

COURT OF INQUIRY

Assembled by the
CHIEF OF NAVY

Into

**THE DEATH OF
ABLE DIVER**

ADR Z.C. YARWOOD, [REDACTED]

**CALLIOPE INNER BASIN, DEVONPORT
NAVAL BASE**

ON 25 MARCH 2019

Note: These are redacted copies of the Court of Inquiry's Report and the Addendum to the Court of Inquiry. The Lists of Witnesses and Lists of Exhibits are not included as they are not official Information under the Official Information Act 1982.

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ORDER FOR THE ASSEMBLY OF A COURT OF INQUIRY

Orders by Rear Admiral D.C. Proctor, Chief of Navy
Service description and appointment of assembling authority

A court of inquiry consisting of the following persons is to assemble at Devonport Naval Base
Place
on 3 April 2019 at 0900 for the purpose of collecting and recording evidence on:²
Date Time

the circumstances leading to the incident in the vicinity of Devonport Naval Base on 25 March 2019, which resulted in the death of [REDACTED] Able Diver Z.C. YARWOOD on 26 March 2019.

(and reporting and commenting)³ ~~(and making a declaration under section 201 of the Armed Forces Discipline Act 1971)~~⁴ as required by the terms of reference below.

President³ [REDACTED]

Members⁴ [REDACTED]

[REDACTED]

[REDACTED]

Counsel assisting⁵ [REDACTED]

The president is to order or summon the witnesses to attend in accordance with section 200I of the Armed Forces Discipline Act 1971.⁶ Upon completion the president is to forward the record of proceedings to the assembling authority.

The court is to have regard to sections 200M and 200N of the Armed Forces Discipline Act 1971 at all times. The court is to read DM 69 (2 ed) Volume 1 Chapter 11 Section 2 before commencing its inquiry.

TERMS OF REFERENCE⁷

See attached.

Dated at Wellington on 2 April 2019
Place Date

[REDACTED]

Signature of assembling authority

Rear Admiral

Rank

Chief of Navy

Appointment

1. Insert a short description of the matter to be inquired into.
2. Delete the words in parentheses if inapplicable.
3. Insert full Service description of the officer appointed as president.
4. Insert full Service description of the officer(s) and/or warrant officers and/or the members of the Civil Staff appointed as members.
5. Insert full Service description of the officer appointed as counsel assisting, if appointed.
6. A summons is to be in form MD 637.
7. Specify the terms of reference. If necessary attach an additional page.

Terms of Reference

1. Background

- 1.1. Outline briefly the relevant service history of [REDACTED] Able Diver Z.C. YARWOOD ('the deceased').
- 1.2. Where and when did the incident occur?
- 1.3. Describe the climatic and sea conditions at the time.
- 1.4. What was the nature and purpose of the activity that was taking place at the time of the incident?
- 1.5. Describe in chronological order the events leading up to the incident, that are, in the Court's view, relevant to the incident.
- 1.6. What duties or activities did the deceased undertake in the 72 hours leading up to the incident?
- 1.7. What level of training and expertise did the deceased have?
- 1.8. Are there any other factors relating to the deceased person which might be relevant, including physiological, and psychological factors?

2. Conduct of the Activity

- 2.1. Who authorised the activity? Did that person have the authority to do so?
- 2.2. Who was responsible for the command, conduct and supervision of the activity?
- 2.3. Were the personnel involved appropriately qualified to conduct the activity (including any safety staff)?
- 2.4. Was a safety brief given prior to the conduct of the activity? If so, by whom?
- 2.5. What other briefs were delivered as part of this activity?
- 2.6. Was the activity conducted and resourced in accordance with contemporary best practices for activities of this type?
- 2.7. What are the relevant RNZN orders, procedures and policies for an activity of this type?
- 2.8. Was the activity conducted in accordance with these orders, procedures and policy?
- 2.9. Describe the risk assessment that was in place for this activity?
- 2.10. What controls were in place for this activity?
- 2.11. Were the controls as designed?
- 2.12. Did the controls work as intended?

DS

2.13. Were all actions that occurred linked to a legitimate training outcome?

3. The Incident and response

3.1. What factors contributed to the event occurring?

3.2. What harm was sustained by the deceased or any other person?

3.3. What actions were taken to provide medical support to the deceased? Were these actions conducted by appropriately qualified personnel and in accordance with best practice for the type of injuries?

3.4. Describe the recovery and emergency response to the event?

4. The Equipment

4.1. What equipment was the deceased wearing, carrying or using at the time of the incident?

4.2. Was all of the equipment introduced into service, and what state of operational release was it at?

4.3. What safety equipment was present?

4.4. What post-incident examination was undertaken of any or all equipment, what did it find?

4.5. Did the equipment contribute in any way to the incident?

4.6. Has this equipment been involved in any other safety related incidents in the NZDF?

4.7. Has this model of equipment been involved in similar incidents by other international military users?

4.8. Is it safe for the NZDF to continue use of this equipment in both operations and/or training? If not, why not?

5. Reporting

5.1. What reporting actions, both internal and external, were taken following the incident?

6. Other

6.1. Comment on any other matters the Court considers relevant to the purpose of the Inquiry.

6.2. Make any recommendations the Court considers relevant.



STATEMENT UNDER AFDA s 200G

The Court assembled for the formal commencement of the Court of Inquiry and first interview at 0900 on 9 April 2019. The Court did assemble at the time and day indicated on the MD 634 to complete various administrative actions required in preparation for commencement of proceedings. These actions included members completion of the prerequisite level one Court of Inquiry training, legal officer briefings, review of Terms of Reference (TOR), clarification of Terms of Reference, planning for the approach to the inquiry, and other administrative set-up requirements.

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REPORT OF THE COURT OF INQUIRY

GENERAL

1. The Court of Inquiry was carried out over the period 09 April 2019 – 26 July 2019. Evidence from 40 witnesses consisting of 49 interviews and re-interviews were considered.

Incident General Overview

2. On the night of 25 March 2019 the Navy Dive Training School was undertaking a training dive at the Devonport Naval Base for students on the 19/1 Able Diver Course who had just commenced week four of their course. The activity involved a snag line search of the seabed in two groups of three using the Very Shallow Water (VSW) LAR7000 rebreather equipment. The activity was approximately 88 minutes into the evolution when Group One got into difficulty with tangled lines. The Supervisor in attendance activated the Diver Recall System (DRS) alarm for all student divers to surface. The Diving Supervisor and Standby Diver then assisted Group One and on completion noted only one student diver from Group Two had surfaced so proceeded over to Group Two using the safety boat. At that time the two other student divers from Group Two surfaced with one splashing the water, a pre-determined signal to indicate a diver in distress. Able Diver (ADR) Yarwood had been brought to the surface unresponsive by the remaining member of Group Two, who had carried out the companion diver drill. He was then taken by safety boat back to the diving pontoon. The onsite Medic and Standby Diver assessed ADR Yarwood, who was unconscious and not breathing. They proceeded to carry out immediate medical treatment until emergency services arrived. Ambulance staff took over medical treatment on arrival and once a pulse was recovered evacuated ADR Yarwood to hospital. ADR Yarwood died as a result of his injuries on 26 March 2019.

3. The purpose of the Court of Inquiry is to collect and record evidence in accordance with Terms of Reference laid down by the Assembling Authority. This report outlines the facts and findings from the Court of Inquiry.

Report Structure

4. This report is structured to address each Term of Reference in sequence. In each Term of Reference the key elements of evidence will be highlighted and where the Court has felt it necessary a summary will be provided for that Term of Reference to conclude the Court's determination of the facts. The conclusion section outlines the main findings of the Court, and this outlines facts by Causal, Contributing, Aggravating and Other Factor categories. The final section will outline relevant recommendations and observations from the Court which aim to improve the organisation and avoid a repeat of the incident.

NZBR 45

5. NZBR 45 is a prime reference for diving and is cited multiple times in this report. At the time of the incident the online version of NZBR 45 in place was version 39 dated 13 March 2019¹. The Court is aware that updating this reference is a continuous process and therefore several amendments have been made to this reference since the incident. The Court has attempted to highlight any changes that have been made to policy that it feels are pertinent to the inquiry.

BACKGROUND

Service History

TOR 1.1 Outline briefly the relevant service History of [REDACTED] Able Diver Z.C. YARWOOD ('the deceased').

6. The following outlines a brief overview of ADR Yarwood's employment History as deemed relevant by the Court.²

7. ADR Zachary Christopher Yarwood [REDACTED] joined the Royal New Zealand Navy (RNZN) on 8 May 2013 as an Electronic Warfare Specialist (Communications). His contracted engagement was to 25 August 2028.

8. ADR Yarwood served on Her Majesty's New Zealand Ship (HMNZS) Te Kaha, ashore at HMNZS Philomel under training and also in a variety of positions within the Naval Operations Support Unit. He also completed an operational mission (Operation Takapu) in 2015.

9. There are no recorded offences held in ADR Yarwood's service file. He received the following honours and awards:

a.	1 st Good Conduct Badge	8 May 2017
b.	NZ Defence Service Medal Clasp	7 May 2015
c.	NZ General Service Medal (Greater Middle East)	10 October 2015
d.	NZ Operational Service Medal	16 September 2015

10. He held a medical grading of H1 A4 G3 Z1. The reason given for his grading of G3 (as opposed to a G2) was ADR Yarwood was recovering from an ankle injury sustained in 2018. However, he was assessed and considered as fit for all duties.³ His fitness record shows a pass in the fitness standard for the RNZN Operational Diver test with effect from 11 March 2019. He held a Top Secret security clearance.

11. In his employment history narrative ADR Yarwood is said to have expressed an interest in becoming a diver early in his career during his Basic Branch Training. Throughout his time as a Communications Rating he was described as an enthusiastic, confident and motivated sailor with a can-do attitude. He was known for

¹ Witness 6, Exhibit W, Flag 19.

² Witness 15, Exhibit RR.

³ Witness 20, Page 3, Lines 3-9.

his jolly nature, wit and general sense of humour. There were indications he was becoming bored with his current trade and was looking for more of a challenge. The final entry, on successful completion of the Defence Divers Course in November 2018, describes ADR Yarwood as standing out from the rest often taking charge of the team. He had some minor issues with one of the diving drills but was expected to improve with time in the water.⁴

Incident date, time and location

TOR 1.2 Where and when did the incident occur?

12. The incident occurred at 2145 Monday 25 March 2019 in the Calliope Inner Dive Basin at Devonport Naval Base.⁵

Climate and sea conditions

TOR 1.3 Describe the Climatic and Sea Conditions at the time.

13. The reported climate and sea conditions pre and post the dive activity are described in the RNZN 260 (Authorisation to Dive) and RNZN 1333A (Report on Unusual Diving Incident or Accident Incident summary) as:

a. RNZN 260 pre-dive conditions:⁶

i. Forecast	Sea slight
ii. Air Temp	20 degrees
iii. Water Temp	14 degrees
iv. Surface Vis	3 nautical miles
v. Water Vis	1 metre
vi. Wind speed/Direction	NE 10 Knots

b. RNZN 1333 post incident conditions:⁷

i. Weather	Fine
ii. Sea	Calm
iii. Tide and current	Low Water at 1744, High Water 0009
iv. Depth	6-7 metres ⁸
v. Underwater conditions	Nil visibility, night dive, muddy bottom

14. The conditions on the night were consistently described by the Instructors and students as clear and calm. The visibility underwater was reported as poor as it was a night dive and due to the muddy bottom.⁹

⁴ Witness 1, Exhibit D.

⁵ Witness 32, Exhibit AAA, Flag 3.

⁶ Witness 6, Exhibit V, Flag 4.

⁷ Witness 6, Exhibit V, Flag 3.

⁸ Witness 17, Page 13 Line 39.

⁹ Witness 22, Page 4, Line 2.

Nature and purpose of activity

TOR 1.4 What was the nature and purpose of the activity that was taking place at the time of the incident?

15. There were six students present for the night diving activity on 25 March 2019 – two students were away sick.¹⁰ There was a variation in how the activity being undertaken on 25 March 2019 was described to the Court. The following demonstrates the variance in both pre and post incident evidence submitted:

- a. The prescribed activity in the course programme for that day and time was outlined as oxygen compass swim-marked diving in pairs.¹¹
- b. The RNZN 260 Authorisation to Dive described the task as a Jackstay Search conducted by marked swimming in pairs.¹²

16. The Court determines that the actual activity being conducted at the time of the incident was a jackstay snag line search of the seabed in a pre-defined area.¹³ The equipment used during the activity was the VSW rebreather LAR7000 in 60/40 Mixed Gas Mode (also called Nitrox).¹⁴ The activity had multiple objectives, firstly it was to complete a search of the seabed, secondly to build students' time on the LAR7000 (including objectives outlined in the Able Diver Syllabus)¹⁵ and to build students endurance underwater.¹⁶

17. The Dive Head of School clarified the variations in programme. The change to the course programme was approved and it was advised to the Court that once a change in the programme occurs the document is not then subsequently updated, which explains the different activity designated on 25 March 2019 in the evidence produced to the Court.¹⁷

18. The jackstay snag line search was conducted in two groups of three personnel. Each group had their own search area either side of the dive pontoon at HMNZS Matataua. The snag line search technique used on the night saw two of the three divers configured secured at approximately 30 meters distance apart on a jack stay with the roving third diver swimming in between unsecured only holding the snag line by hand.¹⁸

19. The Dive Head of School described this configuration as *Marked Pairs*¹⁹ as they are joined by the horizontal rope with which they can use to signal each other

¹⁰ Witness 9, Exhibit DD.

¹¹ Witness 13, Exhibit MM.

¹² Witness 6, Exhibit V, Flag 4.

¹³ Witness 17, Page 8, Lines 31-33

¹⁴ Witness 6, Exhibit V, Flag 4.

¹⁵ Witness 13, Exhibit NN, N08108, Page 15.

¹⁶ Witness 13, Re-interview, Page 3, Lines 31-32.

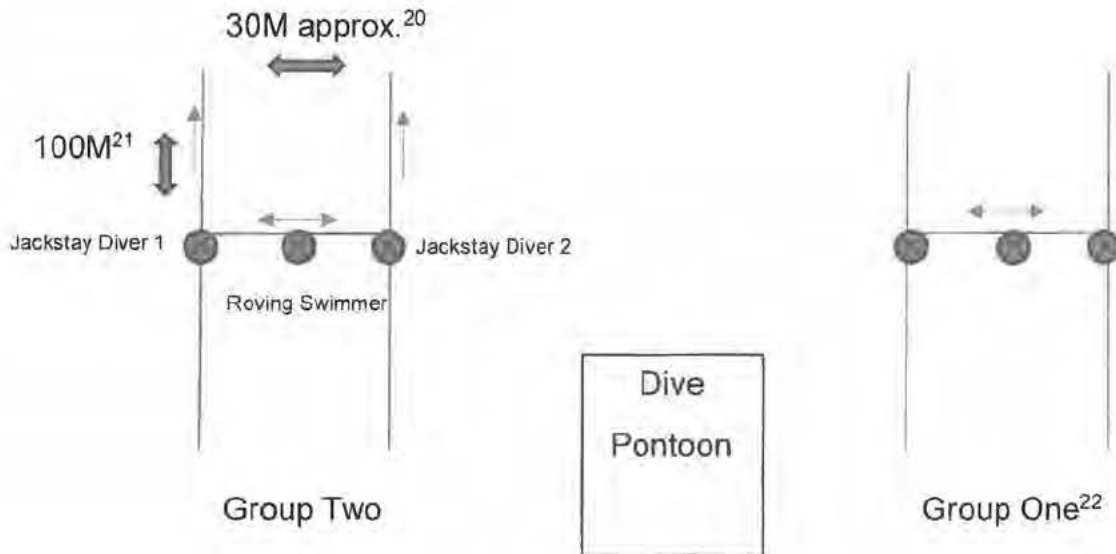
¹⁷ Witness 13, Re-interview, Page 3, Line 7.

¹⁸ Witness 11, Page 15, Line 29.

¹⁹ Witness 13, Re-interview, Page 13, Line 3.

and they are each attached to a float line to the surface. Potential inaccuracies with the description of the diving activity are addressed at TOR 2.6.

20. The following shows a diagram of the Court's perspective of the configuration of the diving on the night as described by witnesses:



Order of events

TOR 1.5 Describe in chronological order the events leading up to the incident, that are, in the Court's view, relevant to the incident.

21. The following describes the chronological order of events commencing from the time the course officially restarted on Monday 25 March 2019 at 0730. It provides an outline of the day's events leading up to the incident and ends at the point of ADR Yarwood surfacing with the Companion Diver at 2145. The order of events from there on is covered in the Recovery and emergency response paragraph TOR 3.4 - recovery and emergency response.

²⁰ Witness 11, Page 15 Line 29.

²¹ Witness 17, Page 9, Line 20.

²² Witness 6, Exhibit V, Flag 8.

Time (Approx. unless referenced)	Description
0630-0730	Students arrive – preparations for the day
0800	Run/Jog ²³ from Devonport Naval Base to Tunapuna Boat Ramp (6km)
0900	Dive - Oxygen Compass swim – Takapuna to Narrowneck (Dive duration 177 minutes ²⁴)
	Drive back to Base
	Post dive and pre dive preparations
1215	Lunch
1300	Pre dive preparations
	Dive - Mixed Gas dive – Calliope Dive Basin (Dive duration 124 minutes ²⁵)
	Post dive and pre dive preparations
1730	Dinner
1900-1945	Pre dive checks
1945-2000	Dive Briefing
2006	Group 2 time on gas (ADR Yarwood's Group)
2009	Group 1 time on gas
2011	Group 2 time left surface (ADR Yarwood's Group)
2012	Group 1 time left surface
2140	Dive supervisor sees group 1 out of configuration
	The Dive Supervisor stated that the progress of the night dive for Group Two (ADR Yarwood's group) was going well based on monitoring the floats. ²⁷
2140	Dive supervisor activates Diver Recall System (DRS) for all divers to surface. ²⁸
2140	Group 1 Left bottom
2141	Group 1 Surface (Dive duration 88 minutes ²⁹)
	One of the group sent back down to retrieve a rope.
	Dive Supervisor notices the other group where only one diver had surfaced. ³⁰
	Safety boat (Supervisor and Standby Diver) proceeds over to group 2. ³¹

²³ Witness 35, Page 4, Lines 14-19.

²⁴ Witness 6, Exhibit V, Flag 3.

²⁵ Witness 6, Exhibit V, Flag 3.

²⁶ Witness 6, Exhibit V, Flag 5.

²⁷ Witness 17, Page 9, Line 12.

²⁸ Witness 17, Page 10, line 2.

²⁹ Witness 6, Exhibit V, Flag 5.

³⁰ Witness 17, Page 10, Line 11.

³¹ Witness 17, Page 10, Line 13.

	Diver heard noises from ADR Yarwood, found him facedown, struggles to get him off the bottom, commenced companion diver drill (switched to Nitrox, opened bubble diffuser and flushed through) sends signals on the float line. ³²
	Group 2 remaining personnel Left bottom
2145	Group 2 Surface. Companion Diver has ADR Yarwood. (Dive duration 93 minutes ³³)

22. The Court notes that there was a comparatively light physical training load for the course on the day of the 25th March. Although, a high number of dive time minutes were accumulated with approximately 390 minutes accumulated at the time of the incident.

23. Recent changes (with effect 1 May 2019) to the NZBR 45 would put this dive workload outside of the prescribed maximum daily limit of 300 minutes for Nitrox rebreather diving.³⁴ At the time of the incident there were no prescribed limits for Nitrox diving. All diving on 25 March 2019 was conducted within the guidelines of the prescribed diving tables.

Previous 72 hours

TOR 1.6 What duties or activities did the deceased undertake in the 72 hours leading up to the incident?

24. The incident occurred at 2145 on Monday 25 March 2019 and the following provides an outline of ADR Yarwood's known actions from completion of course on Friday 22 March 2019 until course recommencement on 25 March 2019.

25. On securing from course Friday 22 March 2019 the Court heard some course members (including ADR Yarwood) had drinks at a local bar then moved onto one of the student's civilian accommodation and continued drinking.³⁵ There is conjecture around his state of sobriety and whether ADR Yarwood remained overnight at the flat. However, based on assessment of witness reliability the Court found the most probable scenario is ADR Yarwood returned home at or around midnight on Friday 22 March 2019.³⁶ From there he had a relatively quiet weekend with his partner.

26. ADR Yarwood went into work with his partner on Sunday 24 March 2019 to take in uniform and additional snacks to put in his locker to prepare for the week ahead.³⁷ There is evidence from another family member, who had a phone call with ADR Yarwood on Sunday evening at approximately 6pm. During this phone call it

³² Witness 19, Page 4 Lines 11-41.

³³ Witness 6, Exhibit V, Flag 5.

³⁴ Witness 5, Re-interview, Page 4, Line 36-38.

³⁵ Witness 19, Page 10, Line 13-17.

³⁶ Witness 27, Page 10, Line 28.

³⁷ Witness 27, Page 6, Lines 17-18.

was reported ADR Yarwood said he was tired.³⁸ There was evidence counter to this from his partner who had spent the weekend with him and who was present with him at the time of that phone call. It was suggested ADR Yarwood stated he was tired in order to end the phone call.³⁹ The evidence received from his partner indicated he was well rested by Sunday evening.⁴⁰ Reports from students indicated he arrived early the next morning and appeared well and ready for the week ahead.⁴¹ The Court believes on balance of the evidence presented that ADR Yarwood was well rested at the commencement of training on the morning of 25 March 2019. The specific activities occurring on the 25 March 2019 are covered in TOR 1.5.

Deceased training and expertise

TOR 1.7 What level of training and expertise did the deceased have?

27. ADR Yarwood completed and successfully passed the Defence Dive Course (N08060) on 23 November 2018. The course completion report highlighted that his maturity and experience in the Navy stood him out from the rest. It expressed he had some trouble with an element of the course (buddy breathing) but this was accessed as requiring more time and experience in the water. Otherwise he was noted to have performed well.⁴² This qualified him in the Compressed Air Breathing Apparatus (CABA) competency.

28. It should also be noted that ADR Yarwood successful completed Exercise Selection, Preparation, Evaluation and Readiness (Ex SPEaR),⁴³ a six day diver selection process which accepts personnel for further training to become a Navy Diver.⁴⁴

29. Pre-course requirements for attendance on the Able Diver Course (N08065) included the following elements:

	Pre-requisite Completions ⁴⁵	ADR Yarwood Completed/In date
1	08060 Ordinary Diver/Defence Diver Course Completed 23/11/18	Yes
2	Medically in date H1A4G3Z1 WEF 1 /3/19	Yes
3	Physically in date Pass 22/10/18 and on course Pass 11/3/19	Yes

³⁸ Witness 28, Page 3, 38-39; Witness 28 Response to Draft Report Page 1

³⁹ Witness 27, Page 11, Lines 4-7.

⁴⁰ Witness 27, Page 11, Line 7.

⁴¹ Witness 22, Page 15, Lines 12-14; Witness 35, Page 4, Lines 23-25; Witness 21, Page 16, Lines 1-2

⁴² Witness 1, Exhibit D.

⁴³ Witness 1, Page 4, Line 34.

⁴⁴ Witness 6, Exhibit W; NZBR45, Art 0601 – 0602.

⁴⁵ Witness 1, Exhibit E.

4	Workplace First Aid (N15010) (2 year expiry) Completed 25/10/18	Yes
5	Diver Alert Network Oxygen Provider Certification (CN08005) Completed 30/10/18	Yes
6	ADAS Part 1 Card (QN08001) Completed 23/11/18	Yes
7	WorkSafe NZ Certificate of Competency/Occupational Diver Part 1 (CN08001) Completed 23/11/18	Yes
8	Occupational Diver Medical Clearance (CN08006) Completed 5/10/18 ⁴⁶	Yes

30. ADR Yarwood had just commenced week four Clearance Diving Breathing Apparatus (LAR7000) consolidation week (also called endurance week) of his Able Diver Course.

31. The three weeks prior had involved: ⁴⁷

- a. **Week One** - pre-course preparation and high performance week: The first week involved administration in preparation for the course. The Psychologist described the high performance component was focused on resilience techniques, mental skills, how to enhance students' performance to an optimal level in a physically and cognitively challenging environment.⁴⁸
- b. **Week Two** - introduction to LAR7000: The introduction to rebreather and the LAR700). This included pre and post diving of the set, pool work where the students get used to the set and mixed gas theory.⁴⁹
- c. **Week Three** – LAR7000 consolidation week: Week three involved refreshing of drills and assessments in the dive tank and pontoon. Also generally more time in the water.⁵⁰

32. In general, ADR Yarwood's diving experience was limited and can be described as extending to dive training as part of the Defence Divers course completed in November 2018 and two weeks as part of the Able Diver course.

33. RNZN 112 Divers Log requires the individual diver to record all diving operations that they have undertaken. ADR Yarwood's log book includes diving entries from the first recorded dive on 30 October 2018 to the last recorded dive on 21 February 2019. This record showed he had completed a total of 58 CABA dives with a total dive time of 2647 minutes.⁵¹ There were no records completed for dives completed on the ADR course. Compliance with this requirement is covered further at TOR 2.8.

⁴⁶ Witness 20, Exhibit SS.

⁴⁷ Witness 17, Page 3, Line 26; Witness 17, Page 4, Line 37; Witness 13, Exhibit MM.

⁴⁸ Witness 12, Page 3, Line 5.

⁴⁹ Witness 17, Page 3 Line 28, Page 4 Line 1, 18.

⁵⁰ Witness 17, Page 4, Line 19.

⁵¹ Witness 39, Exhibit PPP, Flag 7.

Physiological and psychological Factors

TOR 1.8 Are there any other Factors relating to the deceased person which might be relevant, including physiological and psychological Factors?

34. The following identifies key physiological and psychological factors related to ADR Yarwood that have presented in the evidence:

General

- a. **Medical Health.** Evidence from the Defence Heath medical file suggests he was fully fit and well with no psychological issues reported.⁵²
- b. **Attitude and ability.** A driven, competitive individual who was proud, well organised and keen to do well and considered to have proven academic ability.⁵³ ADR Yarwood's family have described him as athletic, generous, and very positive in life, with a determined inquiring mind and who always wanted to be the best.⁵⁴ The Dive Head of School conveyed an opinion formed post incident that ADR Yarwood possessed a level of comfort with activities others may have considered risky.⁵⁵
- c. **Physical ability.** Described as strong, fit and heavily muscled although, it was noted that he had struggled with some of the cardiovascular activities relative to other course members.⁵⁶ This was evidenced in the week prior where he had become exhausted during a mud run, and could not complete the planned dive immediately after.⁵⁷
- d. The Chief Diving Instructor stated he felt ADR Yarwood was dropping off the pace a bit, getting a bit tired at times and the perception was that he was not giving one hundred percent.⁵⁸ This issue had been raised with ADR Yarwood in a scheduled performance meeting. The Chief Diving Instructor stated that he knew ADR Yarwood was a lot fitter than his performance was demonstrating, he based his judgement on what he had seen on selection.⁵⁹ No explanation was offered by ADR Yarwood at the time for the apparent lack of effort or drop in fitness during the course performance meeting.⁶⁰ It is not evident to the Court whether there was any follow-up with ADR Yarwood on this matter or whether it appeared insignificant enough given his general good performance on course.

⁵² Witness 20, Page 3, Line 13-14.

⁵³ Witness 1, Exhibit D.

⁵⁴ Witness 26, Page 2 Lines 23-24; Witness 26, Page 3 Line 3-4; Witness 28, Page 2, Line 31.

⁵⁵ Witness 13, Page 22, Lines 16-20.

⁵⁶ Witness 35, Page 3, Line 30; Witness 22, Page 15, Line 19.

⁵⁷ Witness 25, Page 4, Lines 6-12.

⁵⁸ Witness 16, Page 4, Line 3.

⁵⁹ Witness 16, Page 5, Lines 6-8.

⁶⁰ Witness 16, Page 4, Lines 25.

- e. The Court was presented with evidence that ADR Yarwood had undergone a significant change in body composition in the 12-18 months before the accident and spent a lot of time in the Gymnasium.⁶¹ The Dive Medical Specialist suggested that it was a fairly safe assumption that a bigger more heavily muscled person might use more oxygen.⁶²
- f. **Rebreather Endurance.** ADR Yarwood's rebreather endurance was reported as poor relative to other course members.⁶³ Other students on the course noted there was some pressure for him to increase this endurance.⁶⁴ The Head of School stated that there was a desire to get the students to drive the set (LAR7000) to its limits and get the endurance they need to, but unfortunately some of them have overstepped the mark with an unsafe practice.⁶⁵
- g. The Court has discovered evidence that suggests the endurance of the LAR7000 set in Nitrox has been overestimated by the Dive fraternity. The NZBR 45 states LAR7000 has an endurance of 154 minutes.⁶⁶ The RNZN 288 Record of Dives repeatedly stated the Nitrox endurance of LAR7000 at 180 minutes.⁶⁷ The Court notes this endurance has since been amended in the current version of NZBR 45 to read a planning figure of 110 minutes.
- h. **Psychological pressure to perform.** The Court heard evidence from one student that the Chief Petty Officer Instructor had briefed the course sharply on Friday 22 March 2018 that fatigue was no reason to not dive.⁶⁸ This witness also advised the Court this Instructor later retracted this comment on 3 April 2019.
- i. In response to this statement the Instructor in question said the comment was not directed to ADR Yarwood but to another student. He believed he was taken out of context and was trying to give a motivational speech as he felt some students were using fatigue as an excuse not to dive.⁶⁹ The instructor believed there was personal conflict with the student in question as his continued attendance on course was being reviewed. That student had not achieved the required amount of dives, although the Court found that there is no prescribed limit of dive attendance in place.⁷⁰

⁶¹ Witness 18, Page 14, Lines 9 -12; Witness 19, Page 18, Line 10.

⁶² Witness 29, Page 8, Line 26.

⁶³ Witness 23, Page 6, Line 32.

⁶⁴ Witness 23, Page 7, Lines 1-2.

⁶⁵ Witness 13, Page 20, Lines 35-37.

⁶⁶ NZBR 45, Art 0325, Para 5 (AL 39).

⁶⁷ Witness 39, Exhibit PPP, Flag 8.

⁶⁸ Witness 25, Re interview, Page 2-3, Lines 28-35, Lines 1-2.

⁶⁹ Witness 16, Re-interview, Page 3, Lines 14-15.

⁷⁰ Witness 16, Re-interview, Page 3, Lines 7-13; Witness 16, Re-interview, Page 5, Line 18.

- j. The Instructor further stated that he was happy with ADR Yarwood and he was not getting out of any dives.⁷¹ The Court acknowledges this was directed at another student. However, the Court believes that the remainder of course wouldn't have been immune to the inference and it is possible this comment may have influenced ADR Yarwood, given he had to pull out of a dive the week before due to fatigue.⁷²

Specific to 25 March 2019

- k. **Health.** Evidence from the Medic attending throughout the diving on 25 March 2019 states divers are asked at the beginning of each dive whether they have any concerns.⁷³ ADR Yarwood did not report feeling unwell or tired to his peers, medical staff or instructors throughout the day of 25 March 2019.⁷⁴ However, a statement made by a non-diver colleague at dinner suggested he may have been suffering from fatigue prior to the night dive on the 25 March 2019.⁷⁵ Contrary to this, one of the students reported ADR Yarwood stated at dinner that ADR Yarwood had more energy than he usually had, and Yarwood cited the reason for this being the lack of arduous physical activity.⁷⁶ The Dive Supervisor does not recall talking to ADR Yarwood specifically, prior to the dive, but did carry out his pre-dive checks which included an individual brief question and answer session to gauge levels of alertness of which no issues were noticed.⁷⁷

35. The Court concludes that there were no overt physiological or psychological Factors that contributed to the accident on 25 March 2019. However, the Court finds that any issues of the nature it is very reliant on the individual raising these as opposed to identification by another means whilst on course. The Court does note the following:

- a. **Fatigue:** While it is acknowledged ADR Yarwood would likely have been fatigued to some degree on the evening of the accident it is difficult to make an accurate assessment on just how fatigued he was, given the variance in witness statements. However, the Court finds on balance that ADR Yarwood started the day of 25 March well rested and although it is possible there was some fatigue after two dives that day it was unlikely to have been a direct cause of the accident.
- b. **Body Composition:** ADR Yarwood was strong and heavily muscled. This was likely to have increased his demand for oxygen when diving and would have likely contributed to his perceived decrease in cardiovascular endurance⁷⁸ and comparatively poor diving endurance.

⁷¹ Witness 16, Re-interview, Page 2, Lines 28-29.

⁷² Witness 25, Page 5, Lines 11-16; Witness 11, Page 20, Lines 7-15.

⁷³ Witness 10, Page 8, Lines 10-12.

⁷⁴ Witness 10, Page 8, Lines 10-12.

⁷⁵ Witness 34, Page 11, Lines 27-28.

⁷⁶ Witness 11, Page 15, Line 5-11.

⁷⁷ Witness 17, Page 8, Lines 1-3.

⁷⁸ Witness 35, Page 3, Lines 26-27

- c. **Psychology:** The Court found no psychological reason that would have directly contributed to the outcome. However, the Court notes that ADR Yarwood's previous behaviour highlighted a potentially higher than average appetite for risk. The Court also noted that ADR Yarwood was a very motivated individual and very keen to excel on course.

TOR 2 CONDUCT OF ACTIVITY

Activity authorisation

TOR 2.1 Who Authorised the Activity? Did that person have the authority to do so?

36. A RNZN 260 Authorisation to Dive was completed for the activity and provides the authorisation and confirmation of resources and checks for the activity.⁷⁹ The authorisation for the dive training area is signed by the Dive Head of School and the Dive Supervisor. It is not clear where the authority is conferred. The Court notes that the authority level in NZBR 45 for operational units is the Commanding Officer, but it is silent with respect to Dive Training.

37. The Commanding Officer, HMNZS Philomel does not have a role in authorising diving. It was pointed out that, although there was a notification of diving advised by a harbour movement signal, the HMNZS Philomel duty orders did not mention diving occurring and the Officer of the Day was unaware of the planned night diving.⁸⁰ HMNZS Philomel Command becomes an integral part of the process if an incident occurs, and in the Court's view should be aware if diving is occurring.

38. It is the Court's view that the quality of the authorisation is poor and there is an opportunity for improvement. The checklist contained within the Dive Authorisation form had ticks and crosses making it undiscernible to understand exactly what checks had been conducted. The Court received evidence that these checks were undertaken.⁸¹ However, the Court tested the validity of that evidence during the questioning of witnesses. The responses provided lead the Court to determine that not all checks had occurred. For example, breath testing had been ticked as having being undertaken and the Dive Supervisor advised it would have been undertaken first thing in the morning.⁸² However, it does not appear breath testing had been conducted that day.⁸³ The authorisation also named an Attendant who did not work that evening and had no intention too.⁸⁴ The Court also heard that the Standby Diver was changed late in the afternoon due to a personal issue,

⁷⁹ Witness 6, Exhibit V, Flag 4.

⁸⁰ Witness 4, Exhibit R.

⁸¹ Witness 17, Re-interview, Page 10, Line 11-30, Page 11 Lines 1-4.

⁸² Witness 17, Re-interview, Page 11, Line 4.

⁸³ Witness 19, Page 12, Line 6; Witness 22, Page 16, Line, 11.

⁸⁴ Witness 24, page 3, and Line 14-18.

although the replacement is correctly named on the authorisation. The authorisation was completed prior to the end of the standard working day.⁸⁵

Command, conduct and supervision

TOR 2.2 Who was responsible for the command, conduct and supervision of the activity?

39. NZBR 45 outlines the requirements for command and diver responsibilities.⁸⁶ The Dive Supervisor requirements and responsibilities are also outlined in NZBR 45.⁸⁷ The Dive Supervisor assigned was responsible for the direct command, conduct and supervision of the night dive activity on the 25 March 2019.⁸⁸ The Dive Supervisor commenced his duties at 1200 on 25 March 2019.⁸⁹

40. The command, conduct and supervision of the activity was conducted solely by the staff of the Dive School. It is the opinion of the Court that greater governance, oversight and support would be an opportunity to facilitate more efficient and safe training. The Court noted there was a significant amount of responsibility left to the Dive Supervisor. This individual was left to make critical decisions without an accurate understanding of the wider organisation's priorities. Priorities that would be more apparent to those further up the chain of command.

Personnel qualification

TOR 2.3 Were the personnel involved appropriately qualified (or experienced) to conduct the activity? (Including any Safety staff)?

41. NZBR 45 outlines the requirements for the dive Instructors at the Dive School. The requirements appear to be general in terms of being an In Date Qualified Diver and additional qualifications for Dive Supervisors.

42. The following outlines the three personnel (Dive Supervisor, Standby Diver and Medic) involved in the activity on 25 March 2019 and their qualifications:⁹⁰

- a. **Dive Supervisor.** To be in-date diver and fully trained in LAR7000.

⁸⁵ Witness 13, Page 37, Line 3.

⁸⁶ NZBR 45, Article 0211, 4.

⁸⁷ NZBR 45, Article 0211, Para 1 - 4 (a - o).

⁸⁸ Witness 17, Page 21, Line 32.

⁸⁹ Witness 17, Page 5, Line 4.

⁹⁰ Witness 13, Re-interview, Exhibits GGG & HHH.

	Prerequisites	Completion status
In Date Diver ⁹¹		
1	Medical – H1, A4, G4, Z5. Fit Shore duty NZ only (review was due 25/03/19)	No [#]
2	Physically –Pass next exam was due 19/11/18 (Linked to medical status)	No [#]
3	Maintains an up to date divers logbook (RNZN 112)	Yes
4	Min dive experience of 90mins/6 Mths, Last Dive - 05/12/17	No [#]
5	Workplace First Aid (N15010) (2 year expiry) Completed 23.01.19	Yes**
6	Diver Alert Network Oxygen Provider Certification (CN08005) Completed 27/02/19	Yes
Supervisor Training ⁹²		
7	Dive Medical Technician – Qualified in full Australian Diving Accreditation Scheme (ADAS) - Expiry 07/04/19	Yes**
8	Dive Supervisor- Qualified (ADAS) On Shore SSBA & SCUBA– Expiry 01/07/21	Yes**
9	Equipment Currency in Emergency Operations – Competency 06/04/18	Yes

A Dive Supervisor who is unfit for diving may still supervise diving provided the reason for unfitness does not impair the person's ability to carry out the role.⁹³ The Court notes that at the time of the incident there is no guidance on parameters, recording, or level of approval for providing any such waiver to a Dive Supervisor. This has now been changed with approval required from the individual's Commanding Officer.⁹⁴

b. **Standby Diver.**⁹⁵ To be *in-date diver* and fully trained in LAR7000.

	Prerequisites	Completion status
In Date Diver ⁹⁶		
1	Medical – H1, A4, G2, Z1.	Yes
2	Physically –Pass next exam was due 19/09/19	Yes
3	Maintains an up to date divers logbook (RNZN 112) – Logbook not produced to Court	Unknown
4	Min dive experience of 90mins/6 Mths, Last Dive – Logbook not produced to Court	Unknown*
5	Workplace First Aid (N15010) (2 year expiry) Completed 23.01.19	Yes**

⁹¹ NZBR 45, Article 0203.

⁹² NZBR 45 Article 0211, 2.

⁹³ NZBR 45, Article 0211, 3.

⁹⁴ NZBR 45, Article 0211, 3 AL 45

⁹⁵ NZBR 45 Article 0283.

⁹⁶ NZBR 45, Article 0203.

6	Diver Alert Network Oxygen Provider Certification (CN08005) Completed 27/02/19	Yes
Supervisor Training ⁹⁷		
7	Dive Medical Technician – Qualified (ADAS) - Expiry 07/04/19	Yes**
8	Dive Supervisor- Qualified (ADAS) On Shore – Expiry 17/02/22	Yes ***
9	Equipment Currency in Emergency Operations – Competency 06/04/18	Yes

* Although requested by the Court, the Log book could not be found in order to produce to the Court.

** A conflict exists between the currency timeframe of the Medical Qualification (24 months) versus the requirements for these currencies in the NZBR 45 (12 months).
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*** The ADAS Supervisor qualification does not cover mixed gas diving, only air. Neither the Dive Supervisor nor Stand-by Diver have qualifications in mixed gas.⁹⁹ However, both have completed the OEM 'Train the Trainer training'.¹⁰⁰ The Court notes there is no requirement outlined in the NZBR 45 for any extra diving supervisor qualifications for mixed gas diving. It is unclear if this is an intentional omission or if the Train the Trainer is the only requirement.

- c. **Medic.** A Medic was in attendance during all underwater training and no reference was able to be located for this requirement. To maintain competency a medic is required to achieve sign off for various certificates and qualifications periodically and to remain in date for these. The following outlines the Medic's qualifications:

	Qualification	Completion status
1	Graduate Certificate in Health Science - Paramedicine ¹⁰¹	Yes
2	Hyperbaric Attendant Course	Yes
3	Standard Scope of Practice Expiry 17/5/19	Yes } *102
4	NZRC Certificate in Advanced Resuscitation Expiry 18/9/19	Yes

⁹⁷ NZBR 45 Article 0218, 2.

⁹⁸ NZBR 45 Article 0219, 4.

⁹⁹ Witness 13, Re-interview, Page15, Line 20-21.

¹⁰⁰ Witness 13, Re-interview, Exhibits GGG & HHH.

¹⁰¹ Witness 10, Page 5, Line 7-8.

¹⁰² Witness 38 Exhibit MMM.

43. There is a requirement in the NZBR 45 for the RNZN Diving School to have a Dive Medical Technician (DMT) on site whenever diver training is being conducted.¹⁰³ However, on this occasion, and as is the norm for the Able Divers Course, there was a Navy medic in attendance. There is no formal requirement for this laid out in the NZBR 45, however there is a request made for this service in the Temporary Memorandum for the course.¹⁰⁴

44. The other requirement is for Instructors at the school to have completed a classroom Instructor course and this had not been completed at the time of the incident. Reference NZBR 37 - Training of Administrative and Instructional Staff requires that all personnel posting to an instructional billet are to have completed NZDF Course D11001 NZDF Foundation Instructor prior to or as soon as practicable after posting.¹⁰⁵ Neither the Dive Supervisor nor Standby Diver had completed this training.¹⁰⁶

45. In addition to the above, the Dive Supervisor stated that he had not received any formal orientation or induction into his instructional post, was thrust into the role at short notice, and had to work out what needed to be done himself.¹⁰⁷ There was no recording of having read and understood the various Orders and Instructions he was now subject to.

46. It is of concern to the Court that in an area of hazardous activity that the Instructors present that night, and possibly the remaining staff at the school, have not completed the required instructional training. It should be a priority for the Dive School to have Instructors capable of delivering material in a manner that draws the best out of each student and should be subject to some assessment of suitability in delivering safety critical information.

47. Much of the information related to currency of qualifications appears to be haphazard and fragmented suggesting it is not easily accessible or trackable to those responsible for monitoring. There is a difference between the refresher training requirements laid out in the NZBR 45 (12 month) and what is afforded by ADAS and RNZN Medical (24 month). It appears the Dive School adhere to the least restrictive of these. It is the opinion of the Court that the central and accurate recording, tracking of these requirements and qualifications is essential in order to safely and effectively manage the Dive School.

¹⁰³ NZBR 45 Article 0219, 3.

¹⁰⁴ Witness 1, Exhibit B.

¹⁰⁵ NZBR 37, Article 0251.

¹⁰⁶ Witness 13, Re-interview, Page 18, Line 26.

¹⁰⁷ Witness 17, Re-interview Page 3 line 18-23.

Safety briefings

TOR 2.4 Was a Safety brief given prior to the conduct of the activity? If so, by whom?

48. The Dive safety brief was conducted by the Dive Supervisor.¹⁰⁸ The dive briefing board is used as the basis of the brief to guide the topics to be covered.¹⁰⁹ This is a verbal brief which covers the positions of personnel involved, detail on the specific dive task, hazards and emergency procedures. It then involves an understanding check by asking questions.¹¹⁰

49. This following summarises the key elements written on the dive board from the activity on 25 March 2019:

- a. **Dive Brief:** outlined as Task Snag line Search, Marked swim, two groups of three with individuals named, 60/40 dive, duration of dive 50bar, Call up primary - lifeline, DRS and communication channel and call sign 3/16, D/S.
- b. **Diving Hazards:** outlined as O2 Toxicity, CO2 Toxicity, Yourself, Cuts, Ears and Caustic (cocktail).
- c. **Actions on Emergency:** Loss of gas – Abort/Bailout; Unwell – trouble drill; 50 bar reached – abort dive; Equipment Malfunction – ditching drill/abort dive; Unconscious diver; Companion diver drill; Emergency call-up DRS – Correct signal/abort; Fouled diver – attempt to unfoul; boat malfunction – oars.
- d. **Medical Emergency:** Companion diver drill. Medic to be called forward if a medical event occurs.¹¹¹

50. The Court concludes that a safety brief was conducted by the Dive Supervisor and covered all expected areas. Potential shortfalls in identifying activity specific risks and hazards are covered off under TOR 2.9.

Other briefings

TOR 2.5 What other briefs were delivered as part of this activity?

51. The Dive briefing is an all-encompassing briefing which includes separate sections as indicated above. Once completed, students dress up and don equipment

¹⁰⁸ Witness 17, Page 6, Line 8; Witness 18, Page 4, Line 20.

¹⁰⁹ Witness 6, Exhibit V, Section 2, Flag 14.

¹¹⁰ Witness 17, Page 6, Line 10.

¹¹¹ Witness 10, Page 7, Lines 2-3.

there is a further series of equipment checks. What checks were conducted is covered under TOR 2.10.

52. Just prior to entering the water there is an onsite brief by the Dive Supervisor which is a refresher of the tasking they are about to undertake and this also includes an understanding check before the students enter the water.¹¹²

Activity conduct and resourcing

TOR 2.6 Was the activity conducted and resourced in accordance with the contemporary best practices of this type?

53. The Court looked at this Term of Reference in relation to rebreather operations within NZBR 45, which is considered best practice for RNZN operations, but also sought evidence to determine if any best practice existed externally.

Practices on 25 March 2019

54. **Above Water.** On the night of the incident three personnel were staff in attendance – Dive Supervisor, Standby Diver and Medic.

55. The Court determines in accordance with NZBR 45 the minimum number of attendants required for the type of activity undertaken on the 25 March was two, (one for the standby diver and one for additional divers in the water of up to a maximum of eight). This calculation is supported by the Director of Diving Safety and Standards (DDSS).¹¹³ The number of attendants present that evening was zero. This was confirmed by the Head of School who confirmed there were not enough attendants present for the dive.¹¹⁴

56. Marked diving involves each diver being attached to a float line which was monitored on the surface by an attendant. There were no dive attendants on the night dive.¹¹⁵ An attendant was named on the Authority to Dive,¹¹⁶ but on questioning he seemed unaware of this and it appeared there was no intention of him being required for the evening dive.¹¹⁷ The Court heard students were being used as attendants as was normal for the School.¹¹⁸ The Dive Supervisor noted that dropping to two staff (Dive Supervisor and Standby Diver) was a common practice, and he produced evidence showing this was detailed in a 2010 version of NZBR 45 policy,

¹¹² Witness 17, Page 6, Line 22.

¹¹³ NZBR 45, Table 2B, AL 39 13 Mar 19; Witness 5, Re-interview, Page 3, Lines 1-6.

¹¹⁴ Witness 13, Re-interview, Page 11, Line 22.

¹¹⁵ Witness 6, Exhibit V, Flag 3.

¹¹⁶ Witness 6, Exhibit V, Flag 4.

¹¹⁷ Witness 24, Page 3, Lines 14-18.

¹¹⁸ Witness 24, Page 3, Line 16.

held at the School, and was also a provision included in the training material used on ADR Yarwood's ADR course.¹¹⁹

57. As a result of low staff numbers the Court found that the instructors were undertaking multiple roles on the night:

- a. Dive Supervisor- Roles: Dive Supervisor, Boat Cox 'n and Float Attendant for both the students and Standby Diver.
- b. Standby Diver – Roles: Standby Diver, Boat Bowman and Float attendant.

58. This would have made it essential, for the two staff to remain at the immediate dive site during diving operations. The Court heard at one stage one of the staff left the immediate site to make a hot drink.¹²⁰ This individual stated they were in the immediate vicinity of the Dive site and maintained visual and audio contact with the dive floats.¹²¹

59. The medical coverage for this activity was two DMT qualified divers¹²² and a medic which was more than what was required under NZBR 45 but the Court noted it was normal for the Dive School to request a medic resource in addition to the DMT qualified diver. The requirements for this is covered off under TOR 2.3.

60. **Below water.** As stated the RNZN 260 Dive Authorisation outlined that the type of diving was *marked swimming in pairs*. However, this does not describe the full configuration and evidence from the Head of School indicates that the divers on the jack stay are considered a pair with the roving diver swimming solo.¹²³ The DDSS believes all positions were *marked solo swimming*.¹²⁴ It is the Court's opinion there is confusion about what constitutes swimming in pairs and thus what parameters, such as the length of a buddy line, constitutes a pair.

61. It is estimated the distance between the two jack stay divers was between 15-30 meters.¹²⁵ Additionally, witnesses reported the visibility in the water was zero.¹²⁶ The distance and lack of visibility made contact more about 'feel'. One of the divers on the jackstay reported feeling the roving diver (ADR Yarwood) come to his side three or four times during the dive.¹²⁷ Based on the duration of the dive this is an approximate known contact time of every 20 minutes. A witness on the jackstay position noted that his last contact with ADR Yarwood had been approximately 10

¹¹⁹ Witness 17, Re-interview, Page 7, Lines 17-35; Witness 17, Exhibit NNN; Witness 17, Exhibit OOO.

¹²⁰ Witness 17, Re-interview, Page 10, Line 3-4.

¹²¹ Witness 18, Re-interview, Page 2, Lines 30-31

¹²² Both personnel were in date for ADAS DMT but out of date for the refresher.

¹²³ Witness 13, Re-interview, Page 12, Lines 32-33.

¹²⁴ Witness 5, Re-interview, Page 7, Lines 7-9.

¹²⁵ Witness 11, Page 15 Line 29; Witness 13, Re-interview, Page 12, Line 32.

¹²⁶ Witness 21, Page 15, Line 29.

¹²⁷ Witness 21, Page 10, Line 26.

minutes before the incident.¹²⁸ The other diver estimated the last contact he felt with him was 15-20 minutes before the incident.¹²⁹ However, both acknowledged it was difficult to know if the roving diver was there or not given the visibility. The Court heard this method and configuration of personnel in the diving activity was the norm.¹³⁰

62. It is the Court's opinion that all divers that evening were all *marked solo swimming* and the activity was not resourced to minimum requirements or best practice.

What would best practice look like?

63. **Above Water - Attendant Coverage.** The required RNZN practice is outlined in NZBR 45 and it is considered there should have been more personnel resource involved in this activity.¹³¹ This would have been a minimum of two attendants to cover the number of divers in the water and the standby diver.

64. **Underwater supervision/buddy system.** The Dive Medical Specialist provided information from a study conducted on diving injuries from rebreather diving in the French Armed Forces which suggests possible best practice in the training environment.¹³² The study analysed 153 reported incidents of divers losing consciousness underwater over a period of 30 years. Whilst there were a high number of incidents the low death rate was put down to a strict adherence to procedure and the controls in place. It is acknowledged that the diving equipment in use was not the LAR7000, however the controls around rebreather operations, particularly on students in training, are considered by the Dive Medical Specialist to be an example of what best practice would look like.

65. Controls in the French study included paired diving of all students particularly when visibility was poor. An additional control was also applied at the diving school for trainee divers who they deemed carried a higher risk of biochemical disorders. This extra control involved the students being accompanied by one instructor to each pair of students in the water. Once *both* students have proven competence in drills (for the specific rebreather equipment) then there was an option applied to stand-down the Instructor. The remaining controls in force would then include paired diving with float lines attached. This would still allow for one of the pair to be available to undertake immediate rescue should a loss of consciousness occur.

66. The Dive Medical specialist offered another way to achieve greater buddy coverage if resources are insufficient, using the incident activity as an example, he suggested that you could double up both groups together to enable a buddy system

¹²⁸ Witness 21, Page 10, Line 29.

¹²⁹ Witness 19, Page 12, Line 23.

¹³⁰ Witness 5, Page 40 Lines 23-27.

¹³¹ NZBR 45, Table 2B, AL 39 13 Mar 19.

¹³² Witness 29, Exhibit UU.

to operate therefore providing the facility for immediate rescue should it be required.¹³³

67. The Court's opinion is student divers are more at risk. This is supported by comments from the Dive Medical Specialist who states there is no doubt that in the early phases of rebreather diving you are vulnerable to making mistakes or vulnerable if things going wrong.¹³⁴ He goes on to say it only takes minutes for brain damage to occur post loss of consciousness.¹³⁵

68. The NZ Special Air Service Regiment (1 NZSAS REGT) require that no CCBA diver is to swim solo unless in a swimming pool or other various operational factors prevent this being possible.¹³⁶ The Court acknowledges the difference between 1 NZSAS REGT and RNZN diving parameters, however believes that when under training for rebreather operations this precaution is given serious consideration.

69. It is the Court's opinion that pairing student divers, who are unable to be clearly observed by instructors, with a short buddy line, would be the minimum best practice. This is particularly so in conditions of poor or no visibility and the ideal would to also have an instructor in the water during the early stages of dive training.

Activity compliance with orders, procedures and polices

TOR 2.7 What are the relevant RNZN orders, procedures and policies for an activity of this type?

TOR 2.8 Was the activity conducted in accordance with these orders, procedures and policy?

70. The following RNZN orders, procedures and policies listed below provides a general overview of applicable to the Able Divers Course.

71. **Fleet Personnel and Training Organisation Temporary Memorandum 22/19:** provides authority to conduct the Able Diver Course. This is ratified through Executive Training Officer signature and acknowledgement of the Temporary Memorandum and its associated references¹³⁷. The Temporary Memorandum also stipulates lines of command and control, the course programme (in outline) and procedures for incident and accident reporting.

72. **NZBR 37, Art 08065:** outlines the Able Diver Course requirements and covers the course objective, student eligibility, course duration, instructor requirements and training specifications. Articles 08107 and 08108 provide a course outline for the LAR7000 O2 and Mixed Gas requirements and training specifications.

¹³³ Witness 29, Page 15, Lines 23-26.

¹³⁴ Witness 29, Page 16, Lines 21-23.

¹³⁵ Witness 29, Page 16, Lines 9-10.

¹³⁶ NZBR 45, Article 0912.

¹³⁷ Witness 1, Exhibit B.

- a. The Court determines that the dive activity conducted on the night of the 25 March 2019 (Instructional Objective 3.3.2, Dive Task 1.17.4 – Snag line Search)¹³⁸ was in line with the requirements of Syllabus 08065. However, the Court observes that the Able Diver Syllabus has not transitioned fully from the training specification for the previous rebreather set (Viper), and the training specifications for 08107 and 08108 have not been properly integrated. In the opinion of the Court this is likely to cause confusion.

73. **NZBR 37 Art 0251** requires that Administrative and Instructional Staff posting to an instructional billet are to have completed NZDF Course D11001 NZDF Foundation Instructor prior to or as soon as practicable after posting. Neither of the Dive Supervisor or the Standby Diver had this qualification.¹³⁹ The Court's finding in this regard is this was non-compliant.

74. **NZBR 45** is the prime reference for Navy and Special Operations Forces diving. It provides the procedural rules and safety best practice for the conduct of diving operations. In particular for an activity of this type the NZBR 45 highlights the following:

- a. **Part 1, 3 - Section 3 - Clearance Diving Equipment;** describes the LAR7000 in both modes and the Standard Operating Procedures (SOPs) for its preparation and use.
 - i. Article 0334 - In-Water Gas Switching, stipulates the policies and procedures for its use as follows: "*The LAR7000 facilitates underwater gas switching between Nitrox and Oxygen modes - a feature utilised when operationally expedient. This facility is only to be utilised in accordance with the Dive Supervisor instructions and as briefed for the intended dive profile*".

75. Gas-switching was not covered in the brief for the night dive activity on the 25 March 2019 or on any of the previous dives the students had participated on.¹⁴⁰ The Court found that students admitted that Gas Switching, knowingly without Dive Supervisor instruction, was undertaken during the dive on the evening of 25 March including a suggestion that ADR Yarwood also undertook a practice that is not part of the gas switching drill which involved turning off the oxygen cylinder. The Court's finding is this was non-compliant.

- a. **Part 1, 2 – Regulations, Section 2 - Responsibilities and Personnel Requirements.** This section provides policy on command and diver responsibility for safety. Article, 0211 - Dive Supervisor responsibilities including the following inset articles:

¹³⁸ Witness 6, Exhibit W, Tag 18.

¹³⁹ Witness 13, Re-interview, Page 18, Line 26.

¹⁴⁰ Witness 17, Page 14, Line 17-25.

- i. **Article 0211, paragraph 1:** The Dive Supervisor is not to be designated any additional tasks while involved in a supervision of a dive.
 - 1. The Dive Supervisor was undertaking multiple roles during the task fulfilling the role of coxswain for the safety boat and that of an attendant. The Court's finding is this was non-compliant.

- ii. **Article 0211, paragraph 4(h):** The Dive Supervisor is to ensure the minimum required attendants and standby divers are present in accordance with Article 0278 and Annex 2B.
 - 1. The minimum number of personnel to support a dive activity of this type was not in accordance with the article as there were no attendants present on the night. The Court's finding is this was non-compliant.

- iii. **Article 0284, Standby Diver: Availability.** The Standby Diver was on 'short notice' to move. This required the Standby Diver to be fully dressed, with all equipment prepared, tested and reported to the Dive Supervisor. This was relaxed by the Dive Supervisor which allowed for equipment to be 'slipped' but kept close at hand.¹⁴¹ The NZBR goes on to say 'in all other respects the diver is to remain ready to enter the water'. This is supported by the statement 'the standby diver is to be located on the surface, as close as practical to where the diving task is being carried out.'¹⁴²
 - 1. There was a period of time where the Standby diver left the dive pontoon to go and make a cup of tea.¹⁴³ Whilst he was still reasonably close to the pontoon he was no longer either ready to enter the water or as close as practical to the diving. The Courts view is this is not a contributor to the incident or the response as he had returned prior to the incident. However, it is symptomatic of not enough personnel in attendance. The Court's finding is this was non-compliant.

- iv. **Article 0203, paragraph 1(m) - Divers Attendant:** This is defined as a qualified diver who (in this context) continuously watches a float marking a diver or a swimmer.

¹⁴¹ NZBR 45, Article 0284, Para 2.b.

¹⁴² NZBR 45, Article 0284, Para 1.

¹⁴³ Witness 17, Re-interview Page 10 Line 3-4.

1. On the evening of the 25 March 2019 the student divers did not have an attendant allocated for diver watch duties. The Court's finding is this was non-compliant.
2. The Stand-by diver also did not have an attendant allocated as required by Article 0278 and Annex 2B. The Court's finding is this was non-compliant.
3. It is common place for the students on a course to act as attendants in order to teach them the role.¹⁴⁴ However, this was not the case on the night of the 25 March 2019. The NZBR 45 states an attendant must be a qualified diver.¹⁴⁵ This is defined as a diver who has been issued a WorkSafe NZ Occupational Diving Certificate of Competency.¹⁴⁶ It is unclear if the practice of employing students as attendants meets this requirement and the Court could not find any waiver or allowance.
4. NZBR 45 allows for a waiver of attendants for Mine Counter Measures (MCM) and Explosive Ordinance Disposal (EOD) diving operations carried out by Operational Divers supervised by a Petty Officer Diver (PODR) or above.¹⁴⁷ This reduces the surface support team to two (Dive Supervisor plus standby diver) to minimise risk to personnel due to the use of explosives. It was suggested by the Head of the Dive School that the Dive Supervisor could have been employing this rule.¹⁴⁸ The Court determines this rule is not applicable to this situation and should not have been employed as there was no risk to surface personnel from MCM or EOD operations. The Court's finding is this was non-compliant.
5. In addition to the waiver for MCM and EOD operations, there is an accepted practice of reducing the staff to two when no other staff are available.¹⁴⁹ This had previously been detailed in the NZBR 45 from 2010,¹⁵⁰ and is still in the Able Diver Course Workbook and ADR course documentation.¹⁵¹ Both of these documents were presented to the Court for viewing and it was noted they had been available to view at the Dive School in an uncontrolled state. The statement allowed for a Dive Supervisor

¹⁴⁴ Witness 24, Page 3, Lines 27-29.

¹⁴⁵ NZBR 45, Article 0203 (m).

¹⁴⁶ NZBR 45, Article 0203 (b).

¹⁴⁷ NZBR 45, Article 0278, Para 2.

¹⁴⁸ Witness 13, Re-interview, Page 10, Line 12.

¹⁴⁹ Witness 17, Re-interview Page 7 Line 17-25.

¹⁵⁰ Witness 17, Exhibit NNN.

¹⁵¹ Witness 17, Exhibit OOO.

to reduce the surface support team to two personnel for RNZN Dive School diving training when they deemed it appropriate or safe to do so. The current NZBR no longer states this, however the course workbook has not been updated.

Note: The NZBR states there are to be five waterproof hard copies of the NZBR allocated to the Dive School.¹⁵² The Court is not aware of the amendment status of these copies.

- v. **Article, 0203, paragraph 1(f) - In-Date Diver:** This requires that in order to be considered in-date a "qualified diver" must be medically and physically fit and exercised underwater in-service equipment for a minimum period of 90 minutes during the preceding six months. Log Book, First Aid and currency with Emergency Procedures are also required.
1. The Head of School found it difficult to maintain the 90 minutes every six months minimum for his Petty Officer and Chief Petty Officer Instructors.¹⁵³ A Dive Supervisor who is unfit for diving may still supervise diving provided the reason for unfitness does not impair the person's ability to carry out the role.¹⁵⁴ Due to this provision the Court found that this was compliant.
 2. The Court notes that there is no guidance on parameters, recording, or level of approval for providing any such waiver to a supervisor. This is discussed further at TOR 2.3.
- vi. **Article 0215 – Form RNZN 112 – Divers Log:** Requires that the diver maintains a record of all dives and the log is to be inspected and signed by the Diving Officer when the diver first joins a ship or establishment and then monthly thereafter.
1. Inspection of ADR Yarwood's RNZN 112 revealed a last recorded dive on 21 February 2019.¹⁵⁵ None of the completed Able Diver Course dives had been entered. The Court's finding is this is not compliant.
 2. The Court was unable to locate any evidence ADR Yarwood's RNZN 112 had been inspected or signed by a Diving Officer upon his arrival at the Dive School.¹⁵⁶ The Court's finding is that this is not compliant.

¹⁵² NZBR 45, Distribution Table.

¹⁵³ Witness 40, Re-interview, Page 18, Lines 9-11.

¹⁵⁴ NZBR 45, Article 0211, Para 3.

¹⁵⁵ Witness 39, Exhibit PPP, Flag 7.

¹⁵⁶ Witness 39, Exhibit PPP, Flag 7.

- vii. **Article 0204 - Operational Risk Management (ORM):** Stipulates prior to conducting any diving or maritime EOD operation a comprehensive risk assessment is to be carried out. Furthermore, if circumstances change during the operation the assessment is to be updated and acted upon as appropriate.
1. The Temporary Memorandum stipulates before each day's serial a detailed brief (RNZN 260) and an ORM are to be completed¹⁵⁷. The Court heard a detailed brief was conducted prior to the night dive on the 25 March 2019 which also included hazards from the ORM.¹⁵⁸ However, the ORM appears to be generic in nature and was not a comprehensive analysis of the specific risks the students faced in the night dive being undertaken. The Court's finding is this is not compliant. The Court addresses the ORM at TOR 2.9.
- viii. **Article 0212 - Qualification Level required for supervising types of Diving:**
1. The table under this Article confirms the Dive Supervisor on the night was at the rank level required to supervise the night dive. The Court's finding is this was compliant.
- ix. **Article, 0219, Paragraph 3 - Diver Medical Technician (DMT):** Provides an overview of the comprehensive medical training a RNZN DMT undertakes. It also requires RNZN Diving School to have a DMT on site whenever diving training is being conducted.
1. The Dive Supervisor and Standby Diver were DMT qualified and both were in-date in accordance with ADAS at the time of the accident.¹⁵⁹ Although, the duties of DMT are not to be carried out by the Dive Supervisor, there is no such restriction on the Standby Diver. Whilst both DMT qualified divers were in date under ADAS regulations there were not in date with NZBR 45 as a conflict exists between the currency timeframe of the ADAS DMT Qualification (24 months) and RNZN DMT currency in the NZBR 45 (12 months). The Court's finding is this was compliant.
 2. In addition, a suitably qualified RNZN Medic was present,¹⁶⁰ and although not DMT qualified, nor required by orders, this did provide for additional medical coverage. The presence of a

¹⁵⁷ Witness 6, Exhibit V, Tabs 5 & 7.

¹⁵⁸ Witness 17, Page 6, Line 7-12.

¹⁵⁹ Exhibit GGG & JJJ.

¹⁶⁰ Witness 10, Page 5, Line 7.

RNZN Medic appears to be a common practice and is requested in the TM for the course.¹⁶¹

3. The Court addresses Medical qualifications at TOR 2.3.

x. **Article 0807 – Action required on recovery of Equipment Involved in and Incident/Accident:** This requires equipment involved in a diving incident be isolated and secured with the process of recorded in detail. This information is then to be included in the RNZN 1333. The Court notes this policy has since been updated to include information specific to Clearance Breathing Apparatus.¹⁶²

1. ADR Yarwood's set was isolated on instruction by the Head of School by students. However, a student failed to take accurate account of the actual state the set was found in¹⁶³ and once recorded it was not included in the RNZN 1333 series of forms,¹⁶⁴ and was subsequently lost.¹⁶⁵ The Court's finding is this was not compliant.

xi. **Part 1, Chapter 2 - Regulations, Annex 2D - Purity of Breathing Gas for Diving:** This standard specifies the requirements, including essential purity and dryness for Oxygen, Nitrox, air or any mixture thereof, supplied in cylinders under pressure for diving.

1. The purity of breathing gas in the O2 and Nitrox cylinders used by ADR Yarwood at the time of the incident was consistent with the requirements of the Annex.¹⁶⁶ Forensic testing, both initially during the equipment test and then follow-on testing of gases, conducted by ESR showed nothing unusual.¹⁶⁷ Initial basic analysis conducted uncovered no issues.¹⁶⁸ The Court's finding is this was compliant.

76. **NZBR 45 Volume 2, Chapter 3- LAR7000 - Standard Operating Procedures for Maintenance and Preparation of Equipment:**¹⁶⁹ This Volume is still under development and was not online at the time of the incident but has since been uploaded. A copy was provided to the Court.

¹⁶¹ Witness 1, Exhibit B.

¹⁶² NZBR 45 AL 44 2 July 2019.

¹⁶³ Witness 21, Page 12, Lines 2-13.

¹⁶⁴ Witness 6, Exhibit V, Flag 3.

¹⁶⁵ Witness 13, Re-interview, Page 14, Lines 25-27.

¹⁶⁶ Witness 29, Page 4, Line 31-37; Exhibit V, Tab 14.

¹⁶⁷ Witness 29, Page 5, Line 4; Witness 39, Exhibit PPP

¹⁶⁸ Witness 6, Exhibit V, Flag 14.

¹⁶⁹ Witness 5, Exhibit S.

Risk assessment

TOR 2.9 Describe the risk assessment that was in place for the activity?

77. The risk assessment in place for the activity consisted of the Dive Training School Operational Risk Matrix (ORM)¹⁷⁰ for diving, which accompanies the RNZN 260 Authorisation to dive. This ORM is based on the five by five NZDF Risk Ranking Matrix from the DFO 81¹⁷¹ and the NZBR 97.¹⁷² It refers to 36 different risks and is signed off separately for each RNZN 260 Authorisation to Dive. Any risk Medium or lower is signed off by the Head of School. If it is classified as High it requires sign off from the Executive Training Officer and if Critical, the Assistant Chief of Navy (Personnel & Training).¹⁷³ All risks on the subject ORM were mitigated to medium or below.

78. The Head of School stated the ORM is reviewed for each dive of a different type.¹⁷⁴ However, for the evening of 25 March 2019 there was no specific risk or element of a risk that dealt with the hazards introduced by diving at night and/or in a low visibility environment. This suggests the ORM is a generic matrix that is applied to most if not all dives undertaken. This notion is supported by the NZDF Safety Investigations Manager who stated there is nowhere in the ORM for additional information or comments to be added making it difficult to see if it has been modified for the specific activity.¹⁷⁵ The Dive Supervisor on the night stated that the ORM remains the same unless new hazards are identified.¹⁷⁶ Further supporting this is the mention of the previous Viper rebreather in one of the risks. The Viper has not been in use by the RNZN since 2015. Commander Naval Specialist Training (CNST) stated they felt the RNZN doesn't have particularly good direction around identifying risk and then managing and mitigating these risks.¹⁷⁷

79. During the dive brief on the evening of the 25 March 2019 various risks and hazards were identified and addressed with the course.¹⁷⁸ These were outlined at the dive brief as hazards prior to diving and summarised on the Dive Briefing Board.¹⁷⁹ They were:

- a. O2 Toxicity;
- b. CO2 Toxicity;
- c. Yourself;

¹⁷⁰ Witness 6, Exhibit V, Flag 7.

¹⁷¹ DFO 81, Chapter 4, Annex C.

¹⁷² NZBR 97 Chapter 21.

¹⁷³ Witness 13, Page 36, Lines 7-10.

¹⁷⁴ Witness 13, Page 36, Line 22.

¹⁷⁵ Witness 6, page 20, Lines 20-31.

¹⁷⁶ Witness 17, Page 24, Lines 3-4.

¹⁷⁷ Witness 9, Page 11, Lines 11-12.

¹⁷⁸ Witness 19, Page 3, Line 16; Witness 18, Page 4, Line 23.

¹⁷⁹ Witness 6, Exhibit V, Flag 9, Tab 14.

- d. Ears;
- e. Cuts (etc.); and
- f. Caustic (Cocktail).

80. Also of note is the first risk identified in the ORM which highlights the risk of missing vital information in the dive brief and that it may result in injury to personnel – this increases the importance of a thorough documented brief which is checked to ideally eliminate this risk. Evidence suggests the ADR Yarwood's death was caused by brain death due to hypoxia.¹⁸⁰ This risk, hypoxia, is missing from those briefed on the night, and while it is acknowledged briefing all risks would likely be counter-productive, it does raise the question of how these specific hazards were identified for this night dive.

81. It is the opinion of the Court that while there is risk management being carried out, it appears to only be actioned on a superficial level, with the danger that a templated risk approach could lead to complacency.

Activity controls

TOR 2.10 What controls were in place for this activity?

TOR 2.11 Were the controls as designed?

TOR 2.12 Did the controls work as intended?

82. The following outlines the checks and controls in place for the activity, an assessment if they occurred as designated, and an assessment of the effectiveness of each.

83. Pre-Dive Checklists:

- a. Authority to Dive Checklist – The Court found that the Authority to Dive was completed however, it is the Court's opinion that it was poor quality.¹⁸¹ Refer TOR 2.1.
- b. Clearance Divers Breathing Apparatus– Oxygen/Nitrox Pre-dive Check Sheet - completed by ADR Yarwood and signed by Dive Supervisor.¹⁸²
 - i. The Court observed that the checklist does not contain any checks for the APEK Buoyancy Compensator Device (BCD) and has the

¹⁸⁰ Witness 15, Exhibit PP.

¹⁸¹ Witness 6, Exhibit V, Flag 4.

¹⁸² Witness 6, Exhibit V, Flag 6.

AGIER BCD checks. The LAR7000 rebreather system was originally purchased with the AGIR (BCD). Due to its operational limitations it was deemed unsuitable and the Compressed Air Breathing Apparatus BCD was in use in its place.¹⁸³ There is no check in place specifically for this BCD. However, evidence from the Dive Supervisor confirms an appropriate functional check was carried out.¹⁸⁴

- c. Three levels of equipment checks were conducted on the night - self check, buddy check and supervisor check.¹⁸⁵
- d. Control Effectiveness:
 - i. The Court identified issues with the Authority to Dive Checklist which are addressed at TOR 2.1.
 - ii. The Court was not made aware of any issues with the equipment itself. The dive on the night of 25 March 2019 had been progressing and the duration was over 90 minutes at the time of the accident. Post-accident testing also supports the outcome there is nothing to indicate the equipment was at fault.

84. Communication:

- a. The NZBR stipulates there are to be at least two separate methods of calling divers to the surface in an emergency. In place were the Diver Recall System (DRS) and the surface floats which marked the location of the student divers.¹⁸⁶
- b. Control Effectiveness
 - i. **DRS** – All conscious divers were able to abort dive and return to the surface indicating that students knew and responded accordingly to this control.
 - ii. **Marked Divers** –The students were marked with floats and this allowed the Dive Supervisor to monitor the students and react to problems that arose.¹⁸⁷ This suggests this control was at least partially effective as the Dive Supervisor did respond to movement, or lack of movement of the floats.¹⁸⁸ However, the Court cannot

¹⁸³ Witness 14, Page 4, Lines 9-13.

¹⁸⁴ Witness 17, Page 7, Lines 22-23,

¹⁸⁵ NZBR 45 Articles 0330 & 0331; Witness 6, Exhibit V, Flag 6.

¹⁸⁶ NZBR 45, Article 0211, m; Witness 22, Page 4, Line 13.

¹⁸⁷ Witness 18, Page 11, Lines 5-8.

¹⁸⁸ Witness 17, Page 10, Lines 1-5.

make a definitive assessment of this control's effectiveness as there were not sufficient attendants present (see TOR 2.6).

85. Short Jackstay:

- a. The length of the Jackstay was limited to 100m, with groups going back and forth repeating the sequence search.¹⁸⁹ This was to allow for ease of supervision in limiting the divers to a restricted familiar area.
- b. Control Effectiveness.
 - i. The relatively small area of diving close to the Dive School Pontoon allowed the Dive Supervisor to monitor the students and react to problems that arose. This suggests this control was at least partially effective. However, the Court cannot make a definitive assessment of this control's effectiveness (see TOR 2.6).

86. Paired Diving

- a. The student divers on the jack stay were connected by a snag line, and this has been interpreted as paired diving.¹⁹⁰ This allows for the students to communicate with each other and monitor each other's movements.
- b. Check Effectiveness.
 - i. The Court found the length of the snag line (15-30m) means the activity is more akin to solo diving. It is the view of the Court that this length is too long for divers to be responsive to any difficulties and to effect a prompt rescue should another diver require it in the training environment. In support of this, there was evidence presented by a student diver on the jack stay, they had attempted to send signals on the snag line, but failed to receive any sort of response.¹⁹¹
 - ii. The students on the jackstay were considered to be diving in pairs. However the roving diver (ADR Yarwood) was not secured to the Snag line and was required to hold onto it as he moved up and down clearing snags. The line was also considered by the Court to be too long to effect a successful rescue should one be required. The Court's concern around this has been discussed earlier in the report at TOR 2.6.

¹⁸⁹ Witness 17, Page 9, Line 20.

¹⁹⁰ Witness 13, Re-interview, Page 12, Lines 32-33.

¹⁹¹ Witness 19, Page 4, Lines 4-5.

87. The controls in place for this dive were designed to allow for effective, checking, monitoring of, and communication with the student divers. The prime control appears to have been marking the students with floats. It is the Court's assessment the effectiveness of these controls were largely dependent on having the correct number of attendants present. It could also be argued that float monitoring alone, even with the correct number of attendants, may not be an effective defence against some of the risk divers face, particularly for trainee divers.

88. If one of the objectives of the controls is to provide rapid recovery of an ill diver then, the controls as applied were not effective. The use of a long snag line between trainee divers, some of whom are not directly attached, does not allow for clear and immediate communication and therefore, it is the Court's view it is not an effective control for trainee divers.

Legitimacy of Actions

TOR 2.13 Were all actions that occurred linked to a legitimate training outcome?

89. All actions on the day of the 25 March 2019 appear to be linked to a legitimate training outcome. The day consisted of one physical training run from Devonport to Takapuna Boat ramp which was conducted by a Physical Training Instructor. This run was described by the Physical Training Staff member in attendance as a relatively easy run of approximately six kilometres.¹⁹² The three dives on the day each appeared to have multiple objectives whilst also building the individual's time in the water.¹⁹³

90. The Court could not find any requirement for daily limits of diving time for RNZN or RNZN trainee divers. There is a provision that limits the Special Forces to a 240 minute limit on oxygen diving in a 24 hour period. During the course of the inquiry the Court became aware of a 300 minute maximum daily limit for diving.¹⁹⁴ The Able Diver Course had completed approximately 390 minutes at the time of the incident.¹⁹⁵ However, the Court notes this provision was not in place at the time of the incident and came into effect from 1 May 2019. The catalyst for this change came from the DDSS when reviewing a WorkSafe bulletin on bounce diving (diving with repeated resurfacing) from November 2018. This bulletin suggested a time limit of 300 minutes daily for the specific activity of bounce diving. The DDSS reported that, after discussions with the dive medical fraternity, this would be put in place for all diving to specify a maximum allowable in water time in any 24 hour period. It was advised to the Court this new control has been advised to both operational and dive training areas.¹⁹⁶

¹⁹² Witness 35, Page 4, Lines 18-19.

¹⁹³ Witness 13, Page 20, Line 16-18.

¹⁹⁴ NZBR 45 Article 02117 - Maximum allowable in-water time in any 24 hour period, AL 41 1 May 19.

¹⁹⁵ Witness 6 Exhibit V, Flag 3 & 5.

¹⁹⁶ Witness 5, Re-interview, Page 4, Lines 15-40.

TOR 3 - INCIDENT AND RESPONSE

Contributing Factors

TOR 3.1 What Factors contributed to the event occurring?

91. The following outlines factors the Court considers contributed either directly or indirectly to the incident:

92. **Procedural Violation.** The Court heard evidence that an unsafe practice was being undertaken by some of the students when using Mixed Gas (Nitrox) mode on the Able Diver course.¹⁹⁷ This practice involves gas switching underwater for the prime purpose of increasing endurance. The practice involves closing the bubble diffuser and allowing the counter lung bag to fill up. When the bag is full the individual switches the Gas Switch Lever from Mixed Gas constant flow mode (Nitrox) to Oxygen mode which is delivered on demand. The individual then breathes from the bag trying not to activate the oxygen demand valve. The practice was then to continue to breathe down the Mixed Gas from the bag until it was depleted. The switch back to Mixed Gas Mode is based on a judgement call.

93. It was proposed by some of the students that ADR Yarwood had advised his variation to this was to also turn off the oxygen cylinder to avoid 'tripping' the oxygen demand valve.¹⁹⁸ The Court was unable to conclusively confirm ADR Yarwood's motivation for the additional action. However, based upon the testimony of a number of witnesses it was most likely either:

- a. to avoid detection by instructors as having used too much oxygen;¹⁹⁹ or
- b. to avoid suffering from oxygen toxicity.²⁰⁰

94. A summary of the practice, constructed by the Court, is shown below:

¹⁹⁷ The six students present during the diving activities on 25 March 2019.

¹⁹⁸ Witness 11 Page 11, Lines 35.

¹⁹⁹ Witness Page 8, Lines 31-31.

²⁰⁰ Witness 19, Page 8, Lines 10-16; Witness 22, Page 10, Lines 25-26; Witness 21, Page 7, Lines 5-6.

Operation	O2 Cylinder	Mixed Gas Cylinder	Mode/Switch	Diffuser
Approved				
Oxygen	On	Off (or not attached)	O2 (down)	Blanked off or closed
Mixed Gas 60/40	On	On	Mixed Gas (up)	Self-adjust
Unsafe/unauthorised practice in use in 60/40 Mixed Gas mode				
'the gas switch trick' Variation 1 ²⁰¹	On	On	Commence dive in Mixed Gas. During dive, after closing diffuser, turn switch down to O2. Judgement call to switch back to Mixed Gas.	Close
'the gas switch trick' Variation 2 ²⁰²	Commence dive with 'on'. During dive turn 'off' – unclear at what point.	On	Commence dive in Mixed Gas. During dive, after closing diffuser, turn switch down to O2. Judgement call to switch back to Mixed Gas.	Close

Figure 1. The Court's interpretation of standard operating procedure and student 'gas switch trick'

95. All five students present on 25 March 2019 reported to trying some variation of this practice.²⁰³ It appears to be most in use by those wanting to increase their mixed gas endurance. It appears the gas switch trick enabled the students to increase their endurance with all students achieving 124 minutes on the second dive of the day.²⁰⁴ One student reported that all students had exceeded their own previous endurance expectations.²⁰⁵ When questioned on whether there was

²⁰¹ Witness 11 Page 9, Line 13.

²⁰² Witness 11, Page 12, Line 1; Witness 19 Page 8, Line 6.

²⁰³ Witness 11 Page 12, Line 1; Witness 19, Page 6, Line 29; Witness 21 Page 3, Line 21; Witness 22, Page 8, line 9; Witness 23, Page 8, line 31.

²⁰⁴ Witness 6, Exhibit V, Flag 3.

²⁰⁵ Witness 22, Page 8, Lines 1-7.

anything detected as unusual from the second dive the Supervisor advised he did not recall anything unusual.²⁰⁶

96. This practice was a particular point of discussion on the 25 March 2019 post Dive One (Oxygen Compass Dive),²⁰⁷ and also at dinner post Dive Two (Mixed Gas Jack Stay Dive) before the night dive.²⁰⁸ Some of the students, including ADR Yarwood had experienced dizziness and generally not feeling good whilst undertaking the practice.²⁰⁹

97. The Dive Medical Specialist provided some indicative calculations based on the rebreather loop volumes and an assumed work rate which demonstrated to the Court how someone undertaking this practice could become hypoxic in minutes - depending on actual work rate.²¹⁰ He also explained that symptoms could include light headedness, shortness of breath and it is very common for people to have very little or no perception of being hypoxic.²¹¹ Based on this evidence the Court believes it is possible for ADR Yarwood to have been unaware of his hypoxic state and he could have unknowingly slipped into unconsciousness.

98. There is a legitimate in water gas switching drill. However, this feature is only to be utilised with Dive Supervisor instructions and as briefed for the intended dive.²¹² The students had practiced the in water gas switching the week before the incident but were aware it was only to be used when authorised.

99. The five students who had tried the 'trick' each admitted to knowing that the 'the trick' they were employing was not approved by the instructors.²¹³ When the Court tested if it was possible the instructors could have known, the students were adamant the instructors would not have known²¹⁴ and it appeared to the Court the students had focused on ensuring they wouldn't be found out. One student also highlighted that "none of us knew how high the risks were".²¹⁵ It is the Court's view, on listening to the rationale provided by the five students, they were aware it was a violation and appeared to have more fear of being found out than a fear of the risks involved.

100. The Court sought to find out the genesis of the trick and specifically, whether there was awareness of the trick by instructors and also if it had been used by previous courses or in the operational environment. A diver, who had been on the

²⁰⁶ Witness 17, Page 5, Line 19

²⁰⁷ Witness 11, Page 9, Lines 11-23.

²⁰⁸ Witness 23, Page 6, Lines 7- 12; Witness 11, Page 12, Lines 22-25

²⁰⁹ Witness 11, Page 11, Lines 31-35; Page 21, Lines 1-2; Witness 19, Page 6, Line 31.

²¹⁰ Witness 29, Exhibit TT.

²¹¹ Witness 29, Page 11, Lines 19-21.

²¹² NZBR 45, Article 0333.

²¹³ Witness 11, Page 10, Line 20.

²¹⁴ Witness 19, Page 8, Lines 32-34

²¹⁵ Witness 19, Page 9, Lines 1-4

previous ADR course and now in the operational environment, confirmed that it was not in use or even a consideration on his course and he had also not seen it in used in the operational environment.²¹⁶ On questioning, the instructors all were astonished with one describing it as foolish and stupid.²¹⁷

101. On questioning of the students from 19/1 ADR course there was consensus that the practice was invented and first used by their course.²¹⁸ On questioning who they heard it from first students were reluctant to answer. One student first heard about it the week before from ADR Yarwood.²¹⁹ Similarly, another student suggested ADR Yarwood was one who had tried it early on and could have been one of the initiators.²²⁰ Another student recalls first hearing about the 'trick' when ADR Yarwood first mentioned it at dinner when discussing with others on the evening of the 25th March and believed he was using it as he was under pressure due to his poor endurance.²²¹ The Court believes the 'gas switch trick', both variations one and two as highlighted in Figure 1, were isolated to 19/1 ADR course. There was no conclusive evidence as to the specific individual who first initiated the trick.

102. **Complexity of LAR7000 Equipment.** The Court heard mixed views on the LAR7000. With some describing it as a simple mechanical piece of equipment yet others thought it complex in its use with more to think about underwater. This paradox was put to the Dive Medical Specialist and in his opinion both statements are accurate. He suggests the mechanical equipment itself is simple however, its interaction with the body's physiology is complicated.²²² This notion was supported by the students who suggested that the LAR7000 was complex with more to think about underwater.

103. On the Court's questioning of the students understanding of the gas laws and physiology, that apply to the LAR7000 breathing loop, it was evident they didn't fully appreciate the interaction with the body.²²³ It is the opinion of the Court the complexity of the loop requires the students to have a deeper understanding of how the system affects their physiology. The Court believes this lack of knowledge meant the students were unable to assess the risk the gas switch trick introduced.

104. The Court recommends that dive physiology, gas laws, and rebreather operations theory, tuition and assessment be reviewed to ensure a deeper understanding.

²¹⁶ Witness 31, Page 3, Lines 21-28.

²¹⁷ Witness 17, Page 14, Lines 17-18.

²¹⁸ Witness 21, Page 3, Lines 7-9.

²¹⁹ Witness 22, Page 7, Lines 14-15.

²²⁰ Witness 19, Page 6, Lines 22-24.

²²¹ Witness 23, Page 6 Lines 6-12, Lines 31-35, Page 7 Lines 1-2.

²²² Witness 29, Page 25, Lines 5-20.

²²³ Witness 19, Page 19, Lines 30-33; Page 21, Witness 11, Page 21, Lines 18-20

105. **Equipment setting on discovery underwater.** The companion diver reported that ADR Yarwood was found to be on Oxygen mode when he was rescued (which is contrary to the dive brief which indicated he should have been on Mixed Gas mode).²²⁴ The cylinders are not something that is checked in the companion diver drill.²²⁵

106. **Equipment setting on close down post incident.** A student was directed to close down the set by the Dive Supervisor prior to isolation.²²⁶ That student initially reported that the oxygen cylinder was 'ON' and reported the number of turns to close. However, when 'the trick' became public knowledge the individual confessed that the Oxygen cylinder was found in the 'OFF' position. The student explained the original cover up of this information was to protect ADR Yarwood as he assumed Yarwood was going to survive, but realised once he had passed, that keeping this a secret was not protecting anyone.²²⁷

107. **Other variations to this practice.** During its inquiry the Court heard multiple theories and explanations for the tank being turned off other than ADR Yarwood turning this off himself. These included propositions that the oxygen tank was deliberately turned off by instructor before entering the water, or deliberately turned off by another student underwater.²²⁸

108. The Court heard no evidence in support of any of these different theories from any of the students or staff from the Dive School. The Head of School stated the only time any cylinder is turned off is part of an emergency drill conducted during Surface Supplied Breathing Apparatus diving. This action is designed to prompt the diver to switch to a bail-out breathing option.²²⁹ There is no such drill for rebreather diving.

109. The only other evidence of note the Court received was recalled by one of the students when, prior to entering the water, the instructor called for the students to go 'on gas' and he discovered his cylinder was off. He turned it back on assuming it was a simple mistake.²³⁰ Given the instructor called for the gas check prior to entering the water the Court agreed the most likely cause of this was an error.

110. Further supporting this view is the analysis of ADR Yarwood's oxygen cylinder, during independent equipment testing on 2 April 2019. This showed an eight bar reduction in pressure, suggesting ADR Yarwood's tank had been on for a portion of the dive.²³¹

²²⁴ Witness 19, Page 5, Line 10.

²²⁵ NZBR 45 Article 0339 AL 39 13 March 2018.

²²⁶ Witness 17, Page 11, Line 39.

²²⁷ Witness 21, Page 12, Line 6 -13.

²²⁸ Witness 26, Page 4, Line 38; Witness 27, Page 7, Line 18.

²²⁹ Witness 13, Re-interview, Page 16, Line 32-38.

²³⁰ Witness 33, Page 5, Lines 29-34.

²³¹ Witness 6, Exhibit V, Flag 14.

111. The Court considered the possible scenarios against all of the evidence received. On consideration of the possibilities the Court determined that most likely scenario was ADR Yarwood turned off his own cylinder whilst underwater to either conserve gas, mitigate the risk of oxygen toxicity and/or the risk of discovery. The Court believes the likely motivating factor was a perceived pressure or need to increase his dive endurance. This lack of judgement was aggravated by a lack of knowledge, and the possibility of fatigue. The elements of each of these are outlined below.

112. **Pressure to increase endurance.** There was a focus on increasing endurance underwater during the course,²³² and a variety of accounts of how this was impressed upon the students were put forward. Some said they were advised it would happen in time while others felt it was a more pressing objective to achieve. The Dive Supervisor stated he had raised the issue as a learning point.²³³ There was no set assessment for endurance times on the LAR7000 rebreather set however, instructors wanted to see that students had the ability to utilise the set to its capacity.²³⁴

113. ADR Yarwood was specifically advised by instructors that he needed to increase his endurance, and was known on the course for having the lowest dive times.²³⁵ The students stated they were all trying to do the best on course and wanted to prove themselves and impress the Instructors.²³⁶ Students suggested that it made the instructors happy if they got more minutes.²³⁷ One other student hinted that the motivation was also to avoid remedial exercise for all course members which had been an outcome of poor endurance in the recent past.²³⁸ Remedial training for poor endurance was not unique to this course and this was also mentioned by a student on a previous course.²³⁹

114. On questioning, many of the students were unsure about the exact techniques they could use to increase their own endurance on a constant flow setting. Some stated it was about fitness, managing fatigue and monitoring breathing,²⁴⁰ whereas others stated they were confused about how to improve endurance.²⁴¹ The instructors stated it was about being relaxed under water and controlling your breathing.²⁴²

²³² Witness 11, Page 9, Lines 28-29; Witness 13, Page 20, Lines 35-37.

²³³ Witness 17, Page 15, Line 20.

²³⁴ Witness 17, Page 15, Lines 7-14; Witness 13, Re-interview, Page 8, Lines 32-34.

²³⁵ Witness 23, Page 6, Lines 31-35; Witness 17, Page 18, Lines 8-11.

²³⁶ Witness 21, Page 5, Lines 29-30.

²³⁷ Witness 19, Page 15, Line 11; Witness 22, Page 12, Lines 28-30.

²³⁸ Witness 21, Page 7, Lines 17-18.

²³⁹ Witness 31, Page 4, Lines, 22-23, 33.

²⁴⁰ Witness 22, Page 11, Lines 22-33.

²⁴¹ Witness 23, Page 7, Line 6-9.

²⁴² Witness 17, Page 15, Lines 25-27.

115. The Dive Medical Specialist, suggested this action could have been the result of an 'innocence of ignorance', whilst describing it as 'extraordinary and unbelievably dangerous'. He felt it could be a hidden danger with highly motivated young males in particular. He went on to say 'they just try anything to appear to be good at what they're doing and being good at diving is sometimes interpreted as using the least gas. He also suggested the way we do business sometimes inspires perverse competitive behaviour that can result in events such as this'.²⁴³

116. Overall, the Court found, when it came to dive endurance the student's and instructor's priorities were not aligned. The students felt significant pressure to increase their dive times quickly whereas the instructors felt this was a secondary aim to gaining familiarity and the increased endurance would come with time.²⁴⁴ The students were aware of the goal, and due to their desire to perform they were keen to impress the instructors, so they looked for ways to expedite the progress.

117. As a slightly older, experienced Sailor, ADR Yarwood most likely felt this pressure to improve more than the other students. The Court has heard he had worked hard on his physical abilities, took this dive training very seriously, was academically talented and was always keen to be the best.²⁴⁵ It is the Court's opinion his relatively poor dive endurance is likely to have weighed on him heavily.

118. **Fatigue.** Refer to TOR 1.6 and 1.8 for findings on fatigue in the 72 hours prior and leading up to the night dive on 25 March 2019.

119. **Training compression.** The training material for LAR7000 outlines training is progressive, commencing with Oxygen then moving to Mixed Gas tuition over a period of eight weeks (40 working days).²⁴⁶ The course commenced tuition on the LAR7000 in week two, and they were on day one of week four commencing the endurance/consolidation phase of the course when the incident occurred. The approach of Crawl, Walk, and Run²⁴⁷ was used during the course – although the course programme suggests this approach is done over a short timeframe of two weeks.²⁴⁸ The Dive Head of School suggested this reduction in time was justified as there is much repetition in each of these learning outcomes between the two modes of operations (oxygen and Mixed Gas).²⁴⁹ It is unclear if the Dive School Governance was aware or had approved this compression of the training time.

120. The Court believes the correct analysis may not have been applied to the syllabus in use at the time of the incident.

²⁴³ Witness 29, Page 7, Lines 3-11.

²⁴⁴ Witness 17, Page 15, Lines 18-20; Witness 18, Page 12, Lines 17-25.

²⁴⁵ Witness 17, Page, 27, Line 2; Witness 26, Page 3, Lines 3-4.

²⁴⁶ Witness 6, Exhibit W, Flag 18.

²⁴⁷ Witness 2, Page 30, Line 18.

²⁴⁸ Witness 13, Exhibit MM.

²⁴⁹ Witness 13, Re-interview, Page 5, Lines 14-17.

Harm Sustained

TOR 3.2 What harm was sustained by the deceased or any other person?

121. ADR Yarwood's time of death is recorded at 1652 on 26 March 2019.²⁵⁰ The Coronial Autopsy Report states the Principle Pathological Findings as:²⁵¹

- i. Hypoxic Ischaemic Encephalopathy (terminal)
- ii. Lungs
 - 1. Bilateral congestion and Oedema
 - 2. Early Pneumonia (terminal)
- iii. Heart:
 - 1. Macroscopically and microscopically within normal limits.
- iv. Toxicology:
 - 1. No Alcohol Detected
 - 2. Caffeine (was the only drug) detected in Blood

122. The Court inquired into the Dive Medical specialist opinion on the pneumonia finding. He pointed out that people in the community would associate pneumonia normally with a bacterial infection. However, in his opinion there are multiple reasons why, one day after the event, inflammatory change could occur in the lungs such as saltwater aspiration or aspiration of gastric contents for example. He reiterated that this was purely his opinion based on the context of the case, that whilst it was an interesting observation he didn't believe it was contributory to the causal chain of events in this setting.²⁵²

123. There was blood found in the mouth on removal of the mouthpiece of ADR Yarwood and during medical efforts to revive ADR Yarwood.²⁵³ The Dive Medical Specialist reviewed the final autopsy report and proposed a number of potential sources of the bleeding such as trauma associated with removal of the mouthpiece, insertion of the OPA or ascent barotrauma. He concluded that none these are likely to have contributed to the cause of death.²⁵⁴

124. The Court heard concerns from the family of ADR Yarwood that the hospital advised ADR Yarwood was likely to have been without oxygen for 18 minutes to have sustained the type of brain injury observed.²⁵⁵ The Diver Medical Specialist was unable to ratify this opinion. He explained there is no method of accurately assessing the amount of time an individual is without oxygen based on the damage sustained to a brain. He offered an explanation that the hospital staff may have provided an

²⁵⁰ Witness 32, Exhibit AAA, Flag 4.

²⁵¹ Witness 39, Exhibit PPP, Flag 6.

²⁵² Witness 29, Re-interview, Page 4, 23-39, Page 5, Lines 1-2

²⁵³ Witness 10, Page 4, Lines 19-20

²⁵⁴ Witness 29, Re-interview, Page 5, Lines 20-39, Page 6, Lines 1-10.

²⁵⁵ Witness 27, Page 12, Line 28.

estimation of the sense of lack of oxygen to the brain.²⁵⁶ However, he also stressed if we accept that that estimate is in some way true, it doesn't mean that appropriate attempts to provide oxygen were not occurring.²⁵⁷

125. The Court spent considerable effort accounting for time, looking for possible time delays and calculating possible 'time to recovery from the water'. The Court makes the following observations related to timings:

- a. The instructors suggest they were aware of the movement of the floats marking each of the six divers at all times.²⁵⁸ However, in reviewing the timings it is possible, by coincidence, that Team One and ADR Yarwood in Team Two got into difficulties at around the same time. The instructors then focused on the more visible tangling of surface lines in Team One which prompting the Dive Supervisor to activate the DRS to bring all of the students to the surface.²⁵⁹
- b. This situation could have been aggravated by the position of ADR Yarwood as the roving diver. If ADR Yarwood lost consciousness close to the end of the jackstay, his team would not have discovered him until they had made the turn and started to return. Likewise, it would have been less obvious to the instructors that his marker was not in-line with his peers.
- c. The use of the DRS may have also masked the issue to the instructors. One instructor reported observing the float markers of Team Two coming together prior to surfacing,²⁶⁰ an expected action, that would not have exposed ADR Yarwood's lack of movement as a point of alarm.
- d. It was suggested by one witness, after discussion with the student who completed the companion diver drill, that it is possible that ADR Yarwood could have been unconscious for up to 15 minutes before he was brought to the surface.²⁶¹ This timing is based on a combination of the time to discovery and time to bring him to the surface.
- e. On, hearing the DRS the Companion Diver moved to the middle of the search area following the snag line. He stated he heard a noise from what he thought was ADR Yarwood just prior to discovery, and eventually came across him still on the bottom.²⁶² Initially the Companion Diver thought ADR Yarwood was 'messing around', so he attempted to communicate with him. However, in zero visibility this was difficult. Upon realising he

²⁵⁶ Witness 29, Re-interview, Page 7 Lines 13-30

²⁵⁷ Witness 29, Re-interview, Page 7, Lines 31-33

²⁵⁸ Witness 17, Page 9, Line 12-17.

²⁵⁹ Witness 17, Page 10, Line 1-10; Witness 18, Page 5, Line 35-40.

²⁶⁰ Witness 18, Page 5, Lines 38-39.

²⁶¹ Witness 22, Page 6, Lines 13-20.

²⁶² Witness 19, Page 4, Lines 7-9

was unconscious the Companion Diver drill was carried out by feel and ADR Yarwood brought to the surface. This was described to the Court as being extremely difficult as ADR Yarwood was quite heavy when compared to the Companion Diver.²⁶³

- f. ADR Yarwood was brought to the surface unconscious and not breathing. He was tangled in various lines that required cutting prior to moving him onto the safety boat and to the pontoon.²⁶⁴ Once on the pontoon first aid CPR was given as explained in TOR 3.3. However, despite the best efforts of the medical staff, and possibly due to the blood present, further time passed before a consistently clear airway was established.²⁶⁵

126. In terms of any wider harm, there was no physical harm of other personnel disclosed to the Court. More generally the Court observed the incident has been felt by the majority of both direct and indirect witnesses that were seen by the Court. Some personnel had experienced emotional/psychological trauma post event, but all indicated they were receiving assistance and support.

Medical support administered

TOR 3.3 What actions were taken to provide medical support to the deceased? Were these actions conducted by appropriately qualified personnel and in accordance with best practice for the type of injuries?

127. On completion of the Companion Diver Drill and once on the surface ADR Yarwood was loaded onto the rescue boat by the Dive Supervisor and the Standby Diver and had his equipment removed.²⁶⁶ The Standby Diver attempted to bring ADR Yarwood back to consciousness without success.²⁶⁷ At this time the boat returned to the Dive pontoon without delay.²⁶⁸ Once on the pontoon, the Standby Diver checked for a pulse, attempted to clear the airway, and commenced CPR. The Standby Diver advised that maintaining an airway was a challenge as there was a significant amount of blood coming from ADR Yarwood's mouth.²⁶⁹ The Medic then inserted an Oropharyngeal Airway (OPA) device and a non-rebreather mask²⁷⁰ upon returning from retrieving her equipment from the Dive School. The Dive Supervisor retrieved the Automated External Defibrillator (AED) from the safety vehicle.

²⁶³ Witness 19, Page 4, Line 11.

²⁶⁴ Witness 17, Page 10, Lines 22-25.

²⁶⁵ Witness 18, Page 6, Lines 18-20; Witness 39, Exhibit PPP, Flag 3.

²⁶⁶ Witness 17, Page 10, Line 19.

²⁶⁷ Witness 18, Page 6, Lines 7-10.

²⁶⁸ Witness 17, Page 10, Lines 27 & 36.

²⁶⁹ Witness 18, Page 6, Lines 18-20.

²⁷⁰ Witness 10, Page 4, Lines 10 – 13; Witness 10 Exhibit JJ

128. A call was made to the emergency services by the Dive Supervisor and he remained on-line with that call until ambulance staff arrived.²⁷¹ The Medic and Standby Diver continued attending ADR Yarwood, utilising students for specific tasks when required. It was noted that maintaining the airway, even with the OPA, continued to prove difficult due to the blood coming from his mouth.²⁷² The Medic and Standby Diver then inserted an intravenous line in preparation for ambulance staff arrival to allow for expedited treatment. An AED was fitted to the patient but the patient's heart rhythm was deemed un-shockable by the AED. This was confirmed as expected in cases of cardiac arrest produced by hypoxia by the Dive Medicine Specialist, and the RNZN Doctor.²⁷³ The New Zealand Fire Service arrived and assisted the RNZN team until the ambulance staff arrived shortly after and took over treatment shortly. The ambulance staff intubated ADR Yarwood, drugs were administered and this eventually resulted in a 'Return of Spontaneous Circulation'.²⁷⁴ From there ADR Yarwood was transported to the hospital. The RNZN Medic accompanied him in the ambulance.

129. A report from one of the attending Ambulance Officer's stated he assessed the CPR provided by the RNZN personnel to ADR Yarwood as effective.²⁷⁵ The medical actions on the night described by witnesses were considered appropriate by the Dive Medicine Specialist and the Navy Doctor for an event of this nature.²⁷⁶ This was further supported by a measurement of the amount of CO₂ being exhaled by ADR Yarwood when the Ambulance staff arrived. This was assessed as high and indicative of effective CPR.²⁷⁷ The Dive Medical Specialist's view was that it was easy to be critical of medical treatment once the outcome is known. However, he stated the reality of CPR in the field environment is that there is a low success rate and the fact that the outcome wasn't good should not, in his opinion, necessarily be appointed to the medical effort that was delivered.²⁷⁸ He also outlined the challenges in delivering medical treatment when someone is found profoundly hypoxic in that it is a challenging start point.²⁷⁹

130. The Medic outlined that there was a review by staff at the Defence Health Organisation post-accident to determine whether there was any other equipment that the medic could have had which may have been useful on the night.²⁸⁰ The only item identified, which may assist a patient with blood obstructing their airway, is a Suction Unit. This idea was supported by the RNZN Doctor who made mention of utilising suction when clearing an airway.²⁸¹ However, on balance, given its size and likely

²⁷¹ Witness 17, Page 11, Line 20.

²⁷² Witness 10, Page 4, Lines 18-20.

²⁷³ Witness 29, Page 14, Line 14; Witness 20, Page 4, Line 36.

²⁷⁴ Witness 10, Page 4, Line 30.

²⁷⁵ Witness 39, Exhibit PPP, Flag 3.

²⁷⁶ Witness 20, Page 5, Lines 22-27; Witness 29, Re-interview, Page 6, Lines 14-34.

²⁷⁷ Witness 39, Exhibit PPP, Flag 3.

²⁷⁸ Witness 29, Page 14, Lines 3-6.

²⁷⁹ Witness 29, Re-interview, Page 7, Lines 31-40

²⁸⁰ Witness 10, Page 9, Line 11.

²⁸¹ Witness 20, Page 5, Lines 23-24.

rate of utilisation it was not deemed something to be included in future medical packs.²⁸²

131. In summary, the Court heard no evidence to suggest inappropriate medical treatment contributed to the harm ADR Yarwood sustained. Once discovered, he was brought to the surface and the appropriate first aid was applied despite the difficult circumstances the individuals faced in both recovery underwater and responsiveness to treatment. The Dive Medical Specialist reviewed the treatment provided at the scene by medical services and the RNZN Medic, in his opinion the appropriate medical treatment was provided in challenging circumstances and given the likely hypoxic state.²⁸³

Recovery and Emergency Response

TOR 3.4 Describe the recovery and emergency response to the event?

132. The following covers the recovery and emergency response which commences at the time the companion diver surfaces with ADR Yarwood and ends on securing of the scene at approximately 0400 26 March 2019.

Time (Approx.)	Description
2145 ²⁸⁴	Companion Diver Surfaces with ADR Yarwood. Companion diver inflated ADR Yarwood's buoyancy compensator, switched to atmosphere, closed bubble diffuser, inflated counter lung and splashes water indicating distress. ²⁸⁵
	Diver Supervisor and Standby Diver bring boat alongside the diver – an entangled line on ADR Yarwood is cut. ²⁸⁶
	ADR Yarwood is loaded on the boat/ Standby diver checks responsiveness. ADR Yarwood is unconscious and not breathing. ²⁸⁷
	Boat returns ADR Yarwood to Dive pontoon. Remaining Student divers in the water inflate their buoyancy compensators and swim back to pontoon. ²⁸⁸

²⁸² Witness 10, Page 11, Lines 24-25.

²⁸³ Witness 29, Re-interview, Page 7, Lines 31-40

²⁸⁴ Witness 6, Exhibit V, Section 1, Flag 5.

²⁸⁵ Witness 17, Page 10, Line 19; Witness 19, Page 4, Line 27.

²⁸⁶ Witness 17, Page 10, Lines 19-24.

²⁸⁷ Witness 17, Page 10, Lines 26-27.

²⁸⁸ Witness 17, Page 10, Lines 30-31, 36.

	Standby Diver starts CPR. ²⁸⁹
	Medic starts airway management – breathing bag and inserts Oropharyngeal tube. ²⁹⁰
2152 ²⁹¹	Dive Supervisor calls 111 emergency services ²⁹²
	Continuation of CPR. (AED fitted but not shockable, IV line prepared and inserted) ²⁹³
	Student secures the boat ²⁹⁴
2159 ²⁹⁵	Fire and Emergency arrive ²⁹⁶
2200 ²⁹⁷	Ambulance arrives
2201	Ambulance arrive (111 call ends 10.15 minutes after initial call ²⁹⁸) Ambulance crew take over patient care – CPR ²⁹⁹
	Officer of the Day receives call from main gate and heads to the scene. ³⁰⁰
2205 ³⁰¹	Officer of the Day arrives
	Dive Supervisor rings Dive Head of School and requests assistance with enacting reporting requirements. ³⁰²
2208 ³⁰³	Intensive Care Paramedic arrives and takes over patient care – adrenalin applied. ³⁰⁴
2212 ³⁰⁵	Dive Head of School arrives.
2216 ³⁰⁶	NZ Police arrive. ³⁰⁷
2220 ³⁰⁸	Dive set isolated and transported to head of school office. ³⁰⁹

²⁸⁹ Witness 18, Page 6, Line 20.

²⁹⁰ Witness 10, Page 4, Lines 10-11.

²⁹¹ Witness 39, Exhibit PPP, Flag 3; Witness 39, Exhibit QQQ, Flag 4.

²⁹² Witness 17, Page 11, Lines 20-21.

²⁹³ Witness 18, Page 6, Lines 26-29; Witness 10, Page 7, Lines 13-15.

²⁹⁴ Witness 11, Page 18, Line 9.

²⁹⁵ Witness 40, Exhibit RRR

²⁹⁶ Witness 10, Page 4, Line 26.

²⁹⁷ Witness 39, Exhibit PPP, Flag 3; Witness 40, Exhibit RRR.

²⁹⁸ Witness 39, Exhibit PPP, Flag 4

²⁹⁹ Witness 10, Page 4, Lines 28-30.

³⁰⁰ Witness 3, Page 2, Line 32.

³⁰¹ Witness 40, Exhibit RRR

³⁰² Witness 17, Page 12, Lines 28-30.

³⁰³ Witness 40, Exhibit RRR

³⁰⁴ Witness 39, Exhibit PPP, Flag 3.

³⁰⁵ Witness 39, Exhibit PPP, Flag 5

³⁰⁶ Witness 39, Exhibit QQQ, Flag 5; Witness 40, Exhibit RRR

³⁰⁷ Witness 17, Page 13, Lines 9-10.

³⁰⁸ Witness 40, Exhibit RRR

³⁰⁹ Witness 13, Page 15, Lines 30-33.

2228 ³¹⁰	Ambulance departs the scene.
2230 ³¹¹	Pulse regained and patient taken to North Shore Hospital (Navy medic in attendance)
2230 ³¹²	Duty Executive Officer arrives at the Scene
2313 ³¹³	Ambulance arrives at North Shore Hospital
2318 ³¹⁴	CO PHILOMEL travels to North Shore Hospital
2320 ³¹⁵	Chaplain arrives at scene
2325 ³¹⁶	Duty Military Police arrive
	Personnel involved complete post incident actions
2340	NZ Police CIB arrive conduct interviews with personnel ³¹⁷
0135 ³¹⁸	NZ Police conduct detailed scene inspection
0330-0400	Scene released and personnel started disbanding ³¹⁹

Variations in details

133. The Court established a timeline of activity to construct the recovery and emergency response picture based on CCTV footage, exhibits presented, and witness statements. There were some variations in reported arrival times and sequence of personnel movements. However, the Court found that the focus was clearly on the patient and the arrival of a number of key personnel within a 15 minute period created a dynamic environment and the variation in recollections is therefore not surprising. The Court found the sequence of events, and direct contact with emergency services by the Dive Supervisor, meant the immediate duty personnel (such as the Philomel Officer of the day and duty watch) were not the first on the scene as is normally expected to assist with scene management. The Dive Supervisor was fully engaged on the phone and directing action close to the scene.

³¹⁰ Witness 39, Exhibit QQQ, Flag 5; Witness 40, Exhibit RRR.

³¹¹ Witness 32, Exhibit AAA, Flag 1.

³¹² Witness 4 Exhibit Q.

³¹³ Witness 39, Exhibit PPP, Flag 3.

³¹⁴ Witness 32, Exhibit AAA, Flag 1.

³¹⁵ Witness 32, Exhibit AAA, Flag 1.

³¹⁶ Witness 32, Exhibit AAA, Flag 1.

³¹⁷ Witness 32, Exhibit AAA, Flag 1.

³¹⁸ Witness 39, Exhibit PPP, Flag 3.

³¹⁹ Witness 32, Exhibit AAA, Flag 2.

TOR 4 - EQUIPMENT

Equipment in Use

TOR 4.1 What equipment was the deceased wearing, carrying or using at the time of the incident?

134. The deceased was wearing the following equipment during the time of the incident³²⁰:

- a. LAR7000 rebreather (S/N N11)³²¹
- b. 2x Gas Bottles – 1 Oxygen #22 & 1 Nitrox #6³²²
- c. APEK Buoyancy compensator BB225953
- d. Diving mask
- e. Black navy wetsuit - 2 piece
- f. Black dive fins
- g. Black Sequel dive boots
- h. Black Prosafe gloves
- i. Black colour digital Casio watch
- j. Knife – black handle
- k. Knife in sheath – black handle
- l. Blue rope
- m. Black New Balance shorts

135. All this equipment was removed on the night of 25 March 2019 and remains in the custody of the NZ Police.

Status of Introduction into Service

TOR 4.2 Was all of the equipment introduced into service, and what state of operational release was it at?

136. The LAR7000 was not yet fully introduced into service at the time of the incident. It was at the Trials and Development stage and in the process of progressing requirements to achieve interim operational release.³²³ A Safety Case was completed with the view of identifying risks in relation to LAR7000 use and operations and is addressed at TOR 4.8.

137. The equipment was being operated and maintained under a waiver pending the process of introduction into service to be completed. The RNZN 2180 series of documents is the mechanism used to for the Seaworthiness Authority to make and record seaworthiness decisions.³²⁴

³²⁰ Witness 6, Exhibit V, Section 3, Flag 10.

³²¹ Witness 6, Page 6, Line 3.

³²² Witness 6, Exhibit V, Section 2, Flag 1&2.

³²³ Witness 1, Exhibit G.

³²⁴ Witness 14, Page 7, Lines 19-20.

138. The Court received a series of three RNZN 2180 Forms as evidence for the Very Shallow Water Rebreather System (which includes LAR7000 plus associated components AEGIR 59 vest and ballistic protection and Emergency Breather Inflation System).³²⁵ The first (RNZN 2180/03 February 2018) sought permission to use the system for in-water training and development dives. This request was not approved and direction provided to complete the Technical Management System to reflect the requirements of NZDF equipment assurance and risk appetite. The subsequent remediation was undertaken and approval given 21 March 2018.

139. Outside, but related to the process, was a series of emails commencing 30 August 2018 referring to discussions and considerations in the use of the LAR7000 by trainee students. There were concerns raised by the Commander Naval Specialist Training that the seaworthiness process had not fully considered the use of this equipment in the Dive Training School environment, and the initial RNZN 2180/03 had not clearly stated the equipment would be used on students new to re-breather diving.³²⁶ Some of the issues raised included the risk assessment conducted which had not explicitly considered the use of the LAR7000 in the Dive School and had focused on training in the operational diving area. The other issue raised was the lack of fit for purpose training material on the LAR7000.

140. On 31 August 2018 the Maritime Regulator directed that the LAR7000 equipment cease to be used at the Dive Training School. It was determined that the RNZN 2180/03 and 2180/03/1 were not applicable to the use of the equipment at the Dive Training School. A pathway to resuming training at the Dive School would not occur until Initial Operational Release, training materials were developed and an assurance assessment be made as to resume use on the Able Diver Course.³²⁷

141. The Technical Seaworthiness Authority report, on completion of an investigation into the remediation requirements completed, confirmed that course materials had been created and the operational risk matrix updated. It also recommended that Diver training at the Dive School recommence. This was subsequently approved on 27 September 2018.³²⁸ It is unclear why the decision was then made to recommence before Initial Operational Release but it is possible further commentary outside the seaworthiness process exists. The Court also heard evidence to suggest dated training material remained in use (at least in part) on the ADR course 2019.³²⁹

142. The final of the series RNZN 2180/03/02 dated February 2019 sought approval to allow the operational use of the LAR7000 upon authorisation of Interim

³²⁵ Witness 1, Exhibit G.

³²⁶ Witness 9, Exhibit EE & FF.

³²⁷ Witness 9, Exhibit FF.

³²⁸ Witness 9, Exhibit GG.

³²⁹ Witness 17, Re-interview, Page 7, Line 23.

Operational Release. This form remained unsigned by the final signature at the time of the incident although, it had gone through most of the process.³³⁰

143. In this final form issues were raised in the training section with respect to problems with the LAR7000 equipment. However, on questioning the Court found these were historical issues from early to mid-2018, mainly relating to the bubble diffuser, which had since been resolved by the Original Equipment Manufacturer. The front of the form also specifically mentions that coverage of the 2180/03 and 2180/02/1 does include trainees at the Dive School which is counter to the direction given in the email discussion which specifically expressed that those documents didn't provide coverage.³³¹

144. Overall the Court found the information in the RNZN 2180 process and the decisions that these forms lead to were unclear in parts. In particular, it was not clear if, in the approval process, all parties were in alignment with respect to the coverage (in this case using the LAR7000 on trainee divers) and who had agreed and been informed of that decision. This seemed to occur outside the process. It is acknowledged that the Court's assessment is purely on the documentary evidence received by the Court and interviews with only some of the parties that will have been involved. It was also the Court's opinion the risks that are considered as part of this process should be stated in a more explicit manner and a better linkage between safety reporting achieved.

Safety equipment present

TOR 4.3 What safety equipment was present?

145. The safety equipment present at the time of the incident included:

- a. Safety Boat;³³²
- b. Safety Vehicle³³³
- c. Diver Recall System;³³⁴
- d. Floats (individual line and float to each diver);³³⁵
- e. Safety Vehicle;³³⁶
- f. Oxy-viva; ³³⁷
- g. Medics Medical bag; and ³³⁸
- h. AED (in the safety vehicle).³³⁹

³³⁰ Witness 2, Page 2, Line 31; Witness 2, Page 3, Line 11.

³³¹ Witness 9, Exhibit FF.

³³² Witness 18, Page 4, Line 6.

³³³ Witness 17, Page 11, Line 13.

³³⁴ Witness 18, Page 5, Line 36.

³³⁵ Witness 18, Page 13, Line 17.

³³⁶ Witness 10, Page 4, Line 11.

³³⁷ Witness 18, Page 4, Line 6.

³³⁸ Witness 10, Page 3, Line 09.

³³⁹ Witness 10, Page 4, Line 11.

Post-incident equipment examination findings

TOR 4.4 What post-incident examination was undertaken of any or all equipment, what did it find?

146. A full examination of the LAR7000 equipment utilised by ADR Yarwood was undertaken on Tuesday, 2 April 2019 at the Dräger premises.³⁴⁰

147. This testing involved all interested parties including New Zealand Police, Director of Diving Safety and Standards (RNZN), Maritime Test and Evaluation Authority (RNZN), NZDF Safety Investigations Manager (RNZN), Professor Simon Mitchell, WorkSafe, Dräger New Zealand and two Dräger specialists from Germany. The Court has heard evidence from parties present at the testing, and the consistent message is that an objective and robust equipment check was conducted.³⁴¹

148. The assessment began with an explanation of the operating principles of the LAR7000 for all present and then an examination was conducted on two sets of equipment. Firstly, a fully serviceable set from the LAR7000 equipment pool and then the LAR7000 set (S/N N11³⁴²) ADR Yarwood was wearing at the time of the incident (with cylinders still attached).

149. The checks included:

- a. Visual inspection, (including an assessment of all of the adjustable levers and valves);
- b. weighing the unit;
- c. measuring the various cylinder pressures;
- d. analysis of gas content (samples taken and sent to the Institute of Environmental Science and Research (ESR)); and
- e. functional checks
 - i. pressure checks
 - ii. flow rate checks
 - iii. leakage checks

150. The assessment concluded the equipment was operable and safe to use.³⁴³

³⁴⁰ Witness 6, Exhibit V, Flag 14.

³⁴¹ Witness 6, Page; Witness 29, Page 3, Line 32-33.

³⁴² Witness 6, Page 6, Line 3.

³⁴³ Witness 6, Exhibit V, Section 3, Flag 14.

151. The New Zealand Police also took gas samples and other biological samples during this testing. The results of the testing did not uncover anything significant.³⁴⁴

Equipment contribution in the incident

TOR 4.5 Did the equipment contribute in any way to the incident?

152. The Court has not found any evidence to suggest the equipment itself contributed to the incident. The evidence the Court received indicated all equipment (including supporting equipment) was serviceable:

- a. ADR Yarwood's equipment (LAR7000 S/N N11) had completed annual service and preventative maintenance on 30 January 2019 and a test Certificate was issued.³⁴⁵
- b. Cylinder refilling equipment - Haskell Air Driven Booster had received its 36 month major overhaul (which includes O2 cleaning and pressure testing) 14 September 2018 and Certificate of Conformance issued.³⁴⁶
- c. Gas Testing - Oxygen occurred 2 July 2018 and 60/40 Nitrox mix tested and sensor calibrated 18 January 2019.³⁴⁷

NZDF safety incidents involving LAR7000

TOR 4.6 Has this equipment been involved in any other safety related incidents in the NZDF?

153. The LAR7000 has had five reported occurrences through the Naval Safety, Health and Incident Reporting system.³⁴⁸ Two of the incidents are reported from the operational environment and three from the training environment:

- a. 5/4/18 Bubble diffuser issue – HMNZS Matataua.
- b. 25/5/18 Bubble diffuser issue – Dive Training School.
- c. 10/7/18 Trouble breathing on ascending – HMNZS Matataua (during Force Integration Training RIMPAC 18).
- d. 10/10/18 Water ingress into soda lime – Dive Training School.

³⁴⁴ Witness 39, Exhibit PPP

³⁴⁵ Witness 8, Exhibit AA.

³⁴⁶ Witness 8, Exhibit BB.

³⁴⁷ Witness 8, Exhibit BB.

³⁴⁸ Witness 7, Exhibit X.

e. 11/10/18 Bubble diffuser issue – Dive Training School.

154. On 26 April 2018 the Maritime Regulator endorsed DDSS direction to stop diving on the LAR7000 in mixed gas mode. This was after three separate incidents caused by a faulty over pressurisation valve (OPV) in the bubble diffuser of the LAR7000 set. This stoppage was to remain in place pending investigation by the Original Equipment Manufacturer (OEM).³⁴⁹

155. The investigation concluded the fault was caused by a manufacturing issue, however in the interim (07 June 2018) the OEM sent replacement OPVs that were of a different manufacturing batch but the original design.³⁵⁰ Although, not clear to the Court it appears these replacement OPVs were received to allow deployment to the 2018 Force Integration Training exercise at Exercise RIMPAC. At this exercise there was an additional incident that again implicated the OPV fault.³⁵¹ The exact cause remained unknown as equipment was not assessed by the OEM and it was deconstructed and cleaned to meet customs and quarantine regulations for return to New Zealand.³⁵² The N-SHAIR report for the RIMPAC incident was not signed off on the system until late March 2019 due to NSHAIR access issues.³⁵³

156. Investigations with the bubble diffuser identified the OPV housing, provided by a third party to the OEM, was outside the repair product specifications.³⁵⁴ All NZDF valves were replaced and went through acceptance testing on 25 and 29 September 2018.³⁵⁵ This has appeared to resolve the issue. One further incident related to the bubble diffuser has occurred since then (11/10/18), however, this was understood to be caused by operator error.³⁵⁶

157. The Court found it difficult when reviewing the evidence presented, to follow the process that was utilised to provide assurance of safety at each stage. This may indicate better integration is needed between people and the processes involved in safety reporting. Also consideration as to the link between safety reporting and the seaworthiness process when RNZN 2180's are in existence.

³⁴⁹ Witness 7, Exhibit X, Flag 1.

³⁵⁰ Witness 2, Page 9, Line 26-29; Witness 2, Exhibit J, Flag 1.

³⁵¹ Witness 8, Page 14, Lines 1-2.

³⁵² Witness 8, Page 14, Lines 6-15.

³⁵³ Witness 7, Page 4, Lines 3-10.

³⁵⁴ Witness 37, Exhibit DDD.

³⁵⁵ Witness 2, Exhibit J, Flag 2.

³⁵⁶ Witness 9, Page 9, Lines 6-13.

International safety incidents involving LAR7000

TOR 4.7 Has this model of equipment been involved in similar incidents by other international military users?

23. The LAR7000 is understood to be in use by armed forces in Europe, America, Asia and Africa. The Court sought evidence of any known incidents involving the LAR7000 internationally by questioning key witnesses involved in the introduction into service, safety, supply of equipment and also dive medical personnel. It did not find any evidence of equipment safety issues or incidents with this model of equipment.³⁵⁷ Additionally, the OEM advises they are not aware of any safety incident, injury or death of a diver using LAR7000 internationally.³⁵⁸

Safety of LAR7000 in operations and/or training

TOR 4.8 Is it safe for the NZDF to continue use of this equipment in both operations and/or training? If not, why not?

158. An Operating Safety Case was completed for the LAR7000 in 2018 (Version 1.11).³⁵⁹ Version 1.11 was signed off in 11 July 2018 by Assistant Chief of Defence Force (Capability). The Safety Case outlines its objectives as follows:

159. The primary objectives of the safety case report are to:

- a. Demonstrate that the safety risks associated with the use of the Very Shallow Water dive system have been eliminated or minimised so far as is reasonably practicable (SFAIRP) and are tolerable.
- b. Provide effective control of transfer of safety responsibility.
- c. Provide the framework for management of the safety case through life.

160. The safety case supports the demonstration that the Very Shallow Water dive system;

- a. Is Fit For Purpose,
- b. Is compliant with relevant regulations,
- c. Has had safety risk appropriately assessed and managed during introduction into service, and
- d. Is safe to operate.

³⁵⁷ Witness 5, Page 34, Lines 18-24.

³⁵⁸ Witness 37, Exhibit DDD.

³⁵⁹ Witness 5, Exhibit T.

161. The safety case does cover most contributing hazards and required controls. However, the Court believes consideration should be given to updating the safety case to reflect the risks new rebreather divers introduce and consider ways to mitigate these risks (e.g. Buddy Diving for new rebreather divers & Hypoxia experiential training.)

162. Evidence from the objective equipment testing conducted on LAR7000 S/N N11 2 April 2019 found the equipment to be safe. This testing is outlined at TOR 4.4.

163. Additional internal investigations by the OEM into the manufacturing, process, supply and service are reported to have shown no abnormality.³⁶⁰

164. **Operations.** The Commander of the Technical Seaworthiness Authority (TWSA) and holds the opinion that the equipment and the management of that equipment is safe for operations and the risk sits in the personnel and operation of the equipment.³⁶¹

165. It is the Court's opinion, there is no evidence to suggest the LAR7000 should continue to be restricted for operational use. However, the Court notes that experience in rebreather diving is low due to the gap in capability post the removal of the previous VIPER rebreather system from service. It is with that in mind that caution should be taken in its use in operations to ensure appropriate controls are in place. The equipment needs to strictly be used as intended, in accordance with the instructions for use and NZBR 45 policy. For this to occur all operational divers need to remain current and competent on all of the policy and procedures in place.

166. **Training.** The Dive Medical Specialist also suggests that in the early phases of your rebreather diving when inexperienced you can be vulnerable to making mistakes.³⁶² DDSS and TWSA both outlined that that diving carries risk and the only way to get experienced in the equipment is to provide good training and get students to use the equipment regularly with the appropriate supervision.³⁶³

167. The Court is satisfied policy exists, and if followed, provides identification of hazards and controls for operational diving on the LAR7000. However, when considering the relative inexperience of a new diver, where the risks are potentially greater, that same policy may need enhancement particularly, in the training environment. The Court believes that the use of LAR7000 should not be continued in the Navy Dive School environment until the recommendations at the end of the report are considered and if deemed appropriate enacted.

³⁶⁰ Witness 37, Exhibit DDD.

³⁶¹ Witness 14, Page 15, Lines 10-15.

³⁶² Witness 29, Page 16, Lines 21-22.

³⁶³ Witness 5, Page 31, Lines 1-7; Witness 14, Page 15, Lines 13-18.

REPORTING

TOR 5.1 What reporting actions, both internal and external were taken following the incident?

The following reporting actions were undertaken internally:

- a. RNZN 1333 A, B & C – Report on Unusual Diving Incident or Accident - Incident summary, Equipment involved and Witness Statements;³⁶⁴
- b. Notification of a Casualty (NOTICAS) was made to HMNZS PHILOMEL by signal from the Defence Health Organisation 25 March 2019 1140Z;³⁶⁵
- c. Sea Safety Event signal sent AC Navy Training Priority SIC B2K/LOL 2518050Z MAR 19;³⁶⁶ and
- d. Navy Safety Hazards, Accidents, and Incidents Reporting (N-SHAIR) – Incident Number 190275 at 0115 26 March 2019.³⁶⁷

168. The incident on the evening flowed up the Chain of Command commencing from the Officer of the Day informing the Duty Executive Officer. From there the following personnel were informed at different points following the incident:³⁶⁸

- a. Executive Officer, HMNZS PHILOMEL;
- b. Commanding officer, HMNZS PHILOMEL;
- c. Duty Media;
- d. Chaplain;
- e. Chief of Navy;
- f. Deputy Chief of Navy;
- g. Chief of Defence Force; and
- h. Wider Navy.

169. The following actions were undertaken to external agencies:

- a. Police, Fire and Emergency, Ambulance – Advice of an emergency was advised by Dive Supervisor who made the 111 call;
- b. Next of Kin Notification – Completed 25 March 2019;³⁶⁹

³⁶⁴ Witness 6, Exhibit V, Flag 3.

³⁶⁵ Witness 15, Exhibit OO.

³⁶⁶ Witness 32, Exhibit AAA, Flag 3.

³⁶⁷ Witness 1, Exhibit H.

³⁶⁸ Witness 32, Exhibit AAA, Flag 1, 2,4,5,6.

³⁶⁹ Witness 13, Page 12, Line 34-35; Witness 32, Exhibit AAA, Flag 1.

- c. WorkSafe – Advice of a notifiable event was sent by Health and Safety Manager (Navy) 0653 26 March 2019;³⁷⁰ and
- d. Media Release 27 March 2019.³⁷¹

OTHER

Any Other Matters

TOR 6.1 Comment on any other matters the Court considers relevant

170. Throughout the Court's investigation it received several allegations and unfavourable reports which are not considered to be directly relevant to the Court's Terms of Reference. These were directed for action outside the Court. Otherwise, the Court has attempted to only bring those issues forth that it deems are safety related or that provide visibility of opportunities for change to avoid future accidents.

171. **Substance Abuse/Theft Allegations.** During the course of evidence gathering the Court heard a number of allegations. Firstly, one of suspected substance abuse by divers (both students and operational divers).³⁷² This was deemed outside the Court's Terms of Reference and was referred to the Deputy Chief of Navy for investigation and disposal. The Court understands this was forwarded for Military Police investigation. Additionally, The Court heard of a suspected theft from ADR Yarwood's locker in the intervening time from the incident and date of securing of the locker.³⁷³ The Court understands this information was also advised to the Commanding Officer, HMNZS PHILOMEL and Military Police were investigating.

172. **Scene Security.** All initial actions on the night were focused on recovery and treatment of the ADR Yarwood. The Court heard that emergency services, police, Head of School and duty personnel all arrived at the scene in quick succession.³⁷⁴ The Court heard evidence the following was secured:

- a. Immediate area (Dive Pontoon and Dive Compound area secured by Officer of the Day (2205).³⁷⁵
- b. ADR Yarwood's Dive Set isolated and secured in the Dive Head of Schools Office (2220).³⁷⁶

³⁷⁰ Witness 6, Exhibit V, Flag 1.

³⁷¹ Witness 32, Exhibit AAA, Flag 7.

³⁷² Witness 27 Page 13, Line 3.

³⁷³ Witness 27, Page 8, Line 31-32.

³⁷⁴ Witness 13, Page 12, Line 19-22.

³⁷⁵ Witness 3, Page 3, Line 17-19.

³⁷⁶ Witness 13, Page 15, Lines 30-33.

- c. All LAR7000 Sets directed to be quarantined 27 March 2019 – Confirmation all NZDF sets secured 2 April 2019.
- d. Gas storage and filling facilities secured 27 March 2019.
- e. Soda Lime storage secured 28 March 2019.
- f. Access restricted to Chamber House 27 March 2019.³⁷⁷

173. The scene was busy with a number of personnel, both internal and external going about their duties in response to the accident. This description was consistent between both military and civilian agencies in attendance. This was verified by witnessing the CCTV footage where the Court witnessed a lot of personnel arriving on the scene within a short space of time.

174. After emergency services arrived, the Dive Head of School arrived at 2212 followed by the first police officer at 2216.³⁷⁸ The Head of School directed that the LAR7000 dive set that had been in use by ADR Yarwood was secured as is required by NZBR 45.³⁷⁹ ADR Yarwood's equipment was removed from the pontoon and secured in the Head of School's office by two students at 2220.³⁸⁰ The results were written on the whiteboard then transposed onto paper to go with the set. However, these notes were unable to be found or produced to the Court post incident.³⁸¹ It was also not included in the RNZN 1333 reporting as required.³⁸²

175. The equipment setting reported at the start of equipment testing was on Oxygen³⁸³ which is contrary to that advised in the evidence of the student who completed the companion diver drill and the student who secured the set at the scene, who stated the gas switch was on Nitrox.³⁸⁴ The Court were unable to get clarity on this paradox.

176. There are some domestic areas, such as ADR Yarwood's locker, that appear to have been overlooked or assumptions made that it was already addressed. ADR Yarwood's locker was secured on 10 April 2019.³⁸⁵

177. **Culture.** The Court received evidence suggesting the culture within the Dive Training School still has some elements where a more 'old school' approach or attitude exists, despite the introduction of the SPEaR course.³⁸⁶ The Court was left

³⁷⁷ Witness 32, Exhibit AAA, Flag 1.

³⁷⁸ Witness 39, Exhibit PPP, Flag 5; Witness 39, Exhibit QQQ, Flag 5; Witness 40, Exhibit RRR

³⁷⁹ NZBR 45, Article 0807.

³⁸⁰ Witness 40, Exhibit RRR

³⁸¹ Witness 13, Re-interview, Page 14 Lines 25-27.

³⁸² NZBR 45, Article 0807.

³⁸³ Witness 6, Exhibit V, Flag 14

³⁸⁴ Witness 21, Page 4, Line 22; Witness 19, Page 8, Lines 39-42

³⁸⁵ Witness 32, Exhibit CCC.

³⁸⁶ Witness 1, Page 4, Lines 11-23.

with an impression that the ADR Course is still perceived as a 'Right of Passage', or a proving ground where a student's mettle and fortitude is constantly tested in order prove they are worthy of becoming a Qualified RNZN Diver. The Court thinks this is to the detriment of developing a competent, technically sound and risk aware RNZN Diver. The following are examples of testimony that have led to the concern the Court holds around mind-sets still evident.

- a. **High Performance Week.** The Psychologist, that instructed the students during their high performance week, noted a perception and status that even direct entry candidates held a perception that the dive trade was elite and a very special group. She proposed that if Direct Entry candidates held this perception then it was likely the students and staff also held this opinion.³⁸⁷
- b. Post the High performance week testimony suggests that many of the principles taught were not adhered to by junior instructors, with a feeling that instead of a carefully structured adult learning environment the students were instead regularly being 'thrashed' when their performance was not up to scratch.³⁸⁸
- c. **The Diver Consolidation Log** was presented to the Court as a means of encouraging correct behaviour traits in personnel when undergoing dive training and was approved by training Governance.³⁸⁹ The Court heard it is often used, and at times was used beyond the limits prescribed.³⁹⁰ The Court heard students will do what they can to appear competent and avoid corrective action.³⁹¹
- d. **Physical Training and Mud Run.** The Able Diver Course Temporary Memorandum decreed Physical Training (PT) was to be supervised by the PT Staff only.³⁹² However, it appears this does not apply to all activities that test the student's physical abilities. The Court heard that when conducting mud runs there was no PT Staff supervision. There was no definitive reason given to the Court for this,³⁹³ which was of concern given it was widely considered one of the most physically challenging activities conducted.³⁹⁴
- e. Indicative of the undercurrent of 'old school' culture that appears to exist is the purpose and application of the mud run. The Court heard that an event

³⁸⁷ Witness 12, Page 7, Line 1-6.

³⁸⁸ Witness 25, Page 3, Lines 15-20; Witness, Page 18, Line 29.

³⁸⁹ Witness 13, Exhibit KK.

³⁹⁰ Witness 27, Page 5, Lines 1-2.

³⁹¹ Witness 33, Page 9, Lines 8-11.

³⁹² Witness 1, Exhibit B.

³⁹³ Witness 36, Page 4, 28 – 29.

³⁹⁴ Witness 11, Page 15, Lines 9-10; Witness 36, Page 4, Lines 26-27.

occurred the week of 8 March 2019 where ADR Yarwood suffered exhaustion during a mud run and pulled himself out of participating in the dive event planned immediately after. There are several issues falling out of this:

- i. The Head of School was unaware that a mud run had been conducted immediately prior to a dive and stated its sequencing created risk and served no purpose.³⁹⁵
 - ii. The heat exhaustion event that followed did not appear to be reported as a safety event.
 - iii. The purpose of the mud run, including conducting a mud run immediately before a dive does put into question the purpose, timing and transparency of all activities conducted by the Dive School. If the mud run is an integral part of the course the Court questions why it is not included in any of the approved programmes presented.
- f. **Resources.** The Court heard an allegation that the students only get to select one wetsuit and ADR Yarwood selected a winter weight suit to prepare for later in the course.³⁹⁶ It was proposed to the Court this may have contributed to the heat exhaustion he was reported to have suffered from. This was explained by the Head of School as more to do with resources as there is not enough wetsuits of every type for each diver to have a selection.³⁹⁷ The Court believes this does raise the lack of assessment of risk that is perhaps borne out of a lack of clear objectives for the activity, a desire to test the students' resilience or a combination of both.
- g. The Court also heard evidence to suggest that the school faces additional pressure accessing dive equipment and other necessary resources as they need to share these with HMNZS Matataua. The Head of School felt there was a culture where training came second, and there is yet to be an approved Memorandum of Understanding put in place to better manage equipment.³⁹⁸
- h. **Fatigue Management.** The Defence Technology Agency (DTA) report on fatigue management was cited as being a key input to the current programme.³⁹⁹ Whilst there does appear to be tuition for students in the first week on the management of fatigue, the Court did not hear any

³⁹⁵ Witness 13, Page 7, Line 6-11.

³⁹⁶ Witness 27, Page 3, Lines 26-32; Witness 26, Page 3, Lines 19-24.

³⁹⁷ Witness 13, Re-interview, Page 10, Lines 13-15.

³⁹⁸ Witness 13, Re-interview, Page 18, Lines 30-35.

³⁹⁹ Witness 1, Exhibit I; Witness 1, Page 21, Line 1-5.

evidence on how the principles of fatigue are applied in developing and enacting the course programme. With evidence suggesting not all physical activities are disclosed in the programme, (or additional injected along the way) suggests the principles may not be fully accepted. This is supported by the lack of objective measures and active instructor fatigue management evident to the Court.

- i. Fatigue management appears to be predominately self-assessment and following of the general rule to provide six hours rest a night.⁴⁰⁰ The Court heard from several witnesses that students are briefed that if they had any issues (are not well) then it is up to them to raise this with the medic or instructors.⁴⁰¹This included feeling fatigued.
- j. The Court heard, when students raised issues prior to diving that instructors did stand down students from diving without question.⁴⁰²
- k. It is the Court's view that more thought in fatigue considerations needs to be integrated into the course programme and a consistent active process for accessing and managing fatigue developed. Additionally, clear competency objectives, supported by a policy on acceptable attendance, would minimise the tension between safety and completing all course requirements in the timeframe. It is the Courts opinion it is likely the comment by the Chief Petty Officer Instructor may have influenced course members and contributed to a reluctance to report fatigue prior to diving.⁴⁰³ The Court views this as dangerous given the current fatigue management system strongly relies on students to self-report fatigue.
- l. **Junior Instructors.** Additionally, when physical activities were conducted it appeared to the Court that it was mostly supervised by more junior instructors who had been reported to use a lot of 'negative encouragement' and likely lacked appropriate training.⁴⁰⁴ Comments from more senior students suggested that these more junior Instructors lacked the skills to extract and develop the best performance. Instead it appears they default to what they experienced when they were undergoing training.⁴⁰⁵ The Court also noted that senior instructors appeared to distance themselves from PT sessions or potentially contentious activities.⁴⁰⁶

⁴⁰⁰ Witness 17, Re-interview, Page 6, Line 2.

⁴⁰¹ Witness 10, Page 8, Line 10-12; Witness 16, Page 16, Lines 4-7.

⁴⁰² Witness 16, Re-interview, Page 3, Lines 23-26; Witness 16, Exhibit KKK.

⁴⁰³ Witness 25, Re-interview, Page 2, Lines 28-35.

⁴⁰⁴ Witness 25, Page 11, Lines 28-29; Witness 33, Page 10, Lines 20-24; Witness 33, Page 11, and Line 24-25.

⁴⁰⁵ Witness 33, Page 10-11, Lines 31-36 & 1-4.

⁴⁰⁶ Witness 17, Page 26, Lines 33-36.

- m. **Student Culture.** It appears to the Court the culture of the Dive School continues to self-perpetuate with some students telling the Court they wanted the course to be difficult in order to gain the respect of the Dive Trade.⁴⁰⁷ This culture appears to be powerful as a student indicated he was prepared to ignore Safe Sailor action in favour of fitting in or avoiding retribution.⁴⁰⁸ The level of motivation for the students is extremely high and they quickly appear to reflect attitudes and behaviours of the Trade they wish to be part of.

178. **Governance.** The Court's impression during the course of its inquiries is that the Governance of the school is 'light' and physically located remote from the school. This finding was supported by TSWA and the Diving Capability Representative that the Governance of the Dive School is insufficient⁴⁰⁹ and that there needs to be greater scrutiny on dive training.⁴¹⁰ It appears whilst the operational area is supported by a strong Governance structure the Dive Training area is less so.⁴¹¹

179. It is the Court's opinion the current structure does not afford the CNST the time or resources to govern effectively. The Court heard evidence that there are 14 schools under that position command, one of which is the Dive School.⁴¹²

180. **Training Material.** The Court heard that the training syllabus had been updated to reflect the requirements of LAR7000.⁴¹³ The course data sheets produced to the Court by the School showed the total time on LAR7000 training to be 20 days for Oxygen and another 20 days for Nitrox (total of 96 periods each). The Head of School qualified this by saying much of the objectives are the same and it would be repetitious as it is just a change in gas and is possibly a historical timing based on the VIPER set.⁴¹⁴ The Court determined by viewing the Course programme the students would have had approximately 15 days on LAR7000 at the end of Consolidation Week (Week four).

181. Different versions of training syllabus, course data sheets and programmes, were produced to the Court and it was not clear the time allocations, objectives to be achieved, competency requirements that flowed through to the actual programme delivered. It was also unclear whether any careful analysis had been carried out, and whether command was aware of the differences. The production of training material was a key element to be achieved prior to allowing the use of the LAR7000 on trainees.

⁴⁰⁷ Witness 21, Page 12, Lines 16-18.

⁴⁰⁸ Witness 25, Page 5, 35-37.

⁴⁰⁹ Witness 14, Page 15, L21.

⁴¹⁰ Witness 14, Page 15, L31.

⁴¹¹ Witness 2, Page 33, Lines 21-28.

⁴¹² Witness 9, Page 2, Lines 22-23.

⁴¹³ Witness 9, Page 7, Lines 33-38.

⁴¹⁴ Witness 13a, Page 5, Lines 18-27.

182. The Court also heard that training of the instructors is not clearly defined and followed through at the school. The Dive Supervisor on the night of the accident had not received any sort of induction or familiarisation and had not completed any of the required instructional training. He felt he had just been 'thrown into instructing' and not given time to figure out how the course was supposed to run.⁴¹⁵

183. **Publication Administration/Document Control.** The Court was presented evidence that demonstrated many of the publications for the Dive School are out of date and have not been updated to reflect the latest policy changes.⁴¹⁶ The Able Divers Student's Guide and Dive School Standing Orders were both out of date and there is no requirement and/or enforcement of personnel to periodically sign as having read and understood any of the orders. Further to this, the Court heard there are uncontrolled copies of policy and orders still in place at the school from as far back as 2010.⁴¹⁷ This incorrect information has appeared to flow through to the training material on current courses.

⁴¹⁵ Witness 17, Re-interview. Page 3, Line 10-13.

⁴¹⁶ Witness 17, Exhibit OOO.

⁴¹⁷ Witness 17, Exhibit NNN.

CONCLUSIONS

184. The following outlines the Court's findings in relation to the incident. These have been separated into Prime Causal Factor, Contributing Factors, Aggravating Factors and Other Factors.⁴¹⁸

Prime Causal Factor

Actions that led to the accident.

185. **Procedural violation.** The Court found the factor directly causing the incident, which resulted in the death of ADR Yarwood, was the unauthorised practice that he and some of the other students likely used on course. In particular, the variation to the practice that was proposed to be in use by ADR Yarwood which involved gas switching from nitrox to oxygen mode and turning off the oxygen cylinder underwater.

186. Other possibilities to ADR Yarwood being in the incorrect gas mode, with the oxygen cylinder turned off, were investigated and discounted. No evidence was found to support these other scenarios (such as the switch and gas cylinder being either deliberately or accidentally being tampered with by instructors or other students. The evidence received suggested it was more likely ADR Yarwood made the choice himself.

187. The key points in support of this theory are the practice was successfully tried on Dive Two on 25 March 2019 and it was also discussed immediately prior to the night dive. ADR Yarwood's set was found to be in oxygen mode when it should have been on mixed gas mode on discovery underwater. When the set was subsequently isolated the oxygen cylinder was found to be off. ADR Yarwood's equipment has gone through an extensive and objectively conducted test, which included all interested parties conducting investigations into the incident, plus Dive Medical expertise. It was determined that there was no faults or issues with ADR Yarwood's equipment. The Original Equipment Manufacturer reported they conducted additional internal checks on manufacture, design, and processes associated with the equipment and they found no abnormality in the equipment generally.

Contributing Factors

A factor which made the accident more likely.

188. The Court deemed there was several variables which may have been the motivating factors for ADR Yarwood to undertake the unorthodox practice, however it is thought the drive to increase endurance (and perform well) and lack of knowledge in rebreather operations were the two main factors to consider.

⁴¹⁸ NZAP 201, Article 06.12.

189. **Drive to Increase Endurance** ADR Yarwood was struggling with increasing his endurance underwater and this is not something that would have sat well with him given his drive and determination to do well. The Court felt his drive to perform was particularly relevant given an instructor on Friday 22 March 2019 briefed the entire course setting performances expectations. This is possible to have impacted ADR Yarwood directly as the week prior he had pulled out of a dive due to fatigue. The instructor in question clarified his statement as not being directed at ADR Yarwood or his lack of endurance, however it is likely it would have added to his drive to succeed and increase his endurance underwater.

190. **Lack of Knowledge.** The Court heard the students had passed their assessments on gas laws and diver physiology however found some of their understanding of the more technical elements rudimentary and rote learnt. It is the Court's finding that the course members (including ADR Yarwood through evidence of his course members) had a belief the gas switch trick was a genuine way to increase endurance (by saving gas) and were unaware of the severity of the risk they were exposing themselves too. Although, it was acknowledged, by each student who confessed to trying it, that they knew it was a violation and not endorsed by instructors, the drive to do well superseded the risk they thought they were undertaking. It appeared to the Court students did not fully understand the physiology of rebreather diving on the body and therefore did not fully understand the risk.

Aggravating Factors

A factor that made the outcome worse.

191. There are several factors the Court considers may have aggravated the incident. Most of these resulted in a possible time delay in the discovery of ADR Yarwood and therefore a worse outcome. These factors stem from the control mechanisms in place on the night.

192. **Attendant Coverage.** One of the controls in place was attended float lines to the surface which were being monitored by staff. Around the time of the incident instructors observed a lack of movement of some of the floats in one group and investigated. It is possible both staff members became distracted attending to Group One and therefore did not detect there were any problems with individuals in the other group until they surfaced although this is denied by staff. Staff numbers were insufficient to fulfil all roles and the required number of attendants was not in accordance with NZBR 45.

193. It is possible that the lack of attendants may have also contributed to a delay in contacting emergency services. It appears all staff present were directly involved in patient recovery in the minutes following the companion diver and ADR Yarwood surfacing.

194. The staff numbers for the dive were in line with the waiver option available when conducting diving with explosives. This waiver option is not applicable to activities at the Dive School. The practice of reducing to just the Dive Supervisor and Standby Diver for dives at the Dive School also appears to be common practice. The Court also received evidence that suggests it was policy (circa 2010) that the Dive School could drop to the minimum of two staff during training dives. Furthermore, it was presented to the Court to be a common practice that has continued and was included as a practice in the ADR course workbook.

195. **Underwater Configuration.** At the time of the incident the activity and controls in place were essentially the students monitoring each other underwater. In what was described in the Dive Authorisation as being Marked Pairs however, they were still considerable distance apart.

196. ADR Yarwood was the roving swimmer and, whilst also marked on the surface, was swimming solo. Given the distance between personnel and the poor visibility potentially the time between noticeable contacts was between 18-24 minutes. This is enough time for difficulties to go unnoticed. The Court heard this method of dive training has been the practice for a long time. The Court determines that a prime objective of all underwater training should be the ability to effect immediate rescue, if required, of inexperienced rebreather divers.

197. **Difficulty in underwater recovery.** On hearing the DRS, the Companion Diver moved to the middle of the search area following the Snag line. He stated he heard a noise from what he thought was ADR Yarwood just prior to discovery and eventually came across him lying still on the bottom. Initially the Companion Diver thought ADR Yarwood was 'messing around' and attempted to communicate with him, however in zero visibility this was difficult. Upon realising he was unconscious, the Companion Diver drill was carried out by feel and he brought ADR Yarwood to the surface. This was described to the Court as being difficult undertaking as ADR Yarwood was quite heavy and difficult to manoeuvre.

Other Factors

A factor which is not a cause, contributing or aggravating factor but is noteworthy in that it may cause or contribute to future accidents.

198. During the course of the investigation the spotlight was inevitably cast on a range of aspects related to policy, process and dive training specifically. The following provides more general findings in areas that demonstrate an opportunity to improve. This covers areas of governance, school structure, culture, transparency, training design and clarity in waiver coverage for use of equipment not yet introduced.

199. **Governance.** The current governance of the dive school sits remote from the school and the two positions involved (Commander Naval Specialist Training and

Executive Training Officer) have large portfolios making governance, oversight and support difficult. This creates the risk that there is a variation in what is purported to occur and what actually occurs during dive training. For example, the Court found in evidence that the current governance signs off the course instruction which includes the programme but what actually is delivered is often very different. This is indicative of a general lack of transparency. This disconnection, combined with a 'get on with it' attitude, creates an environment where the challenges within the school go unaddressed and the priorities, risk appetite of command are not understood. The authority to dive, contrary to ship operations, is held at a low level in the dive training area which may be due to the remote Governance structure.

200. **Culture.** It appears there has been work to improve the culture already in the Dive School which includes a change out of staff and implementation of a consolidation log (approved corrective action activities). The Petty Officer level of instructors for the course were cited as being extremely knowledgeable, despite remaining untrained as instructors themselves. The Physical Training Staff appear to have a good oversight of the physical training elements but it is unclear whether they are invited to every physical event. The Court heard for some activities such as mud runs (which are highly physical) were overseen by only junior Instructors at Leading Hand level and the purpose of these was not clear. The Court heard evidence that it was some of these types of activities where students were getting highly fatigued resulting in being unable to complete subsequent dives.

201. The Court heard evidence the underlying priority on physical prowess remains and therefore the need to have a physically demanding course also persists. The approved consolidation log appears to introduce some controls when administered appropriately. However, the use of the consolidation log with involves what can be made into physically demanding activities potentially reinforces the culture. The Court believes an opportunity exists for more of a focus on adult learning techniques (including different remedial training methods). For this to be successful all instructors will need to be trained and fully understand *how* different people learn.

202. **Policy.** NZBR 45 covers both diving in the operational space, Special Forces and Dive School training. The Court believes the Dive School would benefit from a more comprehensive section on the Dive training school specifically outlining authorities, controls and approach to risk - specific for inexperienced trainees in the Dive Training environment.

203. **Activity Objectives.** Having a clear purpose to each day and activity would assist both instructors and students understand what they are trying to achieve. Transparency and a clear purpose are essential for the dive training area both for protection and safety of instructors and students alike.

204. **RNZN 2180 Process.** The Court believes there is an opportunity to refine the Seaworthiness process for recording decisions using the RNZN 2180 to ensure accuracy of information, clarity around what decisions have been made and clarity in

coverage of the decisions. This includes how decisions made in email communication are incorporated into the process. Additionally, there is an opportunity in the future to give more consideration to the appropriateness of trialling and using unintroduced equipment on students in the training environment particularly, where there is low knowledge and experience across the Fleet. If it is deemed appropriate this should be after a thorough risk assessment and consideration of adequate (or in fact additional) resourcing and controls. It is the Court's view the record of that conscious decision should be integrated with any waivers associated with the equipment itself.

205. In the Court's opinion it is also beneficial to show the findings and evidence received based on the Human Factors model which the US Department of Defence adapted from the Reason Model (Reason, 1990). The premise of this model is whilst an unsafe act/violation committed by an individual, often with tragic consequences, is the sole cause of the incident it also provides that latent failures or conditions that exist within the organisation can create a sequence of events making the mishap possible. Viewed with this different lens the actions of individuals are the end result of a chain of factors originating in other parts of the organisation. This is often called the 'Swiss Cheese' theory. These conditions may lie dormant or undetected for some time prior to the incident. It is important that these aspects are addressed to avoid possible incidents in the future. Figure 2. outlines the Court's findings overlaid in the Reason Model to demonstrate where the organisation needs to focus on improvement.

206. In this specific case the Court believes it is pertinent, in addition to any actions that are passed to departments to action, that this broader perspective is shared otherwise there will be a tendency to solely focus on the unsafe act/violation that occurred and reduce the buy-in to understanding and addressing the more holistic issues.

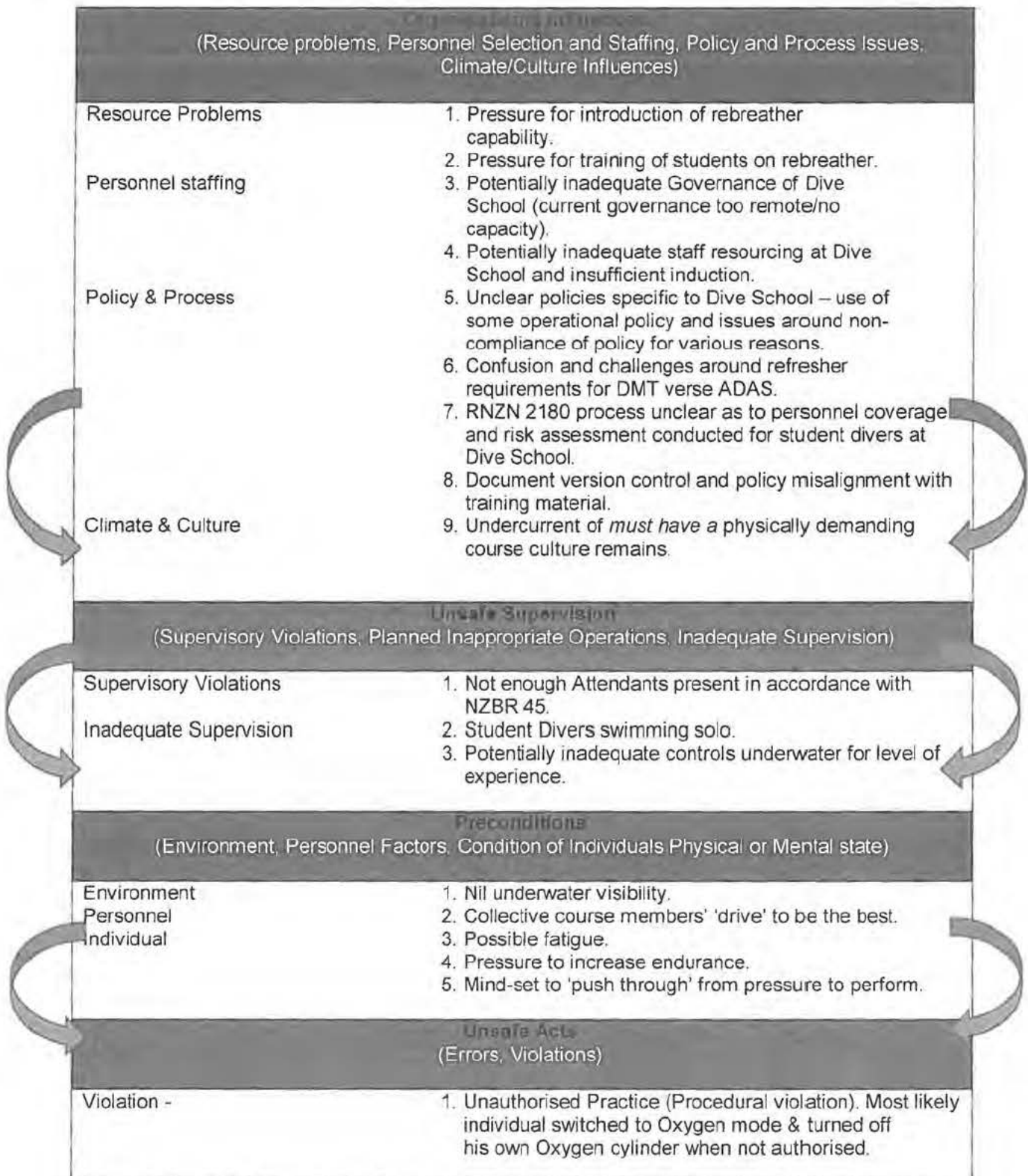


Figure 2: The Court's adaptation of the US Department of Defence Human Factors Model Reason Model (Reason, 1990).

RECOMMENDATIONS

TOR 6.2 Make any recommendations the Court considers relevant

207. The following recommendations are derived from the Court's findings in Prime Causal, Contributing and Aggravating factors. This section will also include observations which are issues that were not directly relevant to the accident itself but worthy of consideration to promote better working practices to eliminate future incidents. These are derived from the findings in the Other Factors area of the report.

208. The Court makes the following recommendations:

- a. **Governance.** Consider a greater level of direct governance:
 - i. The level of risk dive training presents to the organisation, instructors and students justifies a much greater level of scrutiny and control.
 - ii. The use of the RNZN 2180 for introduction of equipment should encompass a more transparent and explicit means of expressing risk and safety concerns to those making the decisions.
 - iii. Specific to the RNZN 2180/03/2; if the use of LAR7000 is subsequently considered to be continued for use by trainee divers the Court recommends the RNZN 2180 is rewritten to be clear on coverage of the decision and risks specific to the Dive School environment.

- b. **Culture.** To achieve more professionalism (both actual and perceived) the Court believes the dive trade leadership, at all levels, work on the following as a priority:
 - i. Refocus on the technical mastery of diving, safety underwater and diving equipment.
 - ii. Ensure an understanding of the principles of humility.
 - iii. Provide professional development for instructors to ensure they are capable of getting the best out of each student.
 - iv. A move to more adult learning environment including but not limited to remedial activities (reconsider the use of the consolidation log – the Court's view is this reinforces a negative culture);

- c. **Diving Controls.** More effective controls are implemented during rebreather operations for students undergoing dive training which includes:

- iv. A transparent assessment plan is provided;
 - v. A progressive training approach is applied;
 - vi. Greater understanding (clarity) for instructors and students on endurance expectations to be achieved;
 - vii. Training programme is transparent to all staff and command;
 - viii. Amendments to activities on the training programme are reported and recorded;
 - ix. All physical training activities are covered by suitability qualified personnel;
 - x. An emphasis applied to the quality of instruction in safety and technical topics;
 - xi. Periodic training audit of materials to ensure compliance with best practice (external from the school);
 - xii. Ensure *application* of high performance principles are applied throughout the course - not just week one.
- g. **NZBR 45.** Review Dive Training School chapter with a view to:
- i. Strengthen the requirements specific to Dive Training School for training diving such as risk identification, assessment and controls. Including levels of command, approval and authority for waivers if applicable;
 - ii. Articulate medic attendance requirements;
 - iii. Align NZBR 45 policy and ADAS requirements or state what has primacy (i.e. Diver Medical Technician currency);
 - iv. Clarify process of scene securing of equipment in Dive incidents;
 - v. Ensure a mechanism to alert Divers of a change in practice or safety requirement, and determine a mechanism of acknowledgment; and
 - vi. Ensure staff and students are periodically assessed on relevant policy.
- h. **General.** The following are other observations made in general areas that the Court believes requires review and change:
- i. Fatigue management system which actively involves instructor assessment;
 - ii. Effective instructor induction;
 - iii. Appropriate supervision, by qualified personnel, of all highly physical activities;
 - iv. Review Dive School resourcing (people and equipment);
 - v. Clarify and enforce qualification requirements for Instructors; and

- vi. Review incident management procedures - ensuring alignment between Philomel, Dive School Temporary Memorandum incident procedures and NZBR 45 procedures.

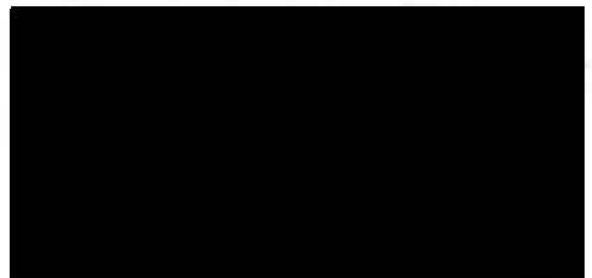
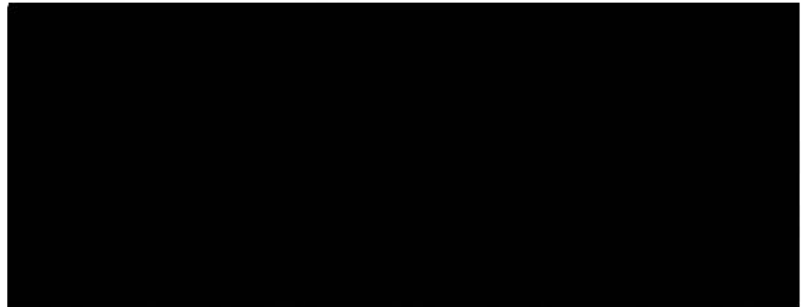
208. During the course of this inquiry the Court became aware that a number of recommendations from previous Courts of Inquiry have yet to be implemented or embedded. However, the Court feels strongly, to make effective change, a plan must be developed and appropriately resourced. Furthermore, a full and frank dialogue with relevant parties ensuring involvement and buy in with the Dive fraternity is required. It's the Court's view a mind-set change will require individuals to understand the philosophy behind any changes and be part of the process if progress is to be made and endure.

Dated at HMNZS PHILOMEL on 03 September 2019.

President



Members



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