Transport Accident Investigation Commission

Report Addendum
Āpitihanga ki te Pūrongo

Aviation inquiry AO-2021-003
Airbus Helicopters AS350 B3e, ZK-ITD
Loss of control in flight
Lammerlaw Range,
40 km northwest of Dunedin Aerodrome
16 September 2021

June 2025

The Transport Accident Investigation Commission
Te Kōmihana Tirotiro Aituā Waka

No repeat accidents – ever!

"The principal purpose of the Commission shall be to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future, rather than to ascribe blame to any person."

Transport Accident Investigation Commission Act 1990, s4 Purpose

The Transport Accident Investigation Commission is an independent Crown entity and standing commission of inquiry. We investigate selected maritime, aviation and rail accidents and incidents that occur in New Zealand or involve New Zealand-registered aircraft or vessels.

Our investigations are for the purpose of avoiding similar accidents and incidents in the future. We determine and analyse contributing factors, explain circumstances and causes, identify safety issues, and make recommendations to improve safety. Our findings cannot be used to pursue criminal, civil, or regulatory action.

At the end of every inquiry, we share all relevant knowledge in a final report. We use our information and insight to influence others in the transport sector to improve safety, nationally and internationally.

Commissioners

Chief Commissioner	Jane Meares (until 30 September 2024)
Chief Commissioner	David Clarke (from 1 October 2024)
Deputy Chief Commissioner	Stephen Davies Howard
Commissioner	Paula Rose, QSO
Commissioner	Bernadette Roka Arapere
Commissioner	David Clarke (until 30 September 2024)

Key Commission personnel

Chief Executive	Martin Sawyers
Chief Investigator of Accidents	Naveen Kozhuppakalam
Investigator-in-Charge for this inquiry	Hamish Johnstone
Commission General Counsel	Cathryn Bridge

Notes about Commission reports
Kōrero tāpiri ki ngā pūrongo o te Kōmihana

Nature of Addendum Report

The Commission may at its discretion resume inquiries where it is in the interests of transport safety to do so and may consider further evidence and make further or amended findings and recommendations through an Addendum Report.

The Addendum Report may state changes to the original report's findings and recommendations based on significant new evidence or information or add to or clarify the original findings and recommendations made where the Commission considers it is in the interests of transport safety to do so.

Citations and referencing

The citations section of this report lists public documents. Documents unavailable to the public (that is, not discoverable under the Official Information Act 1982) are referenced in footnotes. Information derived from interviews during the Commission's inquiry into the occurrence is used without attribution.

Photographs, diagrams, pictures

The Commission owns the photographs, diagrams and pictures in this report unless otherwise specified.

Verbal probability expressions

For clarity, the Commission uses standardised terminology where possible.

One example of this standardisation is the terminology used to describe the degree of probability (or likelihood) that an event happened, or a condition existed in support of a hypothesis. The Commission has adopted this terminology from the Intergovernmental Panel on Climate Change and Australian Transport Safety Bureau models. The Commission chose these models because of their simplicity, usability, and international use. The Commission considers these models reflect its functions. These functions include making findings and issuing recommendations based on a wide range of evidence, whether or not that evidence would be admissible in a court of law.

Terminology	Likelihood	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	

Contents
Rārangi take

1 Executive summary
Tuhinga whakarāpopoto

What happened

1.1. Following publication of the Final Report of aviation inquiry AO-2021-003, the Commission reviewed information provided in a submission from an interested party. The submission was related to findings contained in the autopsy report that raised the possibility of the pilot having an underlying medical condition and raised the issue of whether this contributed to the accident.

1.2. During the inquiry the Commission's specialist aviation Medical Consultant had reviewed the findings of the autopsy report and consulted with the coroner's pathologist regarding those findings. The Medical Consultant then assessed their medical findings in the context of all the inquiry evidence that was included in the Commissions' report.

1.3. The Commission has considered the submission and the medical information provided and has reconsidered the evidence in this inquiry. The Commission decided it was in the interests of transport safety to resume its inquiry and amend its report to provide further information. Having considered these matters, the Commission makes the following changes to its report at the following paragraphs:

Changes to the report

2 Factual information – Pārongo pono

Paragraph 2.24. now reads:

2.24. The pilot's medical history was reviewed during the investigation by the Commission's Medical Consultant,[14] based on communications and medical records from the Civil Aviation Authority, the pilot's aviation medical examiner and their general practitioner. The Medical Consultant determined that there was nothing of relevance to this accident in the pilot's recorded medical history.

Paragraph 2.25. now reads:

2.25. The injuries sustained during the accident limited the autopsy examination. The Medical Consultant was in communication with the coroner's pathologist throughout the examination and considered the autopsy findings and the full autopsy report. The autopsy identified an underlying heart condition. No evidence of performance-impairing substances was found.

[14] The Commission's Medical Consultant holds the following qualifications and fellowships: Bachelor of Medicine and Bachelor of Surgery with Honours (MB ChB (Hons)), Fellow of Faculty of Occupational Medicine (FFOM), Fellow of the American College of Occupational and Environmental Medicine (FACOEM), Fellow of the Australasian Faculty of Occupational and Environmental Medicine of the Royal Australasian College of Physicians (FAFOEM), Fellow of the Australasian Faculty of Public Health Medicine (FAFPHM), Fellow of the Faculty of Occupational Medicine of Ireland (FFOMI), Fellow of the Royal College of Physicians of Ireland (Occupational Medicine) (FRCPI(OM)), Fellow of the Australasian College of Aerospace Medicine (FACAsM), Master of Public Policy (MPP), Diploma in Aviation Medicine (DAvMed), Diploma of Industrial Health (DIH), Fellow of the Aerospace Medical Association (FASMA)

Paragraph 2.47. now reads:

2.47. The helicopter was not fitted with a flight data recorder or a cockpit voice recorder, nor was it required to be. However, the helicopter was fitted with a Vehicle and Engine Multifunction Display (VEMD), an Engine Data Recorder (EDR) and an Electronic Engine Control Unit (EECU). The VEMD was designed to record and display a range of engine- and airframe-related parameters, including any exceedances of the manufacturer's limits. The VEMD does not record control inputs or position.

Paragraph 2.76. now reads:

2.76. When a pilot lacks the visual cues required to orientate themselves correctly, spatial disorientation can occur. The primary visual signal for referencing orientation is the ability to determine where the horizon is, and the loss of this reference typically occurs when flying either in cloud or on dark (moonless) nights when there is little terrestrial lighting. It has been estimated that almost every pilot will experience an episode of spatial disorientation in their flying career (Australian Transport Safety Bureau, 2007). When a pilot becomes spatially disorientated, the aircraft will continue to respond normally to the pilot's control inputs, which are based on the pilot's perception of their orientation in space. This can lead to a departure from the intended flightpath but will not necessarily result in any aircraft limits being exceeded. Spatial disorientation accidents are frequently fatal, with some studies placing fatality rates as high as 80–90 per cent.

3 Analysis – Tātaritanga

Paragraph 3.7. is replaced by new paragraphs 3.7. – 3.13. and now reads:

3.7. The pilot was 36 years old and held a valid class 1 medical certificate with no restrictions. The pilot's aviation medical examiner and their general practitioner had not identified any underlying medical conditions in the pilot.

3.8. The pilot's post-mortem examination identified an underlying heart condition, the nature of which a cardiologist stated may cause cognitive impairment. This raised the possibility that medical impairment caused or contributed to the accident. The Commission assessed this alongside other evidence outlined below, including the environmental conditions and the conduct of the flight.

3.9. The pilot's partner did not recall noticing any change in the pilot's demeanour in the days leading up to the accident flight, including the evening before the accident flight.

3.10. A review of the pilot's recent history indicated there were no fatigue issues and they were observed to be in good health, with no noticeable changes to their demeanour reported by those close to them leading up to the accident.

3.11. Of more significance, during the flight the pilot conducted precise manoeuvres that appeared to be very controlled and deliberate and in direct response to the environmental conditions they were encountering. Those manoeuvres were inconsistent with sudden medical incapacitation or cognitive impairment.

3.12. Had a sudden medical event occurred causing pilot incapacitation, the flight profile would **very likely** have been different from the one flown. The recorded flight path was consistent with pilot spatial disorientation in the final stages of the flight. While the inability to conduct a comprehensive autopsy meant the Commission could not

fully exclude a medical event causing incapacitation or cognitive impairment, the Commission considered that it was **very unlikely** that the pilot suffered a medical event leading to a loss of control. See paragraphs 3.39 to 3.59.

3.13. There was no presence of any performance-impairing substances.

Paragraph 3.50. is replaced by new paragraphs 3.56. and 3.57., and now reads:

3.56. The investigation found that there was no evidence of a mechanical issue with the helicopter and that it was **very unlikely** a medical event occurred. A helicopter is a dynamically unstable aircraft and must remain under positive control by the pilot[52]. The two controlled turns before the final right turn indicate the helicopter was being positively controlled by the pilot, making a medical event **very unlikely**. Had the pilot suffered a medical event, the flight profile leading up to the accident would **very likely** have been different from the one flown.

3.57. The prevailing environmental conditions meant that the pilot, who was **very likely** not proficient flying solely on instruments at the time of the accident, **very likely** did not have a clearly defined horizon. These factors, together with the aircraft's tracking data during the last minute of the flight, are consistent with pilot spatial disorientation.

4 Findings, 5 Safety Issues and 6 Recommendations

There were no changes to the findings, safety issues or recommendations.

[52] Unless fitted with an autopilot. ZK-ITD was not fitted with an autopilot.

2 Conduct of the inquiry
Te whakahaere i te pakirehua

2.1. On 16 September 2021, the Civil Aviation Authority of New Zealand notified the Commission of the occurrence. The Commission subsequently opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an Investigator-in-Charge.

2.2. On 24 May 2023 the Commission approved a draft report for circulation to four interested parties and the accredited representative for their comment. The Commission received and considered four submissions. Any changes as a result of those submissions were included in the final report.

2.3. On 27 September 2023 the Commission approved the final report for publication, and the report was published on 17 November 2023.

2.4. On 26 July 2024 the Commission received correspondence from an interested party questioning the finding that it was very unlikely that the pilot suffered a medical event and putting forward a cardiologist's report relating to the autopsy findings. Having considered the evidence, the Commission decided it was in the interests of transport safety to resume its inquiry and amend its report to provide further information.

2.5. On 26 September 2024 the Commission approved a draft report addendum for circulation to three interested parties for their comment.

2.6. The Commission received one submission. Changes as a result of that submission are included in the amended final report and in this addendum.

2.7. On 12 December 2024, the Commission approved the amendments to its report as outlined in this addendum, and this addendum and the final report were published 23 June 2025.

Kōwhaiwhai - Māori scroll designs

TAIC commissioned its four kōwhaiwhai, Māori scroll designs, from artist Sandy Rodgers (Ngāti Raukawa, Tūwharetoa, MacDougal). Sandy began from thinking of the Commission as a vehicle or vessel for seeking knowledge to understand transport accident tragedies and how to avoid them. A 'waka whai mārama' (i te ara haumaru) is 'a vessel/vehicle in pursuit of understanding'. Waka is a metaphor for the Commission. Mārama (from 'te ao mārama' – the world of light) is for the separation of Rangitāne (Sky Father) and Papatūānuku (Earth Mother) by their son Tāne Māhuta (god of man, forests and everything dwelling within), which brought light and thus awareness to the world. 'Te ara' is 'the path' and 'haumaru' is 'safe' or 'risk free'.

Corporate: Te Ara Haumaru - the safe and risk free path

The eye motif looks to the future, watching the path for obstructions. The encased double koru is the mother and child, symbolising protection, safety and guidance. The triple koru represents the three kete of knowledge that Tāne Māhuta collected from the highest of the heavens to pass their wisdom to humanity. The continual wave is the perpetual line of influence. The succession of humps represents the individual inquiries.

Sandy acknowledges Tāne Māhuta in the creation of this Kōwhaiwhai.

Aviation: Ngā hau e whā - the four winds

To Sandy, 'Ngā hau e whā' (the four winds), commonly used in Te Reo Māori to refer to people coming together from across Aotearoa, was also redolent of the aviation environment. The design represents the sky, cloud, and wind. There is a manu (bird) form representing the aircraft that move through Aotearoa's 'long white cloud'. The letter 'A' is present, standing for a 'Aviation'.

Sandy acknowledges Ranginui (Sky father) and Tāwhirimātea (God of wind) in the creation of this Kōwhaiwhai.

Maritime: Ara wai - waterways

The sections of waves flowing across the design represent the many different 'ara wai' (waterways) that ships sail across. The 'V' shape is a ship's prow and its wake. The letter 'M' is present, standing for 'Maritime.

Sandy acknowledges Tangaroa (God of the sea) in the creation of this Kōwhaiwhai.

Rail: rerewhenua - flowing across the land

The design represents the fluid movement of trains across Aotearoa. 'Rere' is to flow or fly. 'Whenua' is the land. The koru forms represent the earth, land and flora that trains pass over and through. The letter 'R' is present, standing for 'Rail'.

Sandy acknowledges Papatūānuku (Earth Mother) and Tāne Mahuta (God of man and forests and everything that dwells within) in the creation of this Kōwhaiwhai.

Transport Accident Investigation Commission

Recent Aviation Occurrence reports published by the Transport Accident Investigation Commission (most recent at top of list)

AO-2024-003	Airbus A320-232, ZK-OXJ and drone, Air proximity incident over South Auckland, 7 NM east of Auckland International Airport, 02 April 2024
AO-2023-003	Runway excursion (veer-off), Boeing 777-319ER ZK-OKN, Auckland International Airport, 27 January 2023
AO-2023-011	ZK-JED BE76 / ZK-WFS C172, near mid-air collision, Ardmore Aerodrome, 3 October 2023
AO-2023-010	Kawasaki BK117 B-2, ZK-HHJ, collision with terrain, Mount Pirongia, 19 September 2023
AO-2022-005	Boeing 737-484SF, ZK-TLL, Incorrect fuel configuration, Sydney to Auckland, 7 June 2022
AO-2023-001	Airbus Helicopters AS350B2 (ZK-IDB) and EC130B4 (ZK-IUP), reported close air proximity, Queenstown Aerodrome, 27 December 2022
AO-2018-009	MD Helicopters 500D, ZK-HOJ, In-flight breakup, near Wānaka Aerodrome, 18 October 2018
AO-2022-002	Robinson R22, ZK-HEQ, loss of control inflight, Karamea, West Coast, 2 January 2022
AO-2020-002	Glider, Schleicher ASK21, ZK-GTG, Impact with Terrain, Mount Tauhara, Taupō, 31 May 2020
AO-2022-001	Ultramagic Balloons, N-250, ZK-MET, pilot ejection from basket on landing, Lyndhurst, near Methven, 1 January 2022

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