining the approach on runway three zero".*

21. During the intervening period at approximately 9.03AM, one of the passengers sent a text message containing an image of the conditions outside the aircraft depicting significant cloud.

22. At 9.14AM a further image was uploaded by one of the passengers to social media indicating significant cloud and low visibility with a message that the pilot was circling while waiting for a break in the weather.

23. A separate passenger sent a text at 9.14AM advising 'the first attempt at landing was unsuccessful, the runway was not visible, and there was heavy rain'.

24. At 9.15AM the pilot made an inbound broadcast advising:

> "*10 nautical miles to the south east on descent* ***passing through 3,800 ft correction 2,800 feet*** *straight in approach*".

25. The pilot, while attempting a second RNAV GNSS instrument approach to the runway, approached 700ft and descended below the minimum descent altitude on a ground track 20 degrees left of the final approach track before impacting with sand dunes at Quintell Beach, approximately 6.4 kilometres (3.4 NM) south east of Lockhart River Airport at 9.19AM, fatally injuring all on board.

26. The five persons on board were pilot Stuart Weavell, three QBuild employees Wayne Ganter, Henry Roebig and Wayne Brischke, and a contractor employed by Advanced Pest and Weed Control, Mark Rawlings.

27. VH-OZO operated by Airconnect Australia, was procured for a private charter for fee on behalf of QBuild (Department of Energy and Public Works) by Independent Aviation Pty Ltd, a brokerage firm.

28. The purpose of the flight was to convey personnel from Cairns to inspect the site of a school construction project, and to undertake a pest and termite inspection.

29. A regular public transport flight (such as offered by Skytrans) was said to be unavailable at the relevant time and it was at QBuild's discretion to provide a charter flight. [*I note that since this collision the relevant departmental travel policy has been varied such that charter services must only now be used where no regular public transport service is available*].

30. The role of the charter broker, Independent Aviation, was to secure competitive quotes from air operators and ensure those operators complied with safety requirements (including the minimum standards required by CASA and any applicable law) as specified in the Standing Offer Arrangements.

31. The broker was to ensure (amongst other things) that an air operator had a relevant air operator's certificate (AOC), utilised pilots with appropriate licences and any necessary ratings, and had an approved Chief Pilot.

32. At the relevant time, Mr Grant Sindelar held the key positions of CEO, Chief Pilot and Safety Officer at Airconnect Australia, a company he then owned. As at March 2020 he employed one casual pilot, being Mr Weavell. Mr Sindelar leased the plane and did not own it.

33. From a list of six available aircraft options provided by the broker on 2 March 2020, QBuild procurement selected 'Option 1', the least expensive charter available – being a Cessna 404 Titan, at a cost of $5285.00 – it is described as a 9 seat piston prop.

34. The focus of this inquest was to identify and examine the circumstances that might explain the cause of the collision.

The aircraft – general information (as described by the ATSB)

35. The Cessna 404 Titan is an unpressurised, low-wing, twin piston-engine aircraft with retractable landing gear. The maximum take-off weight (MTOW) is 3,810 kg, and the aircraft was certified to be flown by a single pilot.

36. VH-OZO was manufactured by the Cessna Aircraft Company in 1980. It was reported that the aircraft was first operated in Australia before being transferred to Papua New Guinea and registered as P2-ALG. In December 2009, a CASA Certificate of Airworthiness was issued, and the aircraft was registered as VH-OZO. At that time, the aircraft's total time in service was 28,193 hours.

Seating

37. The type certificate data sheet for the Cessna 404 stated the aircraft type had 11 total seats (2 pilot seats and 9 passenger seats). In 1980, VH-OZO was configured with a modified seating configuration with 13 seats (2 pilot seats and 11 passenger seats).

38. During an audit of Airconnect Australia in June 2017, CASA identified that the *Airplane Flight Manual* stated a maximum of 9 passenger seats aft of the pilot seats but there was 11 on the aircraft. In its initial audit response, the operator stated that the seating change was approved many years ago and it was attempting to find supporting documentation. In a subsequent response, the operator stated that it had previously operated and would continue to operate with a maximum of 9 only passengers. It noted that the extra seating would remain in the aircraft as it formed part of the aircraft's current weight and balance data.

39. During the investigation, the chief pilot confirmed that the operator never operated the aircraft with more than 9 passengers and normally operated with significantly less than 9 passengers.

40. Photos taken during the accident flight indicated that no passengers were seated in the front right seat next to the pilot.

41. The aircraft had the standard 6 flight instruments directly in front of the pilot's seat on the left. These include the attitude indicator, which depicts the aircraft's basic roll and pitch attitude, and the primary performance instruments – altimeter, airspeed indicator and vertical speed indicator (VSI). Below those were 2 (GI-106A CDI) instruments that provided course deviation indication provided

either by the GNS 430's digitally- tuned VOR/localiser and glideslope receiver or GPS input to conduct an RNAV GNSS approach. One CDI instrument was coupled to the aircraft's number-1 GNS 430W GPS unit and the other to the number-2 GPS unit.

42. The basis of cockpit design is to have the primary instruments within a small arc of the pilot's forward line of sight. Navigation systems such as the GPS units may be located next to the primary instruments, as was the case in VH-OZO. While conducting an RNAV GNSS approach, it is imperative that the pilot includes the GPS units in the scan.

43. VH-OZO was equipped with two 3-pointer altimeters (Figure 9 of the ATSB Final Report), including one directly in front of the pilot. They had a 100-ft pointer (long and narrow), 1,000-ft pointer (short and wide) and 10,000-ft pointer (long and thin with a triangle at the end). The diagonal hashing indicated when below 10,000 ft and was gradually covered above that height.

44. These types of 3-pointer altimeters are very common in general aviation aircraft, including small aeroplanes used for passenger transport activities. Research has shown that such altimeters can be associated with misreading errors, including misreading the altitude by 1,000 ft, although accidents known to be associated with such errors seem relatively rare. Accordingly, such altimeters (and some other altimeter designs) are no longer allowed to be used on air transport certificated aircraft. Further information about requirements and guidance regarding altimeters is provided in *Appendix A – Research and guidance regarding design of altimeters*.

45. The aircraft was not fitted with a radio altimeter, nor was it required for the type of aircraft and operation.

46. The aircraft was fitted with a Garmin Terrain Function (non-certified).

47. Provided that the terrain advisory/alert function was enabled, a yellow and black 'TERRAIN' annunciation would be generated in the lower left corner of the LCD display, accompanied by a yellow and black 'TOO LOW – TERRAIN' PDA pop-up alert about 15 seconds prior to the terrain collision.

48. It is not known if this function was active or inhibited at the relevant time as it could be overridden so as to de-activate.

The police investigation

49. Detective Senior Sergeant Scott Ezard of the Queensland Police Service (QPS) Forensic Crash Unit was the reporting and investigating officer. Det Snr Sgt Ezard prepared a report for the coroner and gave evidence that upon receiving notification from the Australian Maritime Safety Authority of a missing plane en-route to Lockhart River on 11 March 2020, several helicopters were dispatched to the area. At 11.00 hrs the pilot of one helicopter (Rescue 10) responded from Cooktown with observations of cloud and light wind conditions.
50. Upon locating the accident site, a police officer was winched to the ground at Quintell Beach and confirmed the deaths of a number of people. At 12:58 hrs, this information was communicated to the Forensic Crash Unit at Cairns and recovery processes were commenced.
51. Aircraft wreckage was located at Quintell Beach above the sand dunes in close proximity to where the aircraft had initially impacted the sand. QPS officers returned to the accident site on the morning of 12 March 2020, secured the site and remained at the location until 17 March 2020.
52. Retrieval efforts occurred over a number of days and all deceased men were recovered and conveyed to Brisbane for further identification and autopsy.
53. On 17 March 2020, the aircraft wreckage was lifted and transported by helicopter to LHR for further examination and storage. Electronic items including mobile phones and an Apple iPad used by the pilot were recovered and examined by police and, following a request from the ATSB in October 2020, the items were provided to the ATSB for the purpose of its ongoing investigation.
54. The police handed the investigation to the ATSB per relevant protocols between the organisations.

Area Navigation - Global Navigation Satellite System approaches [RNAV GNSS]

55. Accepting that the pilot of VH-OZO was seeking to conduct an RNAV GNSS approach to LHR on 11 March 2020, the ATSB report explains that such an approach is a 2D instrument approach that, in the case of VH-OZO, required an on-board GPS receiver to “generate lateral/tracking guidance and distance information”. Specific navigational equipment installed in the aircraft enabled that approach procedure to be used. The approach is referred to (by the ATSB) as a

"non-precision" instrument approach, largely to contrast a 3D "precision" approach such as an instrument landing system (ILS) approach where a pilot is provided with both lateral and vertical guidance.

56. All general aviation (GA) aircraft have six basic instruments: airspeed indicator, attitude indicator, altimeter, turn coordinator, heading indicator, and a vertical speed indicator. VH-OZO was equipped with standard flight instruments for a Cessna 404 aircraft including a weather radar and two GNS 430W GPS units.

57. The Garmin GPS units provided distance and track information to the pilot for RNAV GNSS approaches. The GPS also had a Garmin terrain awareness system provided as a "supplemental awareness" feature of the GPS. To operate this function properly, a valid terrain and obstacle database was required to provide the pilot with terrain information, including:

    a. Display of terrain altitudes and obstacles relative to the aircraft's altitude

    b. Pop-up terrain alert messages

    c. Forward-looking visual terrain avoidance alerts

    d. Premature alerting on selected approaches (including RNAV GNSS approaches).

58. The aircraft was not fitted with a TAWS or other specific ground proximity warning system (GPWS). The aircraft was also not equipped (and not required to be equipped) with a radio altimeter (which measures absolute altitude as the height or distance above land or water).

59. To conduct an RNAV (GNSS) approach to an aerodrome for which such an approach has been designed, the pilot must select a pre-programmed approach in the GPS receiver in the aircraft and select one of several available initial approach fixes (IAFs). By setting the GPS approach switch to the appropriate ("arm") position at a specified distance from the destination aerodrome and entering the correct altimeter setting for that aerodrome, the GPS then provides navigational guidance to the selected IAF. The GPS may display a graphic course deviation indicator (CDI) co-ordinately with the separate CDI on the instrument panel to inform the pilot of any lateral navigation error. A pilot may also read the applicable RNAV(GNSS) approach chart as an orientation aid to cross-check the information obtained from the GPS and to ensure that the pilot has the correct descent profile for the approach.

Lockhart River Plane Crash No.1

60. Of note, this Inquest (referred to as Lockhart River Plane Crash No. 2) follows an inquest conducted in 2007 by the then State Coroner (Inquest into the aircraft crash at Lockhart River). All 15 occupants on board that aircraft, a Fairchild Metro 23 died. Mr Harvey, the Counsel Assisting this Inquest, was also the Counsel Assisting the State Coroner in Lockhart No. 1. While the circumstances of both are quite different, it is noteworthy, indeed shocking, that 20 people have now died in two plane crashes at Lockhart River within the last 18 years. Such significant loss of life has impacted many families and the community of Lockhart River.

61. The then State Coroner found that if a properly operating and fully functional terrain alert warning system [TAWS] had been fitted it is probable the accident would not have occurred. The issue of TAWS was again raised on the evidence before me in Lockhart No. 2. There is a useful and valid commentary provided in the Lockhart No.1 findings at pages 49 and 50 that has some application to the issues I raise further below in relation to implementation of TAWS in relevant aircraft (and the failure to do so).

62. It is now 16 years since the State Coroner's findings were handed down and the mandatory introduction of the installation of TAWS has not occurred in relation to particular kinds of regular public transport or charter operations, including the Cessna 404 aircraft the subject of these current inquest proceedings. The implementation of TAWS is referred to extensively below in these findings.

Australian Transport Safety Bureau investigation

63. Under the *Transport Safety Investigation Act 2003* (Cth) a statutory bureau, the ATSB, may investigate any "transport safety matter" (as defined) including an aircraft accident. The ATSB must, as soon as practicable after completion of an investigation, publish a report in relation to the investigation. A published report must not include the name of an individual unless the individual has consented to that inclusion.

64. The ATSB conducted interviews with witnesses at Lockhart River, the operator's personnel, flight examiners and others who knew the pilot, pilots familiar with Lockhart River and pilots familiar with the aircraft's systems and passengers on other flights. Documentation and other evidence were obtained from the aircraft

operator, aircraft owner, maintenance organisation, CASA, the Bureau of Meteorology, Airservices Australia, other operators and flight examiners and the GPS unit manufacturer. The ATSB also obtained and analysed recorded data and did so in conjunction with both internal and external flight operations expertise. Some of these persons were witnesses who identified themselves as having been consulted on data at the inquest. Versions of the ATSB report went through internal review processes and a draft was consulted on externally with Directly Involved Parties and their input addressed.

65. The ATSB report was released publicly on 15 December 2022. It is divided into five main parts prefaced by an "Executive Summary" that includes a specific "Safety message". The ATSB's message is directed, primarily, to two matters:

    a. encouraging air transport operators who conduct IFR flights to recognise "the substantial benefit of a TAWS" with a view to the installation of TAWS in the aircraft they use for their air transport operations; and

    b. encouraging such operators to "evaluate the risk of CFIT in their operations" and take various steps or measures to reduce that risk.

66. I have relied heavily on the factual matrix and the conclusions contained within the ATSB report.

67. Due to the extent of the ATSB investigation and the detailed nature of the ATSB report, the areas for coronial investigation were narrowed and the represented parties accepted the foundational facts set out in the ATSB's report.

68. I extract the very helpful executive summary of the ATSB report as follows (found at pages i, ii, iii and iv):

Executive Summary - What happened

On 11 March 2020, a Cessna 404 aircraft, registered VH-OZO, was being operated by Air Connect Australia to conduct a passenger charter flight from Cairns to Lockhart River, Queensland. On board were the pilot and 4 passengers, and the flight was being conducted under the instrument flight rules (IFR).

Consistent with the forecast, there were areas of cloud and rain that significantly reduced visibility at Lockhart River Airport. On descent, the pilot obtained the latest weather information from the airport's automated weather information system (AWIS) and soon after commenced an area navigation (RNAV) global satellite system (GNSS) instrument approach to runway 30.

The pilot conducted the first approach consistent with the recommended (3°) constant descent profile, and the aircraft kept descending through the minimum descent altitude (MDA) of 730 ft and passed the missed approach point (MAPt). At about 400 ft, the pilot commenced a missed approach.

After conducting the missed approach, the pilot immediately commenced a second RNAV GNSS approach to runway 30. During this approach, the pilot commenced descent from 3,500 ft about 2.7 NM prior to the intermediate fix (or 12.7 NM prior to the MAPt). The descent was flown at about a normal 3° flight path, although about 1,000 ft below the recommended descent profile. While continuing on this descent profile, the aircraft descended below the MDA. It then kept descending until it collided with terrain 6.4 km (3.5 NM) short of the runway. The pilot and 4 passengers were fatally injured, and the aircraft was destroyed.

What the ATSB found

The weather conditions when the aircraft reached the MAPt for the first approach could not be determined. It is possible that the conditions were better than the landing minima at that point but then deteriorated as the approach continued and when the aircraft was at a lower altitude.

The indicated airspeed during the latter part of the first approach was about 140 kt, which significantly exceeded the operator's preferred speed after the final approach fix (FAF) (about 110 kt) and the operator's stabilised approach criteria speed (about 110 kt at 300 ft above aerodrome elevation). Whether the pilot made the decision to conduct the missed approach based on the weather conditions, airspeed, descent rate or some combination of those factors could not be determined.

The aircraft probably entered areas of significantly reduced visibility during the second approach. In particular, there was a period of heavy rainfall at the airport after the first approach, and it is likely the aircraft entered the rain during the second approach.

There was no evidence of any conditions or circumstances likely to induce a medical problem or incapacitation for the pilot and the aircraft appeared to be in controlled flight up until the time of the impact. There was also no evidence of any aircraft system or mechanical anomalies that would have influenced the accident. Therefore, based on the available evidence, the accident was very likely the result of controlled flight into terrain (CFIT).

The most likely scenario to explain the descent 1,000 ft below the recommended descent profile on the second approach could not be determined. Regardless of the exact scenario, it is evident from the continued descent that the pilot did not effectively monitor the aircraft's altitude and descent rate for an extended period.

In addition, when passing the FAF (5 NM prior to the MAPt), the aircraft significantly exceeded the operator's required (lateral) navigational tolerance for the instrument approach for an extended period. This should have resulted in a second missed approach but, although the pilot was correcting the lateral deviation, a missed approach was not conducted. The aircraft's speed after the FAF also increased to 140 kt, before increasing to 150 kt towards the end of the flight.

The ATSB found that the pilot was probably experiencing a very high workload during periods of the second approach. In addition to the normal high workload associated with a single pilot hand flying an approach in instrument meteorological conditions (IMC), the pilot's workload was elevated due to conducting an immediate entry into the second approach, conducting the approach in a different manner to their normal method, the need to correct lateral tracking deviations throughout the approach, and higher than appropriate speeds in the final approach segment.

The pilot had the required qualifications and had been regularly logging RNAV GNSS approaches, although these approaches were almost all conducted in visual meteorological conditions.

However, their workload was potentially further exacerbated by having limited recent experience in conducting RNAV GNSS approaches in IMC.

The aircraft had sufficient fuel to conduct the flight from Cairns to Lockhart River and return, with additional fuel for holding on both sectors if required. In addition, there was no evidence to indicate any organisational or commercial pressures on the pilot to complete the flight, but the extent to which self-imposed pressures or incomplete knowledge of procedural requirements influenced the pilot's performance could not be reliably determined.

The aircraft was not fitted with a terrain avoidance and warning system (TAWS). Given the aircraft's descent profile on the second approach, if a TAWS had been fitted and been operational, it would have provided the pilot with both visual and aural alerts of the approaching terrain for an extended period.

There was no requirement in Australia for piston-engine aeroplanes (such as VH-OZO) to be fitted with a TAWS. Although the Civil Aviation Safety Authority (CASA) had been considering changes to TAWS requirements since 2008, the Australian requirements at the time of the accident for some types of small aeroplanes being used for air transport operations were less than those of comparable countries and they were not consistent with International Civil Aviation Organization (ICAO) standards or recommended practices.

More specifically, although there was a TAWS requirement in Australia for turbine-engine aeroplanes carrying 10 or more passengers under the IFR, there was no requirement for piston- engine aeroplanes authorised to carry 10 or more passengers

(an ICAO standard adopted as a requirement by many comparable countries) and no requirement for turbine-engine aeroplanes authorised to carry 6 to 9 passengers (an ICAO recommended practice adopted as a requirement by many comparable countries).

However, even if these changes had been introduced in Australia prior to the accident, it is unlikely they would have resulted in an aeroplane such as VH-OZO being fitted with a TAWS.

The aircraft was fitted with 2 Garmin GNS 430W GPS units that provided navigation and radio communication capability. As part of the unit's navigation capability, there was also a terrain awareness function capable of providing visual pop-up terrain alerts. However, that functionality was not to the same standard required for a TAWS installation. It could not be determined whether this function was selected on by the pilot during the accident flight.

Although the GNS 430W unit was suitable for an RNAV GNSS approach and other non-precision instrument approaches, it did not provide vertical guidance information, which would have explicitly indicated that the aircraft was well below the recommended descent profile.

CFIT accidents have been a significant problem over many years, although the rate of such accidents has been decreasing. However, risk factors still remain, particularly for smaller operators. Ideally, in order to minimise the risk of CFIT, operators conducting passenger transport operations under the IFR would use aircraft fitted with a TAWS and/or have a GPS/navigational system that provides vertical guidance during non-precision instrument approaches.

Nevertheless, even without these systems, there are other means available for such operators to minimise CFIT risk. In this case, the operator had specified a flight profile for straight-in instrument approaches and stabilised approach criteria in its operations manual, and encouraged the use of stabilised approaches, but there were limitations with the design of these procedures.

In particular, the operator's stabilised approach criteria specified an applicable height of 300 ft above aerodrome elevation for operations in IMC. A similar problem has also been identified in multiple other operators conducting passenger transport operations under the IFR. Although an applicable height of 1,000 ft in IMC has been widely recommended by ICAO and many other organisations for over 20 years, CASA had not provided formal guidance information to operators in Australia regarding the content of stabilised approach criteria.

There were also limitations with the operator's other risk controls for minimising the risk of CFIT, including no procedures or guidance for the use of the terrain awareness function on the aircraft's GNS 430W units, and limited monitoring of the conduct of line operations.

69. I accept the conclusions and findings of the ATSB.

What has been done as a result

On 2 December 2021, Civil Aviation Safety Regulation (CASR) Part 121 (Australian air transport operations – larger aeroplanes) and CASR Part 135 (Australian air transport operations – smaller aeroplanes) commenced. Associated with these regulations, piston-engine aircraft being used for air transport with a maximum operational passenger seat configuration (MOPSC) of 10 or more were required to have a TAWS and operate under Part 121, with the applicable dates dependent on the MOPSC and other factors.

In December 2021, CASA also published guidance material for CASR Part 121 and Part 135. This included guidance information about stabilised approach criteria, including advice regarding applicable heights for stabilised approach criteria in IMC, including an example height of 1,000 ft above aerodrome elevation in IMC.

Associated with the introduction of CASR Part 135 in December 2021, air transport operators of smaller aeroplanes were required to conduct a flight crew member proficiency check at intervals of 6 months (for IFR or night VFR operations) or 12 months (for day VFR operations).

ATSB Safety message

All operators conducting air transport operations under the IFR should evaluate the risk of CFIT in their operations. In addition, any such operators that do not currently have a TAWS fitted to their aircraft should recognise the substantial benefits of a TAWS, and be actively seeking to install a TAWS to maximise the safety of their operations.

In addition, there are many other lessons for operators of small aircraft to reduce their CFIT risk. These include:

(i) If a TAWS is not currently viable but they have aircraft with a GNS 430 or similar system that provides a terrain awareness function, fully understand the nature and limitations of this function and develop procedures and guidance for pilots about its operation (particularly for instrument approaches or operations in IMC).

(ii) If not already fitted, actively seek to upgrade their GPS/navigational system to one that provides vertical guidance information on non-precision instrument approaches.

(iii) Develop (or review) flight profiles for instrument approaches that provide clear guidance regarding the expected configuration, speed and other requirements at key stages of the approach.

(iv) Develop (or review) stabilised approach criteria in line with best-practice industry guidance and ensure that the applicable heights or reference points are suitable

for straight-in approaches and operations in IMC.

(v) Review the frequency and content of flight crew member proficiency checks to ensure they provide sufficient opportunities to monitor the way instrument approaches are being conducted during line operations (noting that such checks for IFR operations conducted under CASR Part 135 are now required every 6 months). In addition, such operators should consider options for obtaining and reviewing recorded flight data of normal line operations for continuous learning purposes.

ATSB Findings

70. The ATSB findings are extracted in full below from pages 84 and 85 of the ATSB report.

Contributing factors

- *While the pilot was operating in the vicinity of Lockhart River Airport, there were areas of cloud and rain that significantly reduced visibility and increased the risk of controlled flight into terrain. In particular, the aircraft probably entered areas of significantly reduced visibility during the second approach.*
- *After an area navigation (RNAV) global satellite system (GNSS) approach to runway 30 and missed approach, the pilot immediately conducted another approach to the same runway that was on a similar gradient to the recommended descent profile but displaced about 1,000 ft below that profile. While continuing on this descent profile, the aircraft descended below a segment minimum safe altitude and the minimum descent altitude, then kept descending until the collision with terrain about 6 km before the runway threshold.*
- *Although the exact reasons for the aircraft being significantly below the recommended descent profile and the continued descent below the minimum descent altitude could not be determined, it was evident that the pilot did not effectively monitor the aircraft's altitude and descent rate for an extended period.*
- *When passing the final approach fix (FAF), the aircraft's lateral position was at about full-scale deflection on the course deviation indicator (CDI), and it then exceeded full-scale deflection for an extended period. In accordance with the operator's stabilised approach procedures, a missed approach should have been conducted if the aircraft exceeded half full-scale deflection at the FAF, however a missed approach was not conducted.*
- *The pilot was probably experiencing a very high workload during periods of the second approach. In addition to the normal high workload associated with a single pilot hand flying an approach in instrument meteorological conditions, the pilot's workload was elevated due to conducting an immediate entry into the second*

approach, conducting the approach in a different manner to their normal method, the need to correct lateral tracking deviations throughout the approach, and higher than appropriate speeds in the final approach segment.

- *The aircraft was not fitted with a terrain avoidance and warning system (TAWS). Such a system would have provided visual and aural alerts to the pilot of the approaching terrain for an extended period, reducing the risk of controlled flight into terrain.*
- *Although the aircraft was fitted with a GPS/navigational system suitable for an area navigation (RNAV) global satellite system (GNSS) approach and other non-precision approaches, it was not fitted with a system that provided vertical guidance information, which would have explicitly indicated that the aircraft was well below the recommended descent profile.*
- *Although the operator had specified a flight profile for a straight-in approaches and stabilised approach criteria in its operations manual, and encouraged the use of stabilised approaches, there were limitations with the design of these procedures. In addition, there were limitations with other risk controls for minimising the risk of controlled flight into terrain (CFIT), including no procedures or guidance for the use of the terrain awareness function on the aircraft's GNS 430W GPS/navigational units and limited monitoring of the conduct of line operations. (Safety Issue)*

Other factors that increased risk

- *Although an applicable height of 1,000 ft for stabilised approach criteria in instrument meteorological conditions has been widely recommended by organisations such as the International Civil Aviation Organization for over 20 years, the Civil Aviation Safety Authority had not provided formal guidance information to Australian operators regarding the content of stabilised approach criteria. (Safety issue)*
- *The Australian requirements for installing a terrain avoidance and warning system (TAWS) were less than those of other comparable countries for some types of small aeroplanes conducting air transport operations, and the requirements were not consistent with International Civil Aviation Organization (ICAO) standards and recommended practices. More specifically, although there was a TAWS requirement in Australia for turbine-engine aeroplanes carrying 10 or more passengers under the instrument flight rules:*
- *There was no requirement for piston-engine aeroplanes to be fitted with a TAWS, even though this was an ICAO standard for such aeroplanes authorised to carry 10 or more passengers, and this standard had been adopted as a requirement in many comparable countries.*

- *There was no requirement for turbine-engine aeroplanes authorised to carry 6–9 passengers to be fitted with a TAWS, even though this had been an ICAO recommended practice since 2007, and this recommended practice had been adopted as a requirement in many comparable countries. (Safety Issue).*

Other findings

- *The forecast weather at Lockhart River for the time of the aircraft's arrival required the pilot to plan for 60 minutes holding or diversion to an alternate aerodrome. The aircraft had sufficient fuel for that purpose; and the aircraft had sufficient fuel to conduct the flight from Cairns to Lockhart River and return, with additional fuel for holding on both sectors if required.*
- *There was no evidence of any organisational or commercial pressure to conduct the flight to Lockhart River or to complete the flight once to commenced.*
- *Based on the available evidence, it is very unlikely that the pilot was incapacitated or impaired during the flight.*
- *There was no evidence of any aircraft system or mechanical anomalies that would have directly influenced the accident. However, as a consequence of extensive aircraft damage, it was not possible to be conclusive about the aircraft's serviceability.*
- *The aircraft was fitted with Garmin GNS 430W GPS/navigational units that could be configured to provide visual (but not aural) terrain alerts. However, it could not be determined whether the terrain awareness function was selected on during the accident flight.*

71. I accept the further conclusions and findings of the ATSB.

72. Based on the extensive investigation, report, conclusions and findings of the ATSB and the evidence at inquest, in respect of the below matters which are not challenged, I **find** that the collision was not:

    a. a result of mechanical fault or defect of the aircraft;

    b. intended by the pilot; or

    c. a result of the pilot experiencing a medical event.

73. I **find** the event can be categorised as a 'controlled flight into terrain'.

74. I **find** that the collision was as a result of pilot error.

ATSB – most likely scenario to explain the CFIT

75. The ATSB investigation established that noting the recommended flight profile for a 3° approach, the aircraft should have descended from **3,500 ft** at about 4.2 NM from the FAF (9.2 NM from the MAPt). At this point, the aircraft was at about **2,500 ft,** and when the aircraft passed LHREF at 0918:23, it was on descent through about 1,100 ft (below the 3° approach profile height of 2,160 ft).

76. The ATSB identified three possible scenarios to explain the collision summarised as:

    (1) The pilot misunderstood his position along the approach path or misidentified the sequential waypoints to form the belief that he was further along the approach path than he in fact was after overflying the IF at the correct altitude of 2,800 ft.

    (2) The pilot believed he was 1,000 ft higher than he actually was during most of the descent from the IF onwards.

    (3) The pilot purposely descended below the descent profile and segment MSAs to maximise the chance of obtaining a visual reference to the ground and the destination airport before again reaching the MAPt.

77. In its analysis of these scenarios, the ATSB opined as follows:

    a. As to scenario 1 above, the recorded data does not provide support for such a hypothesis as the pilot turned near waypoint LHREA and again at the IF (10 NM from the MAPt) and made a correct radio call as to the position of the aircraft remaining above the recommended descent profile for an extended period.

    b. As to scenario 2 above, when the pilot commenced the descent of the aircraft from 3,500 ft, he was busy correcting the lateral position of the aircraft and then turned attention to the altimeter when at 2800 ft by broadcasting **"3,800 ft correction 2,800 ft".** The ATSB considered that this indicated that the pilot was experiencing a high and increasing mental workload which may have affected his subsequent scanning and understanding of the altimeter. At this time, after commencing the descent, his focus may have been more on the vertical speed indicator than the altimeter.

78. Research has shown that the displays of three-pointer analogue ('clock-face') altimeters are capable of being mis-read and several accidents have been

attributed to this cause. However, the ATSB acknowledged that this scenario does not readily explain why the descent rate significantly increased in the last 30 seconds of the approach. In seeking some explanation, the ATSB noted that both the Operations Manual of Airconnect Australia and research undertaken by organisations such as the Flight Safety Foundation warn that when encountering low visibility conditions due to heavy rain a pilot must be aware of an "illusion" of being too high causing the pilot to make an unwarranted nose-down control input to correct the perception that the aircraft is too high.

79. As to scenario 3 above, the ATSB considered it unlikely that a pilot would intentionally descend below the MDA before the MAPt unless the pilot had gained some visual reference to the ground. Although the analysed flight data is consistent with the pilot attempting to level out at the MDA on the final approach segment, the subsequent rapid descent is not consistent with an earlier decision to intentionally conduct a 3° descent that was about 1000ft below the charted descent profile and does not explain why the aircraft kept descending for over 30 seconds after reaching 700ft with an excessive descent rate of some 1200 ft/min.

80. The ATSB considers that "the most likely scenario" to explain the path or descent profile of the aircraft on the second approach is the second scenario.

81. Although not proffered as a definitive conclusion, it is the ATSB's evidence that the pilot "mis-reading the altimeter by 1,000 ft appears to be the most likely scenario".

A catastrophic weather event or microburst

82. Accepting the ATSB conclusion that the aircraft was 1000ft below the **charted profile,** what explanation can be provided for that error and further, why did the aircraft then descend for over 30 seconds after reaching and passing below the MDA from 700ft/ min at an excessive descent rate of 1,200 ft/min.

83. Mr Schott, a CASA approved flight examiner, expressed in his evidence (commencing his evidence on day 4 and recalled the following final day of evidence) a view to explain the vertical profile and flight path of the second approach conducted by Mr Weavell. This view was, to some extent, a hybrid (or melded) adaption of the first and second (and perhaps some aspects of the third) scenarios proffered by the ATSB.

84. In Mr Schott's view there were several "cognitive errors" made by the pilot as indicated by an analysis of the available flight data. First, when reporting just prior to overflying the IF (at LHREI) the pilot called "3,800 ft" but immediately corrected this to say "2,800" feet. At this point he had already commenced descent and was above the minimum safe altitude when overflying the IF point. Mr Schott referred to an industry saying, "gear down to go down", suggesting that well before reaching the IF the pilot had put the landing gear down with approach flap out. Mr Schott considered that the possibility of an incorrect reading of the altimeter thereafter does **not** explain why the aircraft commenced the descent well before passing the IF but still well above the segment MSA until approximately 2.4 NM from the FAF.

85. Next, accepting that on the track between the IF and the FAF the aircraft continued to descend but, at about 4.2 NM from the FAF, was at 2,500 ft, Mr Schott suggested that the pilot may have made another "cognitive error" in misreading "4.2" as "2.4". Nonetheless, referencing the recorded data presented at Fig 17 (page 45) of the ATSB report, the descent profile of the aircraft did not place the aircraft in any danger at that point. On passing the FAF, the aircraft was, at that point, above the MDA for the final segment. On referencing page 72 of the ATSB report (and Figure 21) and accepting the three data points noted to get to the MDA, Mr Schott said that when the aircraft got near to the MDA there was then an "appreciable reduction in descent".

86. Mr Schott seemed to accept, from the data presented in the ATSB report, that the aircraft levelled out for a time at 700 ft before the aircraft descended for about 30 seconds on the final approach at a descent rate of 1,200 ft/min. The aircraft then impacted the beach on the coastline.

87. The ATSB attributed a misreading of the altimeter by the pilot at one or more stages of the approach as "the most likely scenario" based on a failure of the pilot to "effectively monitor the aircraft's altitude and descent rate for an extended period", however Mr Schott considered that although tracking lower than in the first approach, the aircraft was in the slope that it needed to be at.

88. With reference to Figure 17 (p 45 ATSB report) although the aircraft descends below the MSA at about 2 NM to FAF, it is at that point, over water.

89. Mr Schott suggested that the descent of the aircraft after the MDA could be explained by a different event. That event was essentially a sudden weather phenomenon such as windshear, downburst or microburst. In short, Mr Schott

referred to the report of the fisherman who described the weather that he saw at around the time of the second approach being conducted by Mr Weavell as ‘a wall of water’.

ATSB response to microburst theory

90. The ATSB in written submissions at the conclusion of the inquest (and responding to the sudden catastrophic weather theory of Mr Schott above, as expanded on by Counsel Assisting in submissions) advised it applied its analysis methodology and utilised the ATSB’s teams-based approach with relevant subject matter expertise, to test the hypotheses.

91. With respect to the circumstances of the second approach into Lockhart River Airport, the ATSB’s position is that there is no significant new evidence that would change the ATSB’s findings on pages 84 to 85 of its Final Report or its views on the scenarios posited in its report to explain the circumstances of the approach.

92. Having regard to all the available evidence, and utilising specialist investigative and subject matter expertise (including of Dr Michael Walker) the ATSB formed the view that:

> *…it is unlikely that the pilot [Mr Weavell] thought they were one segment out on the approach and there was no specific evidence to indicate that the pilot had or would intentionally descend below the recommended descent profile and below a segment minimum safe altitude. Overall, mis-reading the altimeter by 1,000 ft appears to be the most likely scenario, although there was insufficient evidence to provide a definitive conclusion. Regardless of the exact scenario, it is evident from the continued descent that the pilot did not effectively monitor the aircraft’s altitude and descent rate for an extended period.*

93. In reaching this view, the ATSB had regard to a very high workload that would have been experienced by the pilot associated with the inherent difficulty of single pilot operations in instrument meteorological conditions (IMC), hand flying the aircraft, the known control inputs (based on flight track data) in correcting the aircraft’s lateral position, increased aircraft speed, and the effects of probably entering heavy rain. The reasoning, including consideration of evidence for and against each of the scenarios, is set out at pages 71 –76 of the ATSB Final Report (G1).

94. The report addressed the challenges with the available evidence to explain why the descent rate increased in the last 30 seconds of the flight. In the context of scenario 2, the ATSB said:

> *The scenario does not specifically explain why the descent rate increased in the last 30 seconds of the approach. However, the pilot was probably experiencing a very high workload at that time associated with correcting the aircraft's lateral position (see Second approach lateral position) [Ex G1, pp.74-75]. The pilot may also have started increasing the amount of time they were looking outside the aircraft for visual cues, and/or their attention was diverted when entering heavy rain. In addition, heavy rain on a windshield is known to create refraction effects that can lead a pilot perceive that the aircraft is too high, which can result in an unwarranted nose-down correction and flight below the desired flight path (Flight Safety Foundation 2000).*

95. The above points were made as potential explanations for the increased rate of descent. There was insufficient evidence to make a finding with reference to the ATSB's standard of proof as to the reasons for the increased rate of descent. However, there was evidence that the pilot was experiencing an increased workload (Ex G1, pp.75-76) and there was evidence the aircraft likely entered heavy rain during the second approach (Ex G1, pp.69-70), which reasonably led to these factors being raised as potential explanations.

96. The ATSB referenced further material in written submissions and consulted with the Bureau of Meteorology (BOM) after the inquest to inform its views. I consider the post inquest approach to the BOM for information was appropriate (and helpful) in circumstances where a theory regarding a weather phenomenon developed in the last day of Inquest with no opportunity to otherwise respond.

97. Mr Schott's theory generated further necessary enquiry and the ATSB provided submissions after their consultation with the BOM to assist with a better understanding of a microburst phenomenon and an explanation of the evidence (not available to Mr Schott at the time of his evidence and I extract below).

98. As stated by the Bureau of Meteorology:

> *The main severe weather types produced by thunderstorms in the tropics are damaging wind and heavy rainfall. The wind gusts are "straight line gusts", that is, not associated with the rotating winds within a tornado, but due to the outflow from the downdraught of a thunderstorm as the air hits the ground and spreads out. The name given to an intense thunderstorm downdraught concentrated on a small area is a microburst.*

99. In another relevant publication by the Bureau of Meteorology, in a section titled 'Downbursts', it reads:

> *The outflow from a storm's downdraft will occasionally produce winds of destructive force. When precipitation falls into drier air inside or below a thunderstorm, it immediately begins evaporating. This evaporation cools the surrounding air, increasing its density, causing it to accelerate downwards. A downburst is a concentrated downdraft, typically lasting five to fifteen minutes, and is of unusually high speed such that it can cause damage on, or near, the ground. The term microburst is used to describe a downburst which causes damage over an area with horizontal dimensions of less than four kilometres.*
>
> *Downburst winds originate from the cloud base and diverge when they make contact with the ground. The rapid change in wind speed and direction associated with downbursts poses a threat to aircraft during take-off and landing phases, during which an aircraft will first encounter a strong headwind, then a downdraft which is the vertically descending section of the downburst, and finally a region of strong tailwind.*

100. In the prevailing conditions in the region on the day, the only type of microburst that could have occurred would have been a wet microburst. For such a microburst to have occurred, a thunderstorm would also have had to have occurred, and any microburst produced by the thunderstorm would occur in the later stages of the thunderstorm's cycle. In addition, only a small proportion of thunderstorms will produce a microburst. The ATSB has confirmed its understanding of these points with the Bureau of Meteorology.

101. On the morning of 11 March 2020, a monsoonal trough of low pressure was developing across the Cape York Peninsula. The weather associated with this system was moving across the cape from the north-west (to the south-east). Consequently, for a microburst to have occurred at about 5 NM south-east of Lockhart River Airport at about 0919 on 11 March 2020, a thunderstorm would need to have already passed through the area surrounding the airport in the preceding period. The ATSB has confirmed its understanding of these points with the Bureau of Meteorology.

102. The aerodrome forecast (TAF) for Lockhart River issued at 0449 indicated a 30% probability between 0600 and 1800 of periods of 30–60 minutes of thunderstorms with variable direction 25 kt winds, with gusts up to 35 kt. Those winds were typical conditions for a thunderstorm associated with this type of weather system. Consistent with the Bureau of Meteorology's normal

procedures when forecasting this type of thunderstorm, there were no SIGMETs or warnings issued. However, multiple independent sources of recorded meteorological information did not provide any evidence that a thunderstorm had formed in the vicinity of Lockhart River during the period leading up to the accident or immediately after the accident. The ATSB has confirmed its understanding of these points with the Bureau of Meteorology.

103. More specifically, the ATSB notes the following regarding the recorded meteorological information:

> *Weather conditions recorded at the Lockhart River Airport automatic weather station included rain between 0910 and 0916, with moderate to heavy rain between 0912 and 0914. There was no significant wind recorded and no temperature or air pressure changes recorded during that period. Following the rain, at 0916-0921, there was 3-4 kt recorded wind (from the west), which is light wind. The same rain weather system was moving from the north-west to the south-east, passing over Lockhart River Airport towards the approaching aircraft VH-OZO.*
>
> *All thunderstorms produce lightning. The Bureau of Meteorology has provided the ATSB with images showing lightning activity detected in the vicinity of Cape York by the Earth Networks Global Lightning Network (ENGLN) for the period from 0900- 0930 and 0930-1000. There was no lightning activity detected in the region of Lockhart River during this period. The nearest lightning activity occurred about 100 NM (185 km) south-east of Lockhart River and over 100 NM north-east of Lockhart River, too far away to be connected with thunderstorm activity in the Lockhart River area during the relevant period.*

104. The ATSB notes that a website titled 'Blitzortung.org' provides historical lightning activity information derived from a network of privately-owned lightning detectors. For the period 0900–1000, this data is consistent with the data provided by the Bureau of Meteorology from the ENGLN.

105. The Bureau of Meteorology provided the ATSB with satellite images from a geostationary meteorological satellite taken at 0930 and 1000. These images show no indication of cloud formations characteristic of thunderstorms near Lockhart River, which would typically indicate a storm was present. Those characteristic formations would include distinct white, lumpy clouds overshooting the top of the thunderstorm. The satellite images were reviewed north-east and south-east of Lockhart River (in the vicinity of the recorded ENGLN lightning activity), and characteristic white, lumpy clouds overshooting of the top of the

thunderstorm were visible at those locations, but too far away to be connected with storm activity in the Lockhart River area during the relevant period.

106. The ATSB also interviewed witnesses at or near the airport, pilots who landed before and after the time of the accident as well as a nearby fisherman. If any of these witnesses had reported any lightning or wind gusts, this information would have been included in the ATSB report. The ATSB report makes no references to such information being reported. The only weather phenomenon reported was rain. Similarly, the only weather phenomenon mentioned in the messages from the passengers at 0914 was rain.

107. In summary, I am advised that only a small proportion of thunderstorms will produce a microburst, and a microburst occurs at a specific location for a short period of time. Therefore, the likelihood of a microburst occurring at a specific location at a specific time during a particular thunderstorm would be very low. More importantly, for a wet microburst to have occurred about 5 NM or 9 km south-east of Lockhart River Airport at about 0919 on 11 March 2020, a thunderstorm needs to have occurred in the surrounding area. However, multiple independent sources of meteorological information as well evidence from several witnesses did not provide any evidence that such a thunderstorm had occurred.

108. The ATSB Final Report at page 33 stated, *"Fishermen who were in the area at the time reported that, at about the time of the second approach, there was a 'wall' of heavy rain that came across from the north-west"*. A fisherman recounted that he had discussions with another fisherman at the time of the rain which informed this observation.

109. The fisherman advised that he was located in a boat near the mouth of the Lockhart River (that is, about 6.5 NM or 12 km south-east of the runway 30 threshold, or about 2 NM or 4 km south-west of the FAF). There was low cloud in the area. The 'wall' of rain they observed came from the north-west (from the direction of the airport) towards them and then passed over them. The fisherman described the rain as 'heavy' and 'good, steady rain', and that the visibility in the rain reduced to about 1 to 2 km. There was no wind associated with the rain, and he kept fishing during the rain. He also reported that they were keeping a close watch for any lightning, and they did not see any lightning. He recalled that, after the rain started, they heard a short rumble sound. He recounted to the ATSB that he did not hear the aircraft's engines after the rain started (either before or after the rumble sound).

110. Thunder cannot occur without lightning. Given the sequence of events recounted by the fisherman to the ATSB, the ATSB considers a reasonable conclusion to be that the short rumble sound was consistent with a high-speed impact with terrain and not thunder.

111. Overall, the weather described by the fisherman, and coming from the direction of the airport, was very similar to that recorded by the airport's automatic weather station and reported by another witness close to the airport (that is, heavy rain and no wind). The ATSB had a sound basis to conclude that the aircraft likely encountered this same type of weather during the second approach (as stated on page 70 of the ATSB report). The nature of the fisherman's observations provides no basis for concluding that what he observed was a microburst or that a microburst occurred in the vicinity of the fishermen.

Reconciling the versions provided regarding weather

112. I accept there is insufficient evidence or information before the Inquest to infer a 'microburst' type weather event such that would be the explanation for the descent rate from 700 ft/min to 1200 ft/min in the last 30 seconds of the final approach.

113. There is no doubt that the aircraft was exposed to heavy rain, cloud and weather. Those observations are supported by photographs taken by passengers of the prevailing conditions outside the aircraft at the relevant time and missed approach which depict the inclement weather and lack of visibility.

114. It is accepted that at the point of impact the aircraft was upright, wings level and at a flight path angle of 5^{o} nose down. The ATSB conclude this attitude is consistent with a controlled flight into terrain descent, and not consistent with a microburst scenario.

Findings as to altimeter misread

115. I accept and **find** that the pilot, Mr Weavell believed he was 1,000 ft higher than he actually was, during descent from the intermediate fix (IF) flying onwards to the airport. I **find** he did so due to misreading the altimeter.

116. It is likely the pilot misread the altimeter, and possibly misread other instruments on more than one occasion given that in the ordinary course of flying and

approaching a landing it was essential to look at and scan the altimeter several times during descent. It is clear from his own broadcast **"3,800 ft correction 2,800 ft"** that he had misread the altimeter from the top of descent.

117. I accept the workload under which Mr Weavell was operating caused a number of cognitive errors including the potential for error when monitoring altitude and descent rate, lateral deviation and airspeed, particularly if scanning outside the aircraft for visual clues.

118. A controlled flight into terrain characterises an event when an airworthy aircraft under pilot control is unintentionally/inadvertently flown in to (in this case) the ground.

The last 30 seconds

119. The issue of the altimeter misread does not adequately explain the final 30 seconds of the flight before impact.

120. It can be observed that Mr Weavell's second approach was adequately stabilised from the top of descent all the way to the ground, albeit short of the runway.

121. The question then arises as to why in the last 30 seconds did descent speed increase from 700ft/min to 1200ft/min.

122. In evidence Ms Thomas stated that a drop of the aircraft nose by one to two degrees would account for that increased speed and fall rate.

123. If the pilot had **not** misread his altimeter (or was otherwise on the same descent path as in the first approach) he would likely have either been visual at about 400 ft and landed or he would have conducted another missed approach.

124. On the first approach, the pilot increased his descent rate just before and just after reaching the Missed Approach point to 900/960 ft a minute, - clearly not the 1200 ft a min as in the last 30 seconds of the second approach.

125. The ATSB notes (at page 48) re the second approach that "between the IF and the FAF, the groundspeed (and estimated indicated airspeed) was about 135 kt. It increased to 140 kt soon after passing the FAF and, when the aircraft was 3 NM from the MAPt, the groundspeed increased to about 150 kt (associated with the aircraft's increased descent rate)".

126. When posited to flight instructor Cameron Marchant in oral evidence about the circumstances likely experienced by the pilot at that time he responded as follows:

> *Initially, most pilots generally speaking, although we like to teach them, should be expecting to do a missed approach when doing IFR in poor weather. When we are doing an IFR approach, we're pretty keen to get visual reference. That, in some cases, leads to pilots pushing boundaries. Not at all to suggest here that that has occurred. When flying IFR, flying in focussed mindset, if they don't get that successful outcome, following a MaPt, they may be thinking 'well I've got these folk onboard, so the task is to fly around and have another go at an instrument approach'. The flight path (here) suggests that he has done that in the most efficient manner. There is always the option to go and do a holding pattern somewhere. The one (waypoint) that he has flown by was the one closest to him – most efficient way. What has been flown here is the shortest path to have a second approach. He would've been very, very busy – this would've been high workload.*

127. When asked directly about what should be made of the increasing speed from 140 knots to 150 knots, Mr Marchant proffered a view that Mr Weavell may have been experiencing "*visual illusions*", "*our eyes tell our brains things that aren't true*".

128. Notwithstanding the significant workload that Mr Weavell is assumed to have been experiencing (he was correcting for a lateral deviation which suggests he was at least aware of the course deviation indicator), and which explains an altimeter misread, there is no conclusive explanation as to why thereafter the aircraft descended at the rate that it did in the last 30 seconds of flight and remains unresolved at inquest. The ATSB likewise acknowledge the challenges on the available evidence to explain the descent rate in the final 30 seconds.

Level and adequacy of pilot training

129. At the relevant time, Stuart Weavell met the requisite qualifications, recency and medical requirements to conduct operations on 11 March 2020. He was qualified to conduct an RNAV GNSS approach.

130. Mr Weavell held a commercial pilot licence and a recorded total of 3220 hours flying time, including a total of 148 hours instrument time. I am informed by the ATSB report that in the 90 days prior to the accident (11 March 2020), the pilot had conducted 59 flights (60 flight hours), all in VH-OZO. This included 4.5 hours recorded instrument flying time. In the last 30 days, the pilot had conducted 12 flights (13.5 flight hours), including 1.0 hour recorded instrument flying time. The most recent flights were on 18 February 2020.

131. Since joining the operator in late 2018, the Mr Weavell had logged 69 RNAV GNSS approaches to various aerodromes. These included 21 RNAV GNSS approaches in the previous 6 months, 12 in the previous 90 days, and 2 in the previous 30 days (with the last on 18 February 2020). Only one of the approaches in the previous 6 months was conducted to some extent in instrument meteorological conditions (IMC), and this approach resulted in a missed approach on 22 January 2020.

132. Since the start of 2019, the pilot had flown into Lockhart River 8 times, 6 of which were logged as RNAV GNSS approaches, with the most recent being on 14 October 2019.

133. In relation to the observations as to Mr Weavell's approach to safety, the ATSB report, the chief pilot (and managing director) of Airconnect Australia described the pilot as being a good pilot who would not have gone into an approach if they thought the weather was going to be poor, and that there was never any pressure to fly in poor weather. The pilot was trusted to make safety decisions, which would be supported by the chief pilot. This was consistent with the recollection of a previous pilot who flew with the operator, who reported that there was never any operational pressure (from the operator's key personnel).

134. Another pilot stated that the pilot of the accident flight had 'good stick and rudder skills' and that everything was done 'by the book'. It was also reported that the pilot had not expressed any concerns about the operator, including its approach to safety.

135. Former colleagues from when the pilot was chief pilot at a previous operator described the pilot as smart, diligent, and methodical with good knowledge of the rules and regulations. They reported that the pilot did not take shortcuts or unnecessary risks and had good hand-flying skills.

136. With reference to instrument approaches, one pilot advised that they had many conversations with the pilot of the accident flight regarding aircraft accident

reports and safety, and the pilot of the accident flight had stated that they would conduct instrument approaches using the published constant-descent profile and would not intentionally deviate below published segment minimum safe altitudes in order to get visual early in an approach.

137. During January 2020, the pilot spent a week conducting a series of charter flights between Aurukun and Weipa, Queensland, in VH-OZO with the same group of passengers. Their perception was that the pilot was a good, competent pilot who was diligent, professional, and responsible and that they never felt unsafe. They also advised that they observed the pilot reviewing forecast and actual weather conditions regularly and that the pilot would delay flights due to weather conditions if necessary. Some of the passengers reported observing the pilot make weather-based decisions and did not display any indications of external pressure to fly in poor weather. One of the passengers reported that the pilot had said they would only ever make 2 attempts at landing and, after that, would return to the departure aerodrome or divert to an alternate.

138. Mr Weavell had no reported medical conditions, corroborated by his post mortem results which concluded 'No obvious natural disease to contribute to the cause of death within limits of examination …'. Forensic toxicology screening returned negative results (no alcohol or substances were detected).

139. Mr Weavell had previously failed some components of his training when previously applying for a position in a multi crew environment.

140. The ATSB report indicates that between February and June 2018, prior to joining Airconnect Australia, he undertook training with another airline in a multi-crew environment and high-performing (turboprop) aircraft.

141. The ATSB reports that although Mr Weavell obtained high marks in theory and written tests, he did not obtain satisfactory ratings during 3 proficiency assessments in a simulator (with remedial training given after each of the first 2 assessments). A common identified problem was instrument approaches, with issues identified including inefficient instrument scan, fixation (on some parameters), speed control, workload management, insufficient situational awareness and ineffective profile management. The ATSB notes that the training and checking environment at the airline was different to the pilot's previous experience and the operational environment at Airconnect Australia.

142. I note that the fatal flight also involved an instrument approach, an identified deficiency in altimeter scanning, and workload management issues.

143. CASA acknowledged that the evidence at the inquest:

(a) did not disclose any inadequacy in Mr Weavell's knowledge or understanding of RNAV (GNSS) approach procedures, but that when he had flown such procedures in IMC he had on occasion exceeded the maximum speeds on descent and deviated below minimum sector altitudes; and

(b) demonstrates and reinforces that RNAV (GNSS) approaches in IMC impose a high workload on a pilot and are technical and complex.

144. I further note that Mr Weavell subsequently (and successfully) underwent 6 flight evaluations with 4 independent flight instructors or examiners during his 17-month engagement with AirConnect.

Safety Management Systems (Airconnect)

145. I accept the submissions on behalf of Mr Sindelar that as a smaller operator, Airconnect's safety record was unblemished prior to the accident. On three occasions – March 2016, March 2017 and May 2020 — CASA granted or renewed Airconnect's AOC. At no time has CASA taken any regulatory action against Airconnect. In May 2020, following the accident, CASA carried out a regulatory and safety review of Airconnect, finding no irregularities or concerns, and thus removing the self-imposed suspension that Mr Sindelar had elected to effect immediately at the time of the accident. CASA's findings were summarised in the ATSB Report (p 52):

> *This review concluded that VH-OZO was correctly registered, certified for flight, maintained by qualified people, flown by a qualified person to a qualified aerodrome using a correctly validated approach. The review stated that past and current surveillance events had not detailed safety concerns with the operation of VH-OZO*.

146. The operator was not required to have a safety management system at the time of the accident.
147. There is no evidence that Mr Weavell was under any organisational pressure in decision making in relation to these events.
148. I accept there was no regulatory requirement for VH-OZO to be fitted with a TAWS at the relevant time, or currently. Airconnect did not own VH-OZO, and

therefore was not responsible for the installation of a TAWS (had it been required).

149. The Department's Director-General Goods and Services, Queensland Government Procurement provided communication to the Coroners Court advising the inquest that "QBuild relies upon the broker, charter company and pilot to determine whether there is any risk when a charter is chosen over a commercial flight".

150. After these deaths, in May 2020, the Department raised with the charter broker (Independent Aviation) the question of whether there had been any safety or operational matters identified (either positive or negative) with the pilot Mr Stuart Weavell or the operation of Airconnect Australia. The response received from the broker was that other clients were "always very happy with Stuart who had flown their team around many times over the last 12 months" and that there had been a recorded incident of a fuel light coming on during one of Mr Weavell's flights and the pilot "turned the aircraft around and returned to base". This incident had been included in a Key Performance Indicator report to QBuild for the last quarter of 2018.

Civil Aviation Safety Authority (CASA)

151. By section 9(2)(a) of the *Civil Aviation Act 1988* (Cth) (**CAA**), CASA's functions include the safety-related function of encouraging a greater acceptance of the aviation industry of its obligation to maintain high standards of aviation, through:

    (a) comprehensive safety education and training programs;

    (b) accurate and timely aviation safety advice; and

    (c) fostering an awareness in industry management, and within the community generally, of the importance of aviation safety and compliance with relevant legislation.

152. CASA acknowledges that it is appropriate, following an incident, for it to consider relevant safety related factors that arise or may arise in relation to an investigation into the incident, and take steps to provide, where relevant, further safety education and training programs and accurate aviation safety advice in accordance with its functions.

153. The evidence placed by CASA before the Court in evidence and in written submissions indicate that review and consideration of current policy and regulation is underway as a result of these events.
154. The issue of TAWS remains complex for CASA. I acknowledge and have regard to the extensive written submissions on this issue.
155. I refer to the position of both ATSB and CASA in relation to TAWS further below.
156. CASA also responded to each proposed recommendation put by Counsel Assisting the Inquest and to the extent that there is agreement I do not propose to take those matters further.

Terrain Avoidance and Warning System [TAWS]

157. The aircraft was not fitted with a Terrain Avoidance Warning System (TAWS). Such a system would have provided aural and visual alerts of impending terrain. It isa safety net that provides a distinctive warning to pilots and alerts them to hazardous terrain so that can take evasive action (also called ground proximity warning).

158. CASA confirms in written submissions that the Garmin GNS 430W equipment fitted to VH-OZO, if chosen as the method of installing TAWS B on the aeroplane, would have provided such a display and presentation. Regardless of whether the display or presentation was available, all TAWS B equipment would provide "Forward Looking Terrain Avoidance" functionality which produces warnings and alerts in the event of three situations:

    (a) ***first**, reduced (object) terrain clearance, which occurs when the aircraft is not projected to impact any database obstacles but the projected clearance between the aircraft and nearby obstacles falls below a designated safe vertical distance;*

    (b) ***second**, reduced required terrain clearance, which occurs when the aircraft is not projected to impact the database terrain but the projected clearance between the aircraft and nearby terrain falls below a designated safe vertical distance; and*

    (c) ***third**, imminent terrain impact, which occurs when the aircraft is projected to intersect with the database terrain up to a 3.0 nautical mile (alert) or up to a 1.5 nautical mile (warning) in front of the aircraft.*

159. The ATSB's position is to support any safety action that improves passenger transport safety.

160. The ATSB encourages the fitment of TAWS even if not required. The ATSB and CASA entered discussions about this issue and CASA entered an extended period of consultation with industry.

161. The issue of industry 'pushback' based on a number of factors, which in inquest I understood primarily was due to cost (although not the only reason).

162. Ultimately CASA as the regulator is responsible for regulating aviation safety. CASA in submissions confirms the primary objective of the CAA (Civil Aviation Act) is the establishment of a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation, with a particular emphasis on preventing aviation accidents and incidents, the achievement of that objective regularly involves CASA in the making of fine distinctions about the levels and standards of safety which ought to apply to specific aviation activities. In making those often difficult distinctions, CASA is legislatively mandated to take into account a number of different considerations – noting the primacy of aviation safety.

163. CASA submits that it appropriately executed its obligations under the CAA with respect to the legislative policy it adopted in 2018 (it is not suggested there is not TAWS requirement for turbine engines).

164. CASA determined in 2018 to establish the cut off for TAWS fitment for piston engine aircraft. CASA submits it is now committed to reviewing and reconsidering the position further in the context of commercial operations involving aircraft with a passenger carrying capacity of 6 or more. CASA accepts that the occurrence of this accident changes the paradigm upon which it acted in a way which compels the conduct of a fresh analysis of the safety case supporting the TAWS requirements.

165. CASA changed the proposed TAWS policy earlier adopted after consulting extensively with industry. CASA submit three reasons for doing so:

    a. *to mandate TAWS for all aircraft with a maximum operational passenger seating capacity of six or more would impose substantially greater compliance costs on industry compared to aligning the requirements with ICAO standards (being those international standards that CASA is required to perform its functions consistently with);*

    b. *the safety case for requiring all aeroplanes with a maximum operational passenger seating capacity of six or more to fit TAWS was not strong when considering the cost imposition on the industry sector and the very low number of recent significant*

    c. *CFIT accidents involving air transport operations conducted in aeroplanes*

with a maximum operational passenger seating capacity in the six to nine seat range; and

d. CASA was only aware of one other regulator (Transport Canada) which had required TAWS fitment for piston-engine aeroplane with a maximum operational passenger seating capacity below ten, such that there was not a sufficiently compelling case for the requirements of Part 135 of the CASR to exceed ICAO Standards.

166. The ATSB advises that CASA have been considering changes to TAWS requirements since 2008 and the requirements at the time of this event for some types of small aeroplanes being used for air transport operations were less than those of comparable countries and not consistent with International Civil Aviation Organisation (ICAO) standards or recommenced practices.

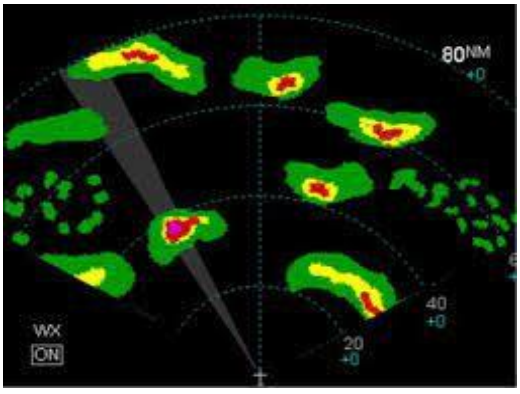
Ms Liz Thomas

167. The Issue of TAWS was raised in the evidence of Ms Elizabeth Thomas Cherian (Liz). Ms Thomas is in a unique position of being a commercial pilot for a major airline, and the long-term partner of the pilot, Mr Stuart Weavell.

168. Ms Thomas' evidence provided powerful insight and support from the perspective of the pilot. Her evidence deserves serious attention and consideration.

169. It is helpful to include the following relevant aspects of written submissions filed by Ms Thomas as follows:

> *OZO had a weather radar, as it was required to. However, this was an old monochrome model that displayed weather "returns" (areas of moisture detected by the radar) in a single colour. Modern radar displays show rain in colours ranging from white (light rain) to green, yellow, red and black (each indicating higher amounts of precipitation). This enables the pilot to discern a light shower from a dangerous storm cell. This distinction is much harder to make on the type fitted in OZO. Example images included below.*



Whether or not Stuart was subject to an "elevator illusion" or, as I believe, had misread his altimeter, has no bearing on the outcome. He was too low to the ground, and did not know. He had very few tools at his disposal to reduce his workload. He had no visual slope guidance to show he was below profile. He had no aural alert to tell him he was low. Each of these has a technological fix. Can we not at least mandate one? Can we not have at least one safety measure external to the pilot?

I will continue to assert that we need modern equipment in these aircraft. We can and should improve pilot training and proficiency - but human error will never be eliminated. Aviation, at higher levels, is upheld as an example of an industry that has multiple layers of defences or 'redundancy'. No single point of failure should be enough to cause catastrophe.

Those of us affected by the accident have endured three and a half years of grief and the immense pain of the inquest. The absence we feel will never ease. It will be a further cruelty for no real change to come of this. We are so far from best practice in General Aviation. Let this be the first step in the right direction.

170. I unequivocally concur with Ms Thomas. I accept that contemporary best practice in modern aviation requires the best available safety equipment to be installed in aircraft of this type, particularly when used for commercial private charter operations. The last line of defence for passengers and the pilot is with readily available and easily installed aural and visual warning systems. One cannot look at the five families who died at Quintell Beach in March 2020 and reassure them that all that could be done was done. Again, the time is long past due, some might say past due by the 16 years since the last Inquest arising from made an almost identical recommendation.

171. Industry pushback for what seems to be primarily monetary reasons is not a reason for this nations regulator to not mandate TAWS. TAWS is essential, available and commercially viable for all operators working in a charter fee for service space.

172. The aviation industry did not require an inquest to learn the benefits or necessity of TAWS. The aviation industry is and should remain the exemplar of the highest standards and cockpits that are outdated and cannot be retrofitted or modified to embed upgraded software should not be carrying fee paying passengers, in this case government employees. One only needs to look at the pictures above to understand the difference between old and new equipment interfaces.

Opportunity for Government

173. I note that TAWS was not required to be installed on the Cessna 404 at the time of the incident flight (nor currently). I accept VH OZO complied with all regulations at the relevant time and did not require fitment of a terrain warning system – however the fact that TAWS was not required in 2020 nor today in 2023 requires serious industry reflection. It is the entirely the prerogative of small operators to not fit TAWS. It is also the prerogative of consumers to chose in an open market place, and consumers may now reflect that their employees safety is not negotiable, and reconsider where to take their business.

174. It is anticipated that the increased awareness in relation to the fitment of what should now be considered an essential and necessary warning system will provide an opportunity for the Queensland Public Service as a whole to review the minimum safety requirements for private charter flights procured for employees in the conduct of their business. Insistence by government that their employees travel only in aircraft fitted with TAWS may quickly dissolve the industry pushback as raised at inquest (notwithstanding the increased cost for a more modern aircraft). The installation of terrain avoidance systems has now been the subject of two inquests, conducted 16 years apart.

175. In addition to the fitment of TAWS, the ATSB submits there are many other lessons for operators of small aircraft to reduce their CFIT risk. These include:

    a. If a TAWS is not currently viable but they have aircraft with a GNS 430 or similar system that provides a terrain awareness function, fully understand the nature and limitations of this function and develop procedures and

guidance for pilots about its operation (particularly for instrument approaches or operations in IMC).

b. If not already fitted, actively seek to upgrade their GPS/navigational system to one that provides vertical guidance information on non-precision instrument approaches.

c. Develop (or review) flight profiles for instrument approaches that provide clear guidance regarding the expected configuration, speed and other requirements at key stages of the approach.

d. Develop (or review) stabilised approach criteria in line with best-practice industry guidance and ensure that the applicable heights or reference points are suitable for straight-in approaches and operations in IMC.

Submission from Jake Ganter

176. Mr Jake Ganter (the son of Mr Wayne Ganter) submitted the following consideration in writing to the Court:

> *For CASA are pilots tested vigorously enough to handle these types of weather phenomena especially in the tropical regions where weather changes rapidly and can be significantly different from the take-off area.*
>
> *Are they encouraged to go into a holding pattern to conduct a risk assessment in calmer weather or without the added mental load of landing an aircraft?*

177. CASA provided a response to Mr Ganter's consideration as follows:

(i) That that an appropriate level of competency evaluation is conducted on pilots who are permitted to fly in IMC.

(ii) that changing/variable weather is a routine and expected event during flight and that pilots are appropriately evaluated in regard to their competency in making appropriate safety decisions when they encounter changing conditions that could impact the safety of a flight.

(iii) While pilots are not encouraged in any specific document to enter a holding pattern to conduct a risk assessment during changing weather conditions, all pilots in command of aircraft have a fundamental regulatory obligation to ensure the safety of their aircraft and the persons onboard the aircraft. At the time of this incident, this obligation was

specified in regulation 224 of the *Civil Aviation Regulations 1988*, which has since been repealed and its effect is now prescribed in regulation 91.215 of the CASR.

(iv) that the weather forecasts that were available to the pilot in command of VH-OZO at the time of the incident did not indicate the presence of weather that would preclude an appropriately qualified pilot from deciding to conduct an instrument approach at Lockhart River aerodrome.

178. I accept the submissions of CASA.

179. The further issue raised by Mr Ganter is:

> *For the state government on how they chose to transport their employees, do they just pick a date and time or do they have a due diligence process.*
>
> *Out of all the operators in cairns or the region why did they chose a one-man operation with a casual pilot?*

180. Some aspects of this question have been addressed withing the findings. A copy of these findings will be provided to the relevant government Department (Public Works) who may wish to consider responding in person to Mr Ganter.

Post mortem examination and autopsy results

181. Over two days commencing on 24 March 2020, three experienced forensic pathologists carried out post mortem examinations on the bodies removed from the wreckage. The autopsies comprised of external and internal examination (to the extent an internal examination was required to determine the cause of death), imaging, document review, DNA profiling and toxicology studies.

182. It was concluded that each occupant of the aircraft sustained catastrophic injuries not compatible with life. Given the severity of the injuries and the force of the impact, death would have been instant.

Recommendations

183. Noting that under s 9 of the *Civil Aviation Act 1998* (Cth), CASA has, amongst other things, the function of conducting the safety regulation of civil air operations in Australia by means that include the following:

(a) developing and promulgating appropriate, clear and concise aviation safety standards;

(b) developing effective enforcement strategies to secure compliance with aviation safety standards;

(c) conducting comprehensive aviation industry surveillance, including assessment of safety-related decisions taken by industry management at all levels for their impact on aviation safety;

(d) conducting regular reviews of the system of civil aviation safety in order to monitor the safety performance of the aviation industry, to identify safety-related trends and risk factors and to promote the development and improvement of the system; and

(e) encouraging a greater acceptance by the aviation industry of its obligation to maintain high standards of aviation safety, through:

    (i) comprehensive safety education and training programs;

    (ii) accurate and timely aviation safety advice; and

    (iii) fostering an awareness in industry management, and within the community generally, of the importance of aviation safety and compliance with relevant legislation,

I recommend as follows:

Recommendation 1

The Civil Aviation Safety Authority to implement relevant regulation to mandate the fitment of TAWS for all small aeroplanes conducting air transport operations under IFR (and night VFR) where the aeroplane has a passenger carrying capacity of 6 or more regardless of whether the aeroplane is turbine or piston powered.

Recommendation 2

CASA, in consultation with AirServices Australia and appropriate aerodrome operators to consider the best way to monitor, or obtain data concerning, the use of the Baro-VNAV procedure at sample or selected aerodromes, including Lockhart River

aerodrome, with a view to assessing or evaluating the effectiveness of those procedures and whether steps are needed to encourage air operators to do so.

Recommendation 3

CASA provide further information and aviation safety advice, together with education, to the relevant industry sectors, about the hazards of conducting instrument approaches (including RNAV(GNSS)) in IMC, and the importance of maintaining a comprehensive and competent systematic scan technique in hazardous weather conditions, including turbulence.

Recommendation 4

CASA provide further information and aviation safety advice, together with education, to the flight examiners who conduct Instrument Proficiency Checks of the need to fully assess and check the competence of a pilot who is or may be required to conduct a RNAV/GNSS approach in maintaining a comprehensive and competent systematic scan technique in hazardous weather conditions, including turbulence, both in terms of underpinning knowledge and in terms of demonstrated performance.

Recommendation 5

That Civil Aviation Safety Authority:

(a) review and amend its existing general guidance material (Advisory Circular AC 1-02) to include appropriate recommendations and guidance in relation to exposition content addressing the requirements of a pilot conducting an instrument approach procedure; and

(b) consider how it might appropriately conduct surveillance of the exposition content of existing Australian air transport operators regarding stabilised approach procedures and the conduct by their pilots of instrument approach procedures.

Recommendation 6

I recommend that the Federal Minister for Infrastructure, Transport, Regional Development and Local Government in consultation with the Lockhart River Aerodrome Company Pty Ltd, review the adequacy of lighting facilities at LHR aerodrome with a view to providing grants or funding for the installation of upgraded lighting, such as Precision Approach Path Indicator (PAPI) lighting so as to provide visual approach slope information. [*and deliver significant benefits for regional aviation and the local community at LHR, in the interests of safety for aircraft, operators and passengers using LHR aerodrome*].

Endorsement of ATSB safety message

184. I also herewith endorse and support the distribution of the ATSB safety message as follows to the wider aviation industry and to include The Aircraft Owners and Pilots Association of Australia as published in the ATSB investigation report to reduce CFIT risk:

    i. All operators conducting air transport operations under the IFR should evaluate the risk of CFIT in their operations. In addition, any such operators that do not currently have a TAWS fitted to their aircraft should recognise the substantial benefits of a TAWS, and be actively seeking to install a TAWS to maximise the safety of their operations.

    ii. If a TAWS is not currently viable but they have aircraft with a GNS 430 or similar system that provides a terrain awareness function, fully understand the nature and limitations of this function and develop procedures and guidance for pilots about its operation (particularly for instrument approaches or operations in IMC).

    iii. If not already fitted, actively seek to upgrade their GPS/navigational system to one that provides vertical guidance information on non-precision instrument approaches.

    iv. Develop (or review) flight profiles for instrument approaches that provide clear guidance regarding the expected configuration, speed and other requirements at key stages of the approach.

v. Develop (or review) stabilised approach criteria in line with best-practice industry guidance and ensure that the applicable heights or reference points are suitable for straight-in approaches and operations in IMC.

vi. Review the frequency and content of flight crew member proficiency checks to ensure they provide sufficient opportunities to monitor the way instrument approaches are being conducted during line operations (noting that such checks for IFR operations conducted under CASR Part 135 are now required every 6 months). In addition, such operators should consider options for obtaining and reviewing recorded flight data of normal line operations for continuous learning purposes.

Conclusions and Findings of Coroner

185. I find that at 7.19AM on 11 March 2020 a Cessna 404 aircraft (VH-OZO) departed Cairns en-route to Lockhart River, a distance of 523 kilometres, with an estimated flight time of approximately 1 hour and 45 minutes.

186. The pilot encountered weather including heavy rain and low visibility upon approach into Lockhart River. The pilot missed the first approach.

187. When attempting a second RNAV GNSS instrument approach to the runway, the pilot was 1000 ft below the recommended descent profile and at 700ft descended below the minimum descent altitude on a ground track 20 degrees left of the final approach track before impacting with sand dunes at Quintell Beach, approximately 6.4 kilometres (3.4 NM) southeast of Lockhart River Airport at 9.19AM, fatally injuring all on board.

188. The pilot believed he was 1,000 ft higher than he actually was during most of the descent from the IF onwards and did not effectively monitor the aircraft's altitude and descent rate for an extended period due to experiencing a very high workload.

189. The five persons on board were pilot Stuart Weavell, three QBuild employees Wayne Ganter, Henry Roebig and Wayne Brischke, and a contractor employed by Advanced Pest and Weed Control, Mark Rawlings.

190. In the circumstances, I am left with little doubt that a functioning terrain avoidance warning system providing visual and aural alerts may have provided the pilot with an opportunity to take the action required to avoid collision.

191. In any event, the absence of such a warning system was a missed opportunity to alter the outcome.

Family Statements

192. Mr Ganter, Mr Roebig, Mr Rawlings, Mr Brishke and Mr Weavell were much loved members of their respective close-knit families and the local community in which they lived and worked.

193. Some of the families elected to deliver a personal family statement at the conclusion of the evidence. The following is a precis of how each man is remembered by their loved ones.

194. Wayne Ganter was born on 23 October 1956. He was a devoted husband to his wife Lisa of thirty-five years, a loving father to their children Jake, Sara and Niki, and adored grandfather of Jazmin, Jaxon, Bella, Sophie, Jack and Charlotte. Mr Ganter and his family moved to Cairns in 2007, where he took up a job in the training sector. Keen to keep learning and always determined to be the best at what he did, he went on to study further and obtain his certifications in health and safety. Mr Ganter was employed by Hays and was contracted by QBuild as a supervisor, with a focus on workplace health and safety. Mr Ganter is remembered for his unconditional love for his family, his determination, and his ability to inspire those around him to be the best they could be.

195. Henry Roebig was sixty-two years of age. He and his wife Robyn were due to celebrate their thirty-fifth wedding anniversary at the time of his death. Mr Roebig was a much-loved husband, adored father, grandfather and brother. Mr Roebig worked for the Queensland Government in various positions and departments for thirty-five years, having relocated to Cairns on 11 March 2009 to take up a position with QBuild. He especially enjoyed the part of his job that took him flying around Far North Queensland and to the indigenous communities of Cape York. Mr Roebig was held in high regard by those communities, and he took great satisfaction in being able to help them in his capacity with QBuild. Mr Roebig is remembered for his love of family, the outdoors and his sense of humour.

196. Mark Rawlings was forty-nine years of age. He is the cherished son of Sharron and Robert and brother of De-anne and Leah. Mr Rawlings had been contracted by QBuild to attend, inspect and treat different government buildings for approximately twenty-five years. He worked in the family pest control business

and eventually took over the running of the business when his father became unwell. Mr Rawlings adored his family and would do anything for them. Although Mr Rawlings had been diagnosed with some health issues, he was always the first to offer a helping hand and support. Mr Rawlings was the life of the party, a loyal friend and an irreplaceable member of his family.

197. Wayne Brischke was born on 14 September 1962 and was fifty-seven years of age when he passed away. Mr Brischke had been employed by QBuild for approximately forty years and was working as a project manager and supervisor at the time of his death. Mr Brischke was described by his son as the “rock of the family”.

198. Mr Weavell was born on 6 March 1984 and was thirty-six years of age when he passed away on the morning of 11 March 2020. He was the son of Dawn and Russell, big brother to his sister Grace and loving partner to Liz. Flying took Mr Weavell all over the Australian landscape; almost the entire East Coast of Australia, from Melbourne to Cairns. He spent four years in Arnhem Land, where he became a much-loved fixture in the community, before moving to Cairns to begin his life with Liz whilst flying around the Gulf. He is remembered for embodying tenacity, courage and humility.

Condolences

I extend my deepest and most sincere condolences to the senior next of kin, Robyn Roebig, Dee-Anne Kavanagh, Jake Ganter, Dwayne Brischke, Liz Thomas and Dawn Maddern) and their wider families for the deaths of these much-loved men in such tragic circumstances. May they rest in peace.

Findings required by s. 45

Identity of the deceased: Wayne Joseph Ganter
Mark Robert Rawlings
Henry Phillip Roebig
Wayne Anthony Brischke
Stuart Henry Russell Weavell

How they died:	On 20 March 2020 a pilot and four passengers sustained fatal injuries when the aircraft in which they were travelling, a Cessna 404 VH OZO impacted the beach short of the Lockhart River airport due to a controlled flight into terrain. The pilot conducted a first missed approach and then during the second approach the pilot believed he was 1,000 ft higher than he actually was during most of the descent from the IF onwards and did not effectively monitor the aircraft's altitude and descent rate for an extended period due to experiencing a very high workload. His descent rate increased significantly in the last 30 seconds of the flight for reasons unknown. A terrain warning system was not installed in the aircraft and it was not required to be. If a terrain warning system providing aural and visual alerts been installed and operational it is probable the accident would not have occurred.
Place of death:	Quintell Beach, LOCKHART RIVER QLD 4892 AUSTRALIA
Date of death:	11 March 2020
Cause of death:	Multiple injuries, *due to, or as a consequence of,* an aircraft accident.

I close the inquest.

Nerida Wilson
Northern Coroner
CAIRNS