Headquarters
New Zealand Defence Force
Defence House
Private Bag 39997
Wellington Mail Centre
Lower Hutt 5045
New Zealand

OIA-2023-4754
OIA-2023-4765

10 August 2023

[redacted]@nzme.co.nz

Dear [redacted]

I refer to your emails of 16 and 26 June 2023 requesting, respectively, *copies of any Minutes relating to a Corrective Action Requirement process from 2017 onwards that mention either hearing loss or traumatic brain injury* and the following:

- *all correspondence since January 2021 to or from Senior Weapons Instructors of the Combat School, Special Operations Command, 1RNZIR and 2/1 RNZIR that makes reference to traumatic brain injury (which might be termed as TBI or mTBI) in relation to the M107A1 anti-materiel rifle (or similar .50 calibre rifle), Javelin Medium Range Anti-Armour Weapon, the Carl Gustaf M3, the 81mm Mortar, M2HB (or similar .50 calibre machinegun);*
- *if not captured in relation to the above, copies of range standing orders from January 2021 onwards showing daily firing limits and firing procedures for trainee and trainers in each of those weapons including the date/s on which those limits and/or procedures were introduced;*
- *if not captured in relation to the above, copies of the process in existence on January 2021 and any subsequent updates for recording suspected harmful blast overpressure experienced by personnel relating to each of those weapons;*
- *from January 2021 onwards, broken down by month and year, the number of suspected harmful blast overpressure incidents recorded for each of those weapons;*
- *Copies of any information provided to Combat School, Special Operations Command, 1RNZIR and 2/1 RNZIR since January 2021 from the Directorate of Safety relating to traumatic brain injury (which might be termed as TBI or mTBI);*
- *Copies of any information provided to Combat School, Special Operations Command, 1RNZIR and 2/1 RNZIR since January 2021 from the Directorate of Health relating to traumatic brain injury (which might be termed as TBI or mTBI)*

Your requests have been considered under the Official Information Act 1982 (OIA). I apologise for the delay in providing this response.

Mild traumatic brain injury (mTBI) is a term that refers to a wide range of injuries (concussion, post-concussion syndrome, contusions to the head or neck, and head injuries). The NZDF provides health care for serving personnel through the NZDF Health Service. Any patient presenting with symptoms or concerns about their health will be assessed and

managed in accordance with their presentation. The NZDF Health Service commonly sees patients who have mTBI as a result of sports or accidents, either in service or commonly occurring in their non-service life.

NZDF health personnel have done extensive research in the field of blast exposure in collaboration with international partners. This has been published and peer reviewed[1] and has directly resulted in a change to training and additional safety measures. The research has been seminal in informing foreign militaries and advancing the science around low level blast exposure hazards for certain military occupations. The research and resource invested in this field gives the NZDF confidence that training in these occupational groups has appropriate controls in place that reduce the risk of mTBI from low level blast exposure. Following the research that has been conducted, safety measures have been in place for a number of years. Personnel who are undertaking training in trades where this exposure may occur are educated annually about the hazard, the appropriate prevention measures, and the actions to take should they have concerns.

A more recently emerging area of hazard analysis is in relation to large calibre weapons that selected members of the NZDF use (specifically types of sniper rifles). As new weapons have been brought on line, significant work has been carried out to quantify the types of hazards that might result from these weapons. This is not through blast exposure, as this is not being recorded at a hazardous level, but may be from other whole body effects. This is an evolving field and the NZDF has been very cautious in its approach, placing restrictions on training and exposure limits with a view to monitoring the emerging science to further establish limits of exposure.

The goal of ongoing analysis of emerging science and military medicine is to identify specific military hazards that may, in some vulnerable people, have impacts on the brain. Identifying the hazards, reducing exposure to these hazards and using controls to mitigate exposure is the key to optimally protecting our people from additional brain impacts.

Regardless of the mechanism that results in mTBI, the current management of presenting symptoms is well established through clinical practice guidelines and ACC guidance. It improves regularly through evolving medical science. Applying this management is well within the competency and standard practice application of doctors in the NZDF. They are able to assess personnel, determine the diagnosis from a range of common presenting symptoms, refer for tests or specialist treatment, and manage patients. This treatment is not dependant on establishing a cause.

Challenges for research and answers to clinical presentations remain and are the subject of large international efforts. The NZDF is actively engaged with allied military health systems in order to understand and learn from evolving research efforts.

No correspondence to or from NZDF senior weapons instructors since January 2021 concerning the weapons that you have identified and traumatic brain injury have been identified. This part of your request is therefore declined in accordance with section 18(e) of the OIA.

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[1] https://academic.oup.com/milmed/article/185/3-4/e513/5549798
https://pubmed.ncbi.nlm.nih.gov/29635591/
https://pubmed.ncbi.nlm.nih.gov/23687938/

Minutes relating to the hearing protection and traumatic brain injury Corrective Action Requirement processes are at Enclosures 1 to 7. Signatures and contact details are withheld in accordance with section 9(2)(k) of the OIA to avoid the malicious or inappropriate use of staff information, such as phishing, scams or unsolicited advertising. The names of those who provided advice are withheld in accordance with section 9(2)(g)(i) of the OIA to maintain the effective conduct of public affairs through the free and frank expression of opinion.

Defence Force Order (Army) Volume 7 (DFO(A) vol 7) defines safety and firing limits around overpressure and recoil generated by each of the weapons identified in your request. There is no information relating to daily firing limits contained in range standing orders. Information from DFO(A) Vol 7 pertaining to the safe operation of each weapon in relation to blast is provided below:

60mm Light Mortar

> *Firers, range staff, exercising troops or anyone else within 10-metres of any 60-mm Light Mortar firing position are to be exposed to no more than 130 rounds fired on charge 6 or 290 rounds fired on charge 3 in any 24 hour period.*

Anti Materiel Rifle

> *To minimise impact of overpressure or effect of recoil on firers, the maximum number of rounds that a firer is permitted to fire in any 24 hour period is 30-rounds unsuppressed or suppressed. Once this limit is reached the firer is not to fire any shoulder controlled weapon with a calibre greater than 7.62-mm for 24 hours.*

Javelin

> *Maximum Exposure Limits Anti-armour detachments and safety supervisors are not to be exposed to more than 20 Javelin live firings in one 24 hour period.*

Carl Gustaf M3

> *personnel within 100 metres of the weapon during live firing may only be exposed to a maximum of 10 rounds in any 24 hour period.*

The NZDF records any harmful blast overpressure events relating to the the above named weapons, and to explosive breaching, in the Safety Event Management Tool (SEMT). There are no recorded harmful blast overpressure events recorded in the SEMT since 2021.

You have the right, under section 28(3) of the OIA, to ask an Ombudsman to review this response to your request. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Please note that responses to official information requests are proactively released where possible. This response to your request will be published shortly on the NZDF website, with your personal information removed.

Yours sincerely

AJ WOODS
Air Commodore
Chief of Staff HQNZDF

Enclosures

1. June 2017 Minute Landworthiness Authority Determination – Hearing protection
2. March 2019 Minute Closure CAR HP-003
3. July 2020 Minute Closure CAR HP-005
4. October 2021 Minute Impulse Noise Limit Exposure Risk
5. 9 May 2022 Minute Closure CAR HP-001 and HP-004
6. 20 October 2022 Minute Closure CAR HP-002 and HP-006
7. 25 May 2022 Minute CAR SRR/AMR-02

HEADQUARTERS NEW ZEALAND DEFENCE FORCE
NZDF Landworthiness Authority

MINUTE

1150/49

~~May~~ 17
6 June 17

See Distribution

LANDWORTHINESS AUTHORITY DETERMINATION – HEARING PROTECTION

References:

A. CA Minute 1150/49 dated 16 Feb 17
B. NZDF DFO 81 Defence Force Orders for Risk Management

1. A Landworthiness Subject Review (Ref A) was undertaken to assess NZDF Hearing Protection and culminated in the conduct of a Landworthiness Board on 24 Mar 17. The Subject Review included military weapons, ammunition, explosives and pyrotechnics within a land-based environment and associated impulse noises.

2. Following the conduct of the Subject Review, the Board concluded that based on the evidence presented:

   a. In-service hearing protection is landworthy with the following observations:

      (1) Issued hearing protection meets current regulations.

      (2) Not all systems integrate with in-service personal protective equipment.

3. Based on the recommendations of the Board and to fully meet my requirements for Landworthiness, there are a number of actions that should be implemented in order to further mitigate the risks associated with Hearing Protection:

   a. Audiometry audit and assurance activities and testing booths do not meet AS/NZS regulatory standards and are not fit for purpose.

   b. There is insufficient baseline and health data to inform our risk profile.

   c. Audiometry monitoring must occur at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure and there is no assessment of NZ Army trades to inform this requirement.

   d. An NZDF Hearing Conservation Programme could better demonstrate a risk based approach to hearing protection.

4. The continuance of Hearing Protection useage is conditional on the completion of the enclosed Landworthiness Corrective Action Requirements (LwCARs) so there is robust assurance that the risk profile is aligned with a risk appetite of *Cautious* (Ref B).

5. The LwCARs detail actions will be undertaken to address the risk mitigation shortcomings with:

a. Action assignees for the LwCARs are to undertake the action specified by the nominated due date for each LwCAR.

b. Upon completion, the action assignee is to submit a closure request to the LwCAR 'Close-out Authority' (cc the Landworthiness Operating Regulator). This request is to be presented by way of a signed minute from the action assignee along with appropriate objective quality evidence to allow for close-out consideration.

c. Should an extension to the close-out date of an LwCAR be required, a request is to be made to the Close-out Authority (cc the Landworthiness Operating Regulator). This request is to incorporate a risk assessment for allowing such an extension, and a formal notification of acceptance of this risk by the appropriate functional authority and force element commander.

6. To allow for the monitoring and satisfaction of LwCAR requirements, the Landworthiness Operating Regulator is to routinely report individual LwCAR status to the Army Management Board (AMB) for monitoring and action deemed necessary for progress; and report the aggregated LwCAR status to the Army Leadership Board (ALB) and LwA on a quarterly basis.

7. Although I have determined that Hearing Protection meet my requirements for Landworthiness, it is subject to the corrective requirements being actioned and any additional risk mitigation requirements the functional Landworthiness Authorities may issue.

s.9(2)(k)

P.T.A.E. KELLY, MNZM
MAJ GEN
NZDF LwA

Annex:

A. LwCAR-HP-01 to LwCAR-HP-05

Distribution list:

CN
CAF
COMLOG (LwLogA)

AC CAP
LCC (LwOA)
SOCC (LwSOA)
DLE (LwEA)
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DMMG
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LC(A)
HQ 1(NZ) BDE
LOTC
1 NZSAS Regt

ANNEX A TO
1150/49
DATED ~~MAY~~ 17
6 Jun 17

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-001
LwCAR Title: NZDF Hearing Conservation Programme		
Landworthiness Deficiency: The NZ Army does not have a hearing conservation programme which could indicate that a potential risk based approach has not been adopted.		
Action Required: 1) Investigate the feasibility of a Hearing Conservation Programme in consultation with DoS, RNZN, NZ Army and RNZAF.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes

Close Out	Extension to Close-out Date
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.
• LwCAR status is maintained by the NZDF LwRO and routinely reported to the AMB, ALB and NZDF LwA.	

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-002
LwCAR Title: Baseline impulse noise data of ammunition, explosives and pyrotechnics		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel. There appears to be an ad hoc approach to impulse noise research based on types of ammunition, explosives and pyrotechnics used by different units.		
Action Required: 1) Conduct research activities that capture baseline impulse noise data of NZDF ammunition, explosives and pyrotechnics that informs actual noise levels and potential noise exposure limits. Research is to include small arms ammunition, including blank ammunition, explosives, grenades, rockets, crew served weapons, 9mm, 5.56mm, 7.62mm, 25mm, 40mm, 60mm, 81mm, and 105mm natures.		
Action Assigned to: **COMD TRADOC**	**Due Date: 29 Jun 18**	**Close-Out Authority:** **LCC**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-003
LwCAR Title: OEM ammunition data		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel.		
Action Required: 1) DMMG is to request for OEM specifications for noise data from OEM when procuring new munitions and explosives.		
Action Assigned to: **SO1 Ammunition & Explosives, DMMG**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **COMLOG**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-004
LwCAR Title: Audiometry Regulatory Standards		
Landworthiness Deficiency: There is no auditing and assurance activity of audiometry testing booths and rooms or hearing protection equipment. The regulatory standard for audiometry testing booths used in occupational noise management programmes is the AS/NZS 1269.4:20144. Audiometry booths used in NZ Army camps do not meet this standard.		
Action Required: 1) Address the regulatory standard and audit and assurance requirements for audiometry testing booths and rooms, including audiometry monitoring of NZ Army personnel. 2) Address the HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. 3) Investigate and direct procedures and/or processes for in-service hearing protection that devices still provide the expected protection.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **03 Dec 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-005
LwCAR Title: NZ Army trades risk profile		
Landworthiness Deficiency: There is a HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. The current practice post initial test is five yearly testing, pre and post deployment. There is no assessment of NZ Army trades that are at higher risk due to working within environments with regular and/or consistent excessive noise exposure.		
Action Required: 1) Assess NZ Army trades that are at higher risk due to work environments and inform findings to DDH. 2) Incorporate findings into DFO(A) Vol 2 Army Health and Safety		
Action Assigned to: **Army Health & Safety**	**Due Date:** **03 Dec 18**	**Close-Out Authority:** **LWOR**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

HEADQUARTERS NEW ZEALAND DEFENCE FORCE
Defence Logistics Command

MINUTE

7500/DLC/1

29 Mar 19

NZDF Landworthiness Operating Regulator

LANDWORTHINESS BOARD CORRECTIVE ACTION REQUIREMENTS SIGNOFF

Reference:
A. DMMG Minute 11300-01 dated 14 Mar 2019

LwCAR-HP-003 has been signed off by COMLOG, and is enclosed with evidential trail from DMMG SO1 (AMMO and EXPL).

s.9(2)(k)

s.9(2)(g)(i)
CAPT, RNZN
DLC CoS

Enclosure:
1. DMMG Minute 11300-01 dated 14 Mar 2019, covering LwCAR-HP-003

#129

HEADQUARTERS JOINT FORCES NEW ZEALAND
Defence Munitions Management Group

MINUTE

11300-01

14 Mar 19

HQ DLC

CLOSURE REQUEST – LAND WORTHINESS CORRECTIVE ACTION REQUIREMENT (CAR) - OEM AMMUNITION DATA

Reference:
A. LwCAR-HP-03 dated 24 Mar 17

1. The subject CAR required DMMG to request OEM specifications for noise data when procuring new munitions and explosives.

2. DMMG currently request noise level test data on any such purchases, along with Lot Acceptance Test (LAT) data, Material Safety Data Sheets (MSDS) and other relevant technical specifications. This requirement is incorporated into the new NZDM 4.2.2.3, NZDF's ammunition technical publication currently under development. Sections of this publication will be published as they are completed and reviewed over the course of the next year. This data can currently be found in the DMMG SharePoint site and can be supplied upon request from the Technical Assurance Cell.

3. It is requested therefore that this CAR be closed.

s.9(2)(k)

s.9(2)(g)(i)

LTCOL
SO1 AMMO & EXPL

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-003
LwCAR Title: OEM ammunition data		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel.		
Action Required: 1) DMMG is to request for OEM specifications for noise data from OEM when procuring new munitions and explosives.		
Action Assigned to: **SO1 Ammunition & Explosives, DMMG**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **COMLOG**
Close-Out Approval: **Approved / Not Approved**	**Signature:** s.9(2)(k)	**Date:** 27 Mar 19

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

NEW ZEALAND ARMY
NZDF Land Worthiness Operating Regulator
MINUTE

Army 1006/1

28 Jul 20

s.9(2)(k)

LwOR

CLOSURE LWCAR-HP-005

References:
A. Landworthiness Board: Hearing Protection dated 24 Mar 17
B. DFO (A) Vol 2 Chap 15, sect 25
C. AS/NZS 1269: 2005. Occupational Noise Management

1. Reference A, via LwCAR-HP-005 tasked Army Health & Safety (Army H&S) with conducting an assessment of noise exposures in NZ Army garrison based workplaces.

2. Army H&S has now completed their assessment. While the LwCAR required an assessment of trades, Army H&S chose to assess the noise at source and therefore the assessment monitored representative industrial noise from individual equipment at source rather than individual personnel conducting their workplace practices. As a result a generic list of baseline noise readings for a variety of Army logistic equipment as used by RNZALR trades personnel, but does not exclude personnel with occasional access to and use of such equipment, has been incorporated into reference B, including the inclusion of a new annex to reference B which presents the findings, DFO (A) Vol 2 Amdt 41/19, published 13 Jun 19.

3. The list is a baseline assessment only and does not negate units from conducting specific noise monitoring in accordance with their risk management responsibilities. It is assessed that provided in service personal protective equipment is worn during the use of the equipment, no personnel will be exposed to noise above the legal threshold. The application of appropriate hearing protection is to follow the guidance in reference B.

4. While the LwCAR requires an assessment of NZ Army trades that are at higher risk due to workplace environments this is a work stream outside the capability of Army H&S. The next step, should a unit risk assessment identify workplaces with a higher exposure, is a personnel surveillance programme using individual dosimeters. Army H&S does not have this capability. Such an assessment falls within the parameters of the Defence Directorate of Health noise conservation programme and may necessitate the contracting of an outside specialist organisation.

5. Regular audiometry testing is an additional control for all staff regularly exposed to prolonged higher noise levels. In these situations reference C requires an annual audiometry assessment. The applicable policy and implementation is a Directorate of Health function.

6. It is requested that LwCAR-HP-005, enclosure 1, now be closed. The Close-Out Authority is LWOR.

s.9(2)(k)

s.9(2)(g)(i)

Mr
GSO2 H&S (A)

DTelN: s.9(2)(k)

Enclosures:
1. LwCAR-HP-005
2. DFO (A) Vol 2 Amendment 41/19

Closure approved.

completion of wider trade related assessments by DDH is noted. CoS JDDH has been engaged with regards inclusion of this work into an LwCAR that has been assigned to his organisation.

s.9(2)(k)

s.9(2)(g)(i)

LTCOL
LWR

28 July 2020

ENCLOSURE 1

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: Hearing Protection	Date of Landworthiness Board: 24 Mar 17	LwCAR Identifier: LwCAR-HP-005

LwCAR Title: NZ Army trades risk profile

Landworthiness Deficiency:

There is a HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. The current practice post initial test is five yearly testing, pre and post deployment. There is no assessment of NZ Army trades that are at higher risk due to working within environments with regular and/or consistent excessive noise exposure.

Action Required:

1) Assess NZ Army trades that are at higher risk due to work environments and inform findings to DDH.
2) Incorporate findings into DFO(A) Vol 2 Army Health and Safety

Action Assigned to:	Due Date:	Close-Out Authority:
Army Health & Safety	03 Dec 18	LWOR
Close-Out Approval: Approved / ~~Not Approved~~	**Signature:** s.9(2)(k) [redacted]	**Date:** 28 July 2020

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

ENCLOSURE 2

CHAPTER 15

COMMON HAZARDS

CONTENTS

SECTION 25 – NOISE

15561. Noise is covered in this section.

15562. All practical steps are to be taken to ensure that no person's hearing is exposed to excessive noise. Excessive noise is a significant hazard and is to be treated in accordance with the provisions of Chapter 6 of this volume. Excessive noise includes any noise that may induce hearing loss in any person and as a minimum includes noise levels that exceed:

a. 85 dB(A) ($L_{aeq.8h}$) for continuous noise, being the average sound pressure level (A weighted) to which a person is exposed, averaged out over an eight hour period; and

b. 140 dB Peak for impact noise, being the highest sound pressure level, unweighted.

15563. Annex A to this section provides indicative noise levels for common industrial equipment used by New Zealand Army units. These figure should be used as an initial guide however unit commanders are responsible for completing specific risk assessments within their unit in accordance with Chapter 6.

15564. Reserved.

Controls

15565. The following controls are to be applied in all workplaces:

a. **Monitoring.** All workplaces are to be regularly monitored for excessive noise levels, whether generated within or impacting upon that workplace from outside. Where the noise levels are loud then noise level measurements are to be conducted.

b. **Elimination.** Excessive noise is to be eliminated at source if possible.

c. **Isolation.** Excessive noise that cannot be eliminated is to be isolated if possible.

d. **Minimisation.** Where excessive noise cannot be fully controlled through elimination or isolation then the residual excessive exposure is to be further controlled and managed through the options at e to i below.

e. **Personal Protective Equipment (PPE).** Hearing protectors, approved and classified in accordance with Australian/New Zealand Standard 1270, are to be provided and used as follows:

Hearing Protection Class	L_{eq8} (dBA)	Peak Level (dB)	Types of Approved Hearing Protectors
1	86-90	For peak levels above 140 dB, applicable protection is to be specifically assessed, refer to the Unit Health and Safety Officer	Earmuffs/earplugs
2	91-95		Earmuffs/earplugs
3	96-100		Earmuffs/earplugs
4	101-105		Earmuffs/earplugs
5	106-110		Earmuffs/earplugs

f. **Unit Hazard Register.** Excessive noise levels as defined in paragraph 15562 of this section are significant hazards and are to be documented and recorded in the unit hazard register.

g. **Information.** All personnel and visitors who may be exposed to excessive noise are to be provided with information on the hazard and on the precautions to be taken. Warning signs are to be displayed.

h. **Personnel Trained.** Where hearing protectors are provided employees are to be trained in their correct fitting, maintenance, and storage.

i. **Audiometry.** Regular hearing tests are to be programmed and provided for employees who are exposed to excessive noise. Civilian employees are to be programmed for hearing tests with their informed consent.

15566-15570. Reserved.

Resources

15571. Resources to be used include:

a. Health and Safety in Employment Regulations 1995;

b. an audiometric testing facility;

c. the provision of adequate and suitable approved hearing protectors;

d. the provision of adequate supervision;

e. a training programme for employees;

f. safety signs;

g. unit standing operating procedures;

h. Approved Code of Practice for the Management of Noise in the Workplace 2002 (Department of Labour);

i. AS/NZS 1269.2005: Occupational Noise Management;

j. Poster – Hazardous noise levels in this area (WorkSafe New Zealand);

k. Health and Exposure Monitoring (WorkSafe New Zealand);

l. Hearting Protection (WorkSafe New Zealand);

m. Noise – Legal Duties (WorkSafe New Zealand);

n. Preventing Noise Induced Hearing Loss; Jun 16 (WorkSafe New Zealand);

o. Supporting Good Hearing Health at Work (WorkSafe New Zealand);

p. Noise and You – The ABCs of Hearing Conservation (Department of Labour); and

q. MIL-SD-1474D 12 Feb 97 Noise Limits.

15572-15580. Reserved.

EQUIPMENT NOISE READINGS

Equipment	Unloaded / Idle Range	Under Load Range Notes 1 and 2	Comment
GE Machinery			
Bench Grinder	73.2-91.0dBA	89.0-97.1dBA	
Lathe	80.3-89.2dBA	73.8-98.5dBA	
Drill Press	66.2-86.2dBA	70.8-100.4dBA	
Linisher	86.4-96.4dBA	91.3-96.5dBA	
Milling Machine	68.8-85.3dBA	87.5-90.3dBA	Rpm influences the dBA
Cold Cut Off Saw	66.4-79.7dBA	86.5-98.9dBA	
Cut Off Saw	101.4-108.7dBA	104.9-107.8dBA	
Horizontal Metal Bandsaw	74.8-83.4dBA	76.8dBA	
Surface Grinder	78.3dBA		
Arc Welding		83.6dBA	
TIG Welding		90.2dBA	
Gas Cutting		85.1dBA	
Hydraulic Guillotine	73.1-77.8dBA	90.6-95.6dBA	Impact Noise
Die Grinder		98.5dBA	
Buffing Machine	75.8-85.3dBA		
Battery Powered Hand Tools			
18v Angle Grinder	83.4-98.4dBA	97.3-107.7dBA	
18v Rattle Gun	87.8dBA	112.0dBA	
Mains Powered Hand Tools			
Angle Grinder	99.8-100.5dBA	98.8-106.4dBA	
Hot Air Gun		66.0dBA	

Equipment	Unloaded / Idle Range	Under Load Range Notes 1 and 2	Comment
Compressed Air Tools			
Dust Gun		83.0-90.1dBA	
Rattle Gun		103.3dBA	
Sand Blasting Cabinet		82.3-83.4dBA	Exhaust vent 91.2dBA
Woodworking Equipment			
Wood Lathe	74.5dBA	86.0-87.0dBA	
Compound Dropsaw	96.7-97.1dBA	97.4-97.6dBA	
Overhand Planer	78.2-85.3dBA	90.2-93.3dBA	
Thicknesser	74.7-84.7dBA	88.8-103.3dBA	
Wood Bandsaw	78.5-79.4dBA	83.2-87.1dBA	
Benchsaw	80.3-91.0dBA	95.6-98.0dBA	
Spider/Draw/Radial Saw	78.4dBA	92.7dBA	
Horizontal Table Sander	75.0-78.0dBA	83.3-84.4dBA	
Table Router	83.9dBA	89.1dBA	

Notes

1. Noise produced during use will vary dependant on equipment age, maintenance, material being processed, and the rpm.

2. The figures are Leq8h (dBA) when based on an eight hour continuous exposure.

3. For hearing protection guidance refer to paragraph 15565 of this chapter.

Defence Logistics Command (Land)

CATO MINUTE 39/2021

Nov 21 11300/18

LwOA (Through: LwSOA)

For information
SOCC (Attn: SOTC)
HQ 1(NZ) Bde
HQ TRADOC
S7 Wpns and Range Safety
DTI (Attn: CI DEOS)
1 NZSAS Regt

IMPULSE NOISE LIMIT EXPOSURE RISK: CONDUCT OF EXPLOSIVE ACTIVITIES

References

A. Land Worthiness Corrective Action Requirements (LwCAR)-HP-002 dated 24 Mar 17.

Purpose

1. The purpose of this minute is to provide direction to LwOA and LwSOA in regards to how respective Land explosive users are to manage the impulse noise limit exposure risk to ensure NZDF personnel and the public are not exposed to unsafe levels of noise.

Background

2. There is an outstanding LwCAR, reference A attached as enclosure 1, to capture baseline impulse noise data of all NZDF ammunition, explosives and pyrotechnics that informs actual noise levels and potential noise exposure limits. Research identified that:

a. There is no baseline scientific report for the current impulse noise formula for explosives activities such as RNZALR logistic disposal, demolitions and breaching.

b. NZDF does not have the capability and resources to validate any formulas against variable locations, geographical and meteorological conditions.

c. Impulse noise exposure limitations are not factored into existing safety distance regulations for explosive demonstrations, disposals and other associated practices. Which could put the service personnel and/or the public in danger.

3. The chair of the NZDF Explosives Safety Committee (ESC) has advised that there is unlikely to be a short term quick fix to the problem of identifying the hazards posed by peak noise levels produced by explosives. The ability to calculate impulse noise safety distance accurately and consistently, given the multitude of variables, is inherently problematic.

Direction to Land Users

4. In consultation with key users[1], it was demonstrated that they have a clear understanding of the requirement and support the change. The Chief Ammunition Technical Officer (CATO) has identified the following effected Land units and Defence Schools:

a. HQ TRADOC specifically SME (breaching, demolitions, blasting and quarrying)[2].

b. 2 ER (breaching, demolitions and blasting and quarrying).

c. 1 NZSAS Regt (breaching, demolitions and EOD disposal).

d. 2 CSSB specifically 21 Fd, Ammo Pl (Multi-item Explosive Ordnance Disposals and Conventional Munitions Disposal (CMD)).

e. Defence Training Institute (DTI) specifically Defence Explosive Ordnance School (DEOS) who instruct on land EO disposal procedures.

5. **Explosive Activity Risk Assessment**. An Explosive Activity Risk Assessment is to be completed for each explosive activity, this is an extension to the current range approval process. This will require a simple risk assessment for impulse noise and the collection of range data. In the near future this will include collection with sound measurement equipment. The data collected will be used as a tool to validate future peak noise calculations. The completed forms are to be centrally filed with Land Explosive Ordnance Technical Services (LEOTS) in DLE, POC s.9(2)(a) DtLN s.9(2)(k)

6. LEOTS has drafted amendments for the DFO(A) Vol 7 Book Two and NZ P109 Part 21 which will guide the user on the production and retention impulse noise risk assessments. As DFO(A) Vol 7 amendments require ATRB approval, this minute will provide command direction until such time as the required amendments can be published. LEOTS will issue effected units working copies of the risk assessment guidance and range data sheet.

7. CATO has identified the following activities as potentially falling within the scope of a risk assessment review and ongoing monitoring:

a. Potential in-scope activities could include:

(1) Multi-item Explosive Ordnance (EO) disposal.

(2) Large single item (EO) disposal.

(3) Explosive demonstrations.

(4) Blasting and quarrying.

(5) Demolition by explosives.

(6) Explosive Breeching, including training for Output 4, where practical.

b. Recommended Out-of-scope activities:[3]

[1] Telecon CATO/CI SME on 28 Sep 21, Email CATO/OC E Sqn of 281431 Sep 21, Email CATO/TWO NZSOF of 051335 Oct 21

[2] Battle Noise and BATSIM are to be considered under the NZDF review of single item EO.

[3] To be considered as part of the overall risk assessment for the activities, noting that the fragmentation safety distance will generally exceed that for impulse noise.

(1) Use of EO inventory items for training/operational effect. For example functioning a Charge Directional Fragmentation or Battle Noise Simulation[4].

(2) Blinds disposal.

(3) Small single item EOD/CMD tasks.

(4) EOD in support of civil authorities.

(5) Explosive Breeching in support of Output 4 operations.

Conclusions

8. Land explosive users need to manage the impulse noise limit exposure risk to NZDF personnel and the public, until a formal method can be adopted, a risk assessment mythology needs to be applied. Once confirmed this will be published in the DFO(A) Vol 7. The collection of data from in scope activities will provide base line data against which potential solutions can be assessed. This data will be held by LEOTS in a central data base until required for assessment.

Recommendations

9. LwOA is requested to:

a. **note** a short term solution, to identify a suitable impulse noise safety formula, is unlikely;

b. **note** that a amendments to the DFO(A) Vol 7 and P109 Part 21 are pending and this minute will provide command direction until such time as the required amendments can be published;

c. **identify** relevant Land stakeholders that this guidance applies to;

(1) HQ TRADOC specifically SME.

(2) 1 NZSAS Regt.

(3) 2 ER.

(4) 2 CSSB specifically 21 Fd, Ammo Pl.

(5) DTI specifically DEOS.

d. **confirm** in-scope activities;

(1) In-scope activities could include:

(a) Multi-item Explosive Ordnance (EO) disposal.

(b) Large single item (EO) disposal.

(c) Explosive demonstrations.

(d) Blasting and quarrying.

(e) Demolition by explosives.

(f) Explosive Breeching, including training for Output 4 where practical.

(2) Out-of-scope activities:

[4] The requirement and responsibility for identifying noise hazards relating to single EO items and weapons systems associated with specific natures of EO sits with the wider NZDF noise hazard project.

(a) Use of EO inventory item for training/operational effect.

(b) Blinds disposal.

(c) Small single item EOD/CMD tasks.

(d) EOD in support of civil authorities.

(e) Explosive Breeching in support of Output 4 operations.

e. **direct** respective Land units to undertake a risk assessment based approach for future EO activities, until informed otherwise; and

f. **direct** relevant Land units to centrally file the EO risk assessments and range data with LEOTS.

Technical Certification by:	LwEA Approval:
s.9(2)(g)(i) MAJ CATO	s.9(2)(g)(i) LTCOL LwEA
Date:	Date:
Land Worthiness Logistic Authority Approval:	Integration Authority / Risk Owner Acceptance:
s.9(2)(g)(i) COL LwLA	s.9(2)(g)(i) COL LwSOA
Date:	Date:

Integration Authority / Risk Owner
Acceptance:

HR Mc ASLAN

BRIG

LwOA

Date:

Enclosures

1. Impulse Noise Limit Exposure Risk: Conduct of Explosive Activities SO1 Ammo Minute 027/2021 dated Aug 21.

ENCLOSURE 1 TO
CATO 39/2021
DATED NOV 21

LANDWORTHINESS CORRECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board:** **24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-002
LwCAR Title: Baseline impulse noise data of ammunition, explosives and pyrotechnics		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel. There appears to be an ad hoc approach to impulse noise research based on types of ammunition, explosives and pyrotechnics used by different units.		
Action Required: 1) Conduct research activities that capture baseline impulse noise data of NZDF ammunition, explosives and pyrotechnics that informs actual noise levels and potential noise exposure limits. Research is to include small arms ammunition, including blank ammunition, explosives, grenades, rockets, crew served weapons, 9mm, 5.56mm, 7.62mm, 25mm, 40mm, 60mm, 81mm, and 105mm natures.		
Action Assigned to: COMD TRADOC	**Due Date: 29 Jun 18**	**Close-Out Authority:** **LCC**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

HEADQUARTERS NEW ZEALAND DEFENCE FORCE

DDH MINUTE 12/2022

9 May 22 1370/DDH/1

CA (through Special Projects Officer Army)

For information
NZDF Land Worthiness Cell (s.9(2)(g)(i))

LAND WORTHINESS CORRECTIVE ACTION REQUIREMENTS -HEALTH UPDATE AND REQUEST FOR CLOSURE

Reference

A. LwCAR-HP-01: NZDF Hearing Conservation Programme
B. LwCAR-HP-04: Audiometry Regulatory Standards

Purpose

1. The purpose of this minute is to provide an update and request closure of two Land Worthiness Corrective Action Requirements (LwCAR-HP-01 and LwCAR-HP-04) assigned to the Defence Health Directorate (DHD).

Background

2. Refs A & B are Land Worthiness Corrective Action Requirements (LwCAR-HP-01 and LwCAR-HP-04) that were assigned to DHD with the following actions required.

a. LwCAR-HP-001: NZDF Hearing Conservation Programme.

(1) Investigate the feasibility of a Hearing Conservation Programme (HCP) in consultation with Directorate of Safety, RNZN, NZ Army and RNZAF.

b. Audiometry Regulatory Standards:

(1) Address the regulatory standard and audit and assurance requirements for audiometry testing booths and rooms, including audiometry monitoring of NZ Army personnel.

(2) Address the HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure.

(3) Investigate and direct procedures and/or processes for in-service hearing protection that devices still provide the expected protection.

Occupational Noise Exposure Study

3. A NZDF-wide baseline scoping study of occupational noise exposure initiated by DHD and conducted in 2021, by an external contractor, Vipac Engineers and Scientists Ltd, in consultation with the Directorate of Safety, RNZN, NZ Army, RNZAF and Defence Technology Agency.

4. Vipac were engaged by NZDF to provide specialist acoustic consultancy services and expert advice towards the development of a hearing conservation programme (HCP). The study aimed to conduct full scoping of all potential noise hazardous areas, processes and practices across NZDF, and inform the development of a NZDF hearing conservation programme that meets AS/NZS accredited standards.

5. The study consisted of an extensive desktop review of relevant NZDF documentation relating to NZDF's Safety Management System (SMS) and Defence Policy, Orders and Instructions in the area of safety, health and noise management. Previous occupational health and noise reports and assessments, where available, were included in the document review. A programme of escorted site visits was also undertaken based on pre-visit surveys and known areas of noisy activity. Face to face interviews were held with over 250 military and civilian personnel from entry level service providers to strategic directors.

6. The recommendations of the study were presented to and noted by the Executive Health and Safety Committee (EXHS) in August 2021. The recommendations identified the components and estimated cost of introducing a HCP to NZDF, which includes the establishment of consistent audiometric testing of personnel; a review the current state of existing audiometric test booths across the entire NZDF; and better hearing protection PPE management including compatibility.

7. The EXHS also approved the establishment of an Occupational Health Working Group in order to facilitate the implementation of these recommendations.

8. Funding has been requested for FY 22-23 to support the phased introduction of a HCP in line with the study's recommendations.

9. EXHS will be the governance board overseeing the implementation of the recommendations and DHD through Director Business Performance will remain the co-ordinating contact for ongoing action across the recommendations.

Conclusion

10. The scoping study undertaken by Vipac has provided measurable recommendations and identified a process for the development of a comprehensive hearing conservation programme within NZDF that addresses the actions required within LwCAR-HP-01 and LwCAR-HP-04.

11. Implementation of the HCP is dependent upon the necessary resources (personnel and funds) being provided from across interdependent delivery domains including Directorate of Safety, CapBr, RNZN, NZ Army, RNZAF (through relevant worthiness boards) and Defence Technology Agency.

Recommendations

12. It is recommended that LwCAR-HP-01 and LwCAR-HP-04 are closed with transition of remaining required delivered action to current HCP.

s.9(2)(k)

s.9(2)(g)(i)

LTCOL
A/DDH

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-001
LwCAR Title: NZDF Hearing Conservation Programme		
Landworthiness Deficiency: The NZ Army does not have a hearing conservation programme which could indicate that a potential risk based approach has not been adopted.		
Action Required: 1) Investigate the feasibility of a Hearing Conservation Programme in consultation with DoS, RNZN, NZ Army and RNZAF.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature:** s.9(2)(k)	**Date:** 16/5/22

Processes

Close Out	Extension to Close-out Date
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.
• LwCAR status is maintained by the NZDF LwRO and routinely reported to the AMB, ALB and NZDF LwA.	

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-004
LwCAR Title: Audiometry Regulatory Standards		
Landworthiness Deficiency: There is no auditing and assurance activity of audiometry testing booths and rooms or hearing protection equipment. The regulatory standard for audiometry testing booths used in occupational noise management programmes is the AS/NZS 1269.4:20144. Audiometry booths used in NZ Army camps do not meet this standard.		
Action Required: 1) Address the regulatory standard and audit and assurance requirements for audiometry testing booths and rooms, including audiometry monitoring of NZ Army personnel. 2) Address the HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. 3) Investigate and direct procedures and/or processes for in-service hearing protection that devices still provide the expected protection.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **03 Dec 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature** s.9(2)(k) [redacted]	**Date:** 16/5/22

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

HEADQUARTERS NEW ZEALAND DEFENCE FORCE

NZDF Landworthiness MINUTE 17/2022

20 Oct 22 1150/49

LwA

For Information:
Director DHD
AGS (Attn: AH&S and W&RS)
Comd TRADOC
DMMG

REQUEST TO CLOSE LANDWORTHINESS CORRECTIVE ACTION REQUIREMENTS (LWCAR) HEARING PROTECTION (HP) 02 AND 06

Reference

A. Lw Board Minutes dated 24 Mar 17
B. LwA Determination – Hearing Protection dated 6 Jun 17 (attached as Enclosure 1)
C. VIPAC Hearing Conservation Assessment Report dated 30 Jul 21

Purpose

1. The purpose of this request is to seek Landworthiness Authority (LwA) approval to close the final two outstanding Landworthiness Corrective Action Requirements (LwCAR) for the Hearing Protection (HP) review based on corrective actions to date.

2. Request to Close Landworthiness Corrective Action Requirements (LwCAR) Hearing Protection (HP) 02 and 06.

Background

3. A Lw Subject Review was undertaken to assess NZDF Hearing Protection and culminated in the conduct of a Lw Board on 27 Mar 17 (Ref A), where it was concluded that:

   a. Current issue HP meets regulations; and

   b. Not all systems integrate with in-service personal protective equipment.

4. As a result of these findings from Ref B, five LwCARs were issued:

   a. HP-01 NZDF Hearing Conservation Program;

   b. HP-02 Baseline impulse noise data for ammunition, explosives and pyrotechnics;

   c. HP-03 OEM ammunition data;

   d. HP-04 Audiometry Regulatory Standards; and

   e. HP-05 NZ Army trades risk profiles.

5. An additional LwCAR (HP – 06 Purpose Built Range – Noise Testing Levels) was issued on 28 Jun 19. This was ensure momentum was maintained in identifying potential

mitigations that land elements could implement and control whilst the HP LwCARs were being worked on.

6. To date, the following LwCARs have been closed:

a. HP-01, as at 16 May 22;

b. HP-03, as at 27 Mar 19;

c. HP-04, as at 16 May 22; and

d. HP-05, as at 20 Jul 20.

Open LwCARs and Mitigation

7. LwCARs HP-02 and HP-06 were assigned to TRADOC and remain open. During the course of TRADOC's investigation it became apparent that NZDF (including the Defence Technology Agency) did not possess the subject matter expertise or specialised equipment required to accurately measure or analyse impulse noise.

8. Funding was sought for external expert assistance, however this was not approved at the time.[1] Since the completion of the LwCARs listed in para 5, it is assessed that HP-02 and HP-06 are now redundant and have be mitigated as a result of actions listed below:

a. **HP-02 Baseline impulse noise data for ammunition, explosives and pyrotechnics.** This has been answered, as far as is practicable, through the completion of HP-03 and Lw Reviews in that:

(1) DMMG now request noise data from original equipment manufacturers (OEM)[2] or suppliers of ammunition, explosives and pyrotechnics,

(2) Lw Subject Reviews now include requests for impulse noise data for weapon systems, ammunition, pyrotechnics and explosives in order to:

(a) Identify the risks to personnel;

(b) To ensure personal protective equipment (PPE) is fit for purpose;

(c) To ensure effectiveness; and

(d) Ensure that current policy mitigates risk so far as is reasonably practicable (SFAIRP).

(3) The newly established Occupational Health Working Group (OHWG - formed as a result of Ref C) will facilitate the recommendations of the VIPAC Report as part of the wider Hearing Conservation Programme.

b. **HP-06 Purpose Built Range – Noise Testing Levels.**

(1) The results of this investigation by TRADOC and Army Health and Safety (AH&S) did not produce the fidelity of data to form accurate conclusions. However, it did provide enough information to ensure that DFO (A) Vol 7 now provides safety mitigation to ensure that:

[1] This was subsequently completed in 2021, see Ref C

[2] Note that some OEMs have refused to provide this information due to NZ being a small user

(a) Personnel not directly involved in live are located away from the firing line; and

(b) Correct PPE is provided for the respective weapon or demolition range practices.

(2) The investigation also led to AH&S and Weapons and Range Safety Branches producing and distributing education materials for Hearing Protection awareness and types of suitable hearing protection for various tasks or applications. This will operate on a continuous improvement system as new data around noise / impulse noise is revealed through Lw Reviews, DMMG data or the OHWG work.

Conclusion

9. Both LwCAR HP-02 and HP-06 have been completed SFAIRP given the lack of subject matter expertise, specialised equipment, and OEM response to requests for information. However, the original intent has been answered through the completion of the other HP LwCARs within this Subject Review, other corrective actions, and separate programmes of work.

Recommendations

10. It is recommended that the LwA **approves** the closure of LwCAR HP-02 and HP-06.

s.9(2)(k)

s.9(2)(g)(i)

MAJ
Deputy Landworthiness Regulator

Enclosure(s)

1. LwA Determination – Hearing Protection dated 6 Jun 17.

Approved / Not Approved

J.R. BOSWELL, DSD
MAJGEN
NZDF LwA

Date:

HEADQUARTERS NEW ZEALAND DEFENCE FORCE
NZDF Landworthiness Authority

MINUTE

1150/49

~~May~~ 17
6 June 17

See Distribution

LANDWORTHINESS AUTHORITY DETERMINATION – HEARING PROTECTION

References:

A. CA Minute 1150/49 dated 16 Feb 17
B. NZDF DFO 81 Defence Force Orders for Risk Management

1. A Landworthiness Subject Review (Ref A) was undertaken to assess NZDF Hearing Protection and culminated in the conduct of a Landworthiness Board on 24 Mar 17. The Subject Review included military weapons, ammunition, explosives and pyrotechnics within a land-based environment and associated impulse noises.

2. Following the conduct of the Subject Review, the Board concluded that based on the evidence presented:

   a. In-service hearing protection is landworthy with the following observations:

      (1) Issued hearing protection meets current regulations.

      (2) Not all systems integrate with in-service personal protective equipment.

3. Based on the recommendations of the Board and to fully meet my requirements for Landworthiness, there are a number of actions that should be implemented in order to further mitigate the risks associated with Hearing Protection:

   a. Audiometry audit and assurance activities and testing booths do not meet AS/NZS regulatory standards and are not fit for purpose.

   b. There is insufficient baseline and health data to inform our risk profile.

   c. Audiometry monitoring must occur at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure and there is no assessment of NZ Army trades to inform this requirement.

   d. An NZDF Hearing Conservation Programme could better demonstrate a risk based approach to hearing protection.

4. The continuance of Hearing Protection useage is conditional on the completion of the enclosed Landworthiness Corrective Action Requirements (LwCARs) so there is robust assurance that the risk profile is aligned with a risk appetite of *Cautious* (Ref B).

5. The LwCARs detail actions will be undertaken to address the risk mitigation shortcomings with:

a. Action assignees for the LwCARs are to undertake the action specified by the nominated due date for each LwCAR.

b. Upon completion, the action assignee is to submit a closure request to the LwCAR 'Close-out Authority' (cc the Landworthiness Operating Regulator). This request is to be presented by way of a signed minute from the action assignee along with appropriate objective quality evidence to allow for close-out consideration.

c. Should an extension to the close-out date of an LwCAR be required, a request is to be made to the Close-out Authority (cc the Landworthiness Operating Regulator). This request is to incorporate a risk assessment for allowing such an extension, and a formal notification of acceptance of this risk by the appropriate functional authority and force element commander.

6. To allow for the monitoring and satisfaction of LwCAR requirements, the Landworthiness Operating Regulator is to routinely report individual LwCAR status to the Army Management Board (AMB) for monitoring and action deemed necessary for progress; and report the aggregated LwCAR status to the Army Leadership Board (ALB) and LwA on a quarterly basis.

7. Although I have determined that Hearing Protection meet my requirements for Landworthiness, it is subject to the corrective requirements being actioned and any additional risk mitigation requirements the functional Landworthiness Authorities may issue.

s.9(2)(k)

P.T.A.E. KELLY, MNZM
MAJ GEN
NZDF LwA

Annex:

A. LwCAR-HP-01 to LwCAR-HP-05

Distribution list:

CN
CAF
COMLOG (LwLogA)

AC CAP
LCC (LwOA)
SOCC (LwSOA)
DLE (LwEA)
DLEM

DPG
DMMG
Defence Health
Directorate of Safety
HQ TRADOC

For information:

HQ NZDF
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DCA
OSM (A)
IG(M)
IG(A)
IG(F)
LC(M)
LC(L)
LC(A)
HQ 1(NZ) BDE
LOTC
1 NZSAS Regt

ANNEX A TO
1150/49
DATED ~~MAY~~ 17
6 Jun 17

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-001
LwCAR Title: NZDF Hearing Conservation Programme		
Landworthiness Deficiency: The NZ Army does not have a hearing conservation programme which could indicate that a potential risk based approach has not been adopted.		
Action Required: 1) Investigate the feasibility of a Hearing Conservation Programme in consultation with DoS, RNZN, NZ Army and RNZAF.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes

Close Out	Extension to Close-out Date
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.
• LwCAR status is maintained by the NZDF LwRO and routinely reported to the AMB, ALB and NZDF LwA.	

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-002
LwCAR Title: Baseline impulse noise data of ammunition, explosives and pyrotechnics		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel. There appears to be an ad hoc approach to impulse noise research based on types of ammunition, explosives and pyrotechnics used by different units.		
Action Required: 1) Conduct research activities that capture baseline impulse noise data of NZDF ammunition, explosives and pyrotechnics that informs actual noise levels and potential noise exposure limits. Research is to include small arms ammunition, including blank ammunition, explosives, grenades, rockets, crew served weapons, 9mm, 5.56mm, 7.62mm, 25mm, 40mm, 60mm, 81mm, and 105mm natures.		
Action Assigned to: **COMD TRADOC**	**Due Date: 29 Jun 18**	**Close-Out Authority:** **LCC**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-003
LwCAR Title: OEM ammunition data		
Landworthiness Deficiency: There is no consolidated baseline assessment/data of the NZDF ammunition, explosives or pyrotechnics that provides actual noise levels or noise exposure levels for NZDF personnel.		
Action Required: 1) DMMG is to request for OEM specifications for noise data from OEM when procuring new munitions and explosives.		
Action Assigned to: **SO1 Ammunition & Explosives, DMMG**	**Due Date:** **29 Jun 18**	**Close-Out Authority:** **COMLOG**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-004
LwCAR Title: Audiometry Regulatory Standards		
Landworthiness Deficiency: There is no auditing and assurance activity of audiometry testing booths and rooms or hearing protection equipment. The regulatory standard for audiometry testing booths used in occupational noise management programmes is the AS/NZS 1269.4:20144. Audiometry booths used in NZ Army camps do not meet this standard.		
Action Required: 1) Address the regulatory standard and audit and assurance requirements for audiometry testing booths and rooms, including audiometry monitoring of NZ Army personnel. 2) Address the HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. 3) Investigate and direct procedures and/or processes for in-service hearing protection that devices still provide the expected protection.		
Action Assigned to: **BRIG A. Gray**	**Due Date:** **03 Dec 18**	**Close-Out Authority:** **CA**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

LANDWORTHINESS CORECTIVE ACTION REQUIREMENTS

Subject Review: **Hearing Protection**	**Date of Landworthiness Board: 24 Mar 17**	**LwCAR Identifier:** LwCAR-HP-005
LwCAR Title: NZ Army trades risk profile		
Landworthiness Deficiency: There is a HSW Act requirement that audiometry monitoring must occur if workplace circumstances and noise exposure-levels change, and at no greater than 12 month intervals for those members of the NZDF working within environments with regular and/or consistent excessive noise exposure. The current practice post initial test is five yearly testing, pre and post deployment. There is no assessment of NZ Army trades that are at higher risk due to working within environments with regular and/or consistent excessive noise exposure.		
Action Required: 1) Assess NZ Army trades that are at higher risk due to work environments and inform findings to DDH. 2) Incorporate findings into DFO(A) Vol 2 Army Health and Safety		
Action Assigned to: **Army Health & Safety**	**Due Date:** **03 Dec 18**	**Close-Out Authority:** **LWOR**
Close-Out Approval: **Approved / Not Approved**	**Signature:**	**Date:**

Processes	
Close Out	**Extension to Close-out Date**
• Action assignee takes action to satisfy the intent and requirements of the LwCAR. • Action assignee submits a closure request supported by appropriate objective quality evidence to the Close-Out Authority cc the NZDF Landworthiness Review Officer (NZDF LwRO). • LwCAR is approved / not approved as competed.	• Request is to be made to the Close-out Authority cc the NZDF LwRO (incorporating a risk assessment and formal advice of acceptance of the risks by appropriate authority(s)). • Request will be evaluated by the Close-out Authority. • Action assignee will be notified of the decision cc appropriate addressees and NZDF LwRO.

HEADQUARTERS NEW ZEALAND DEFENCE FORCE

NZDF Landworthiness **MINUTE**

25 May 2022 1150/49

DLwR

LANDWORTHINESS SUBJECT REVIEW (LWSR): LWCAR-SRR/AMR-02

References

A. LwCAR Barrett M107A1 Anti-Materiel Rifle (AMR) - 02
B. P99, Book 17, Barrett M107A1 Anti-Materiel Rifle (AMR) Training Manual

E iti noa ana, na te aroha Though my present be small, my love goes with it.

Purpose

1. The purpose of this minute is to provide a summary of fact-finding WRT Landworthiness Corrective Action Requirement (LwCAR), for the SRR/AMR-02 (ref A). It is longer than intended as it seeks to convey a comprehensive picture to enable informed decisions.

Background

2. A LwA determination (ref A) for SRR/AMR was issued on 04 Dec 19, which included 1x LwCAR, being:

   a. *"Minor Traumatic Brain Injury (mTBI) is identified as a potential risk to personnel firing the AMR due to cumulative concussive exposure. NZDF has no current system to record personnel exposure data. The lack of record was identified as requiring rectification".*

3. To rectify the LwCAR, *"LwOR is to co-ordinate the establishment of a corporate system of personnel exposure record keeping to document potential mTBI due to AMR firing. The resultant system is be compliant with civilian legislation and NZDF policy; to ensure data is suitably managed and accessible both during and after NZDF service".*

4. General background research was conducted to inform this LwCAR exposed wider issues regarding AMR use, mTBI and exposure monitoring from other exposures such as 84mm GG or explosive breeching[1], noise or harmful compounds such as lead, silica, formaldehyde or asbestos. Wider exposure monitoring is not in the scope but is of considerable secondary benefit. Noise induced hearing loss (NIHL) is also outside scope, but warrants further investigation. Training SOPs, methodology and firing limits was initially outside scope but is now considered as immediately achievable actions to prevent mTBI.

Findings

5. **AMR.** The .50 cal AMR is, as its name suggests, is an Anti Material Rifle, it is not a 'sniper rifle'. The AMR is primarily employed by Direct Fire Support Weapons Platoon in regular force infantry battalions. However, the AMR is also employed for long range effect by SOCC snipers[2]. The AMR is a newly introduced capability in the NZDF. Australia, Canada, UK and the US have employed similar weapons in similar roles for some time.

6. **mTBI.** TBI is classified broadly *'as injuries that affect normal brain function'*. TBI can result from a blow to the head, fall, or penetrating injury. More silent, are injuries resulting from blast overpressure waves impacting the brain. This can occur from explosions, such as from an IED or repeated exposure to blast overpressure when firing heavy weapons, explosive breeching or heavy calibre (.50) rifles. Blast-induced TBI is difficult to detect and diagnose. There are often no visible signs of brain trauma and many

[1] DFO(A) Vol 7, Book 3, Chap 4, Sect 4, Annex D.
[2] DFO(A) Vol 7, Book 3, Chap 5, Sect 4, Para 5301, 5302 and 5303.

mTBI symptoms overlap with post-traumatic stress disorder (PTSD) symptoms. These factors make determining blast-induced TBI and its severity complicated.

a. Studies of TBI incidence classify severity of injury as 'mild', 'moderate' and 'severe'. The most commonly used criterion for classifying severity is the Glasgow Coma Scale score. This is usually used for assessment when a person with suspected TBI presents to an Emergency Department or general practitioner. The scores (maximum 15 and 3 minimum) are categorised: 'mild TBI' 13 to 15; 'moderate TBI' 9 to 12; and 'severe TBI' 3 to 8.

b. The NZDF recognises causal links to mTBI from blast overpressure and consequently has a minimum safe distance for personal exposed to engineer explosive breeching blasts. This is based on the maximum blast overpressure not exceeding a maximum of 24 kilopascals or 3.4 PSI[3]. 3 psi is sufficient to cause decreased coordination, balance and strength and be classified as mTBI.[4] Many studies have provided evidence that the effects of blast exposure on the brain are cumulative and long-lasting. In a U.S. study of 27,169 army special operations command (USASOC) personnel, Kontos et al found that those with a history of blast-related mTBI were at greater risk of reporting PTSD symptoms than those with no mTBI history. Trotter et al, in a study of 249 veterans, found evidence that blast exposure accelerates the brain's aging process by reducing the integrity of the brain's white matter tissue. Elder et al reviewed 212 references, and concluded that low-level blast has long-term effects on the brain. They can all be summarised by saying *"while many questions remain concerning how blast overpressure waves affect the brain, there seems little doubt that low-level blast exposure should be of significant concern".*

7. **Literature review of evidence.** A literature review for relevant and reputable data was conducted using a search criteria of 'in English, published (but not necessarily peer reviewed), research based on a NATO, ABCANZ or European military population, data collected using published by a professional organisation using acceptable and stated methodology and published results have applicability to the NZDF'. The review was conducted by a person who has a PGrad Dip in Health Science endorsed in Occupational Health (being qualified in research methods) and has 34 years infantry experience. The online search used 'Google', 'Google Scholar' and the 'University of Otago Library'. Documents were cross-referenced against NZDF held documents using DDMS and RFIs to SMEs. This process removed bias and independently confirmed the body of knowledge already held by NZDF as relevant. It also confirmed that the NZDF has conducted a significant amount of research, knows mTBI harm from blast and recoil is probable, knows it has legislative obligations and to date has made little practical progress in implementing appropriate risk management or monitoring strategies. Key documents identified were:

a. Report for the ADF: Analysis of Blast Events, recorded during training in Australia from 17/10 - 01/11/2016, Black Box Biometrics, Blast Gauge.com.

b. NZDF DTA Report 425: Impulse Noise Measurement and Assessment in the New Zealand Army: A Scoping Study, N. de Lautour, Sep 2017.

c. Protecting Warfighters from Blast Injury, by L. Fish and P. Scharre Center for a New American Security's study on dismounted soldier survivability for the Army Research Laboratory, May 2018.

d. Occupational Blast Wave Exposure During Multiday 0.50 Caliber Rifle Course, Skotak et al, Frontiers in Neurology, Vol 10, Jul 2019.

8. **Literature found:**

a. Research on blast overpressure experienced by military personnel during operations (e.g. breaching), identifies measurable effects on operator readiness. Specifically, blast can be associated with suppressed response speed and cognitive function. Studies have

[3] DFO(A) Vol 7, Book 3, Chap 4, Sect 4, para 4509, q.

[4] Taber et al, blast related traumatic brain injury: what is known neuropsychiatry clin neurosci, 2006

demonstrated some personnel experience cognitive deficits (delayed verbal memory, visual-spatial memory, and executive function) after firing heavy weapons, even within allowable limits. Studies have also found higher rates of concussion and post-concussion associated symptoms among individuals with a history of prolonged exposure to low-level blasts from breaching and shoulder-fired weapons[5][6].

b. It is possible brain injury can be caused from repeated blast exposure from firing heavy weapons[7]. An animal study demonstrated mild brain injury in pigs and rats from blast overpressure from artillery, anti-tank weapons (84mm Carl Gustaf), and high-calibre rifles (M82A1 Barrett .50 calibre sniper rifle). Small haemorrhages in the brain, increasing with blast intensity, were seen in 21% of pigs exposed to M82A1 .50 calibre rifle fire and 7% exposed to Carl Gustav fire (even after as few as 3x shots). In practice, gunners for these weapons could be exposed to significantly more shots during training. The type of brain injury was consistent with brain damage seen in previous wars from soldiers who died, without signs of external injury, after exposure to blasts. While minor, the damage from these blasts has led the Swedish military to impose daily firing limits limit for .50 cal. The US Army also has limits on the number of times a soldier can fire shoulder-fired weapons per day. Even within approved firing limits, US DoD studies have demonstrated that service members may experience short-term cognitive deficits in delayed verbal memory, visual-spatial memory, and executive function after heavy weapons firing.

c. Some countries such as Sweden, the US and NZ have introduced individual firing limits on shoulder launched weapons.[8] Sweden and NZ have daily limits on .50 cal firing. The NZ limit is for the firer only and does not include the RCO, safety supervisor or surrounding troops, such as in explosive breeching rules[9].

d. NZDF DTA has conducted independent studies[10]. These have identified a potential causal link to mTBI from .50 cal rifle recoil and as such imposed daily firer limits. However, mTBI in studies are more typically associated with blast over-pressure. NZ also has a daily limit on some other heavy weapons and explosive breeching. Explosive breeching also requires an individual to self evaluate against known mTBI symptoms and maintain a personal record.

(1) P99, Book 17 (ref B) makes no mention of mTBI risk associated with the AMR other than the threat of unintentional discharge and there is no specific advisory in the safety brief. AMR LFTT uses 5x live rounds. Shooting practice chapters are yet to be issued and as such Part 1 and Part 2 shoots are not defined. CO SOCC has been delegated the authority to construct a suitable test, the current test (under review) uses 14x rounds.

(2) Given the time in service at IOR it can be assumed the daily firing limit has not impinged on the ability of personnel to become qualified and competent on the AMR.

9. **Ancillary equipment.**

a. The AMR is fitted with an ATACR Rifle Scope and the spotter uses a Leupold spotting scope.

[5] Protecting Warfighters from Blast Injury, by L. Fish and P. Scharre Center for a New American Security's study on dismounted soldier survivability for the Army Research Laboratory, May 2018.
[6] Report for the ADF: Analysis of Blast Events, recorded during training in Australia from 17/10 - 01/11/2016, Black Box Biometrics, Blast Gauge.com.
[7] Occupational Blast Wave Exposure During Multiday 0.50 Caliber Rifle Course, Skotak et al, Frontiers in Neurology, Vol 10, Jul 2019.
[8] Headquarters, Department of the Army, TM 3-23.25 (FM 3-23.35), "Shoulder Fired Munitions," September 2010, Table 2-3, 55.
[9] DFO(A), Vol 7, Book 3, Ch 4, Sect 4, Para 5354.
[10] NZDF DTA Report 425: Impulse Noise Measurement and Assessment in the New Zealand Army: A Scoping Study, N. de Lautour, Sep 2017.

(1) Ref B does not identify if these items are eye safe in a laser environment, it is assumed they are.

b. The AMR is issued with 2x barrels; standard (73.66cm in length) and close quarter (52.32cm in length) and suppressor.

(1) A longer barrel and suppressor significantly decreases overpressure exposure[11].

10. **Stakeholder engagement.**

a. **The Directorate of Safety**. Stated SEMT should be used to register harmful exposure.

b. **The Directorate of Health**. Stated the project to record harmful exposures had not been funded but a person has been recently appointed to create an exposure record system. The DoH also stated the Directorate of Safety is implicitly responsible for NZDF HSWA compliance.

c. **The Capability Manager**. Holds a .50 cal firing register on an excel document on DDMS.

d. **Range and safety**. Assisted DTA during DT&E and thought exposure limits were to mitigate recoil, rather than overpressure.

e. **AMR employing units.** Units were engaged with (by email) to Senior Weapon Instructors (SWIs), RFIs included:

(1) *Are you able to meet training (operational readiness) requirements within the current firing limit (30x shots per firer per day)?*

(2) *If you were to amend the limits; what would they be (up or down)? and why?, and should personnel within 50m (spotter, SS, RCO etc) also be included in limits?*

(3) *Are you aware of any incidence of signs/symptoms of mTBI from 50.Cal AMR use? (headache, vomiting, blurred vision, reduced cognition – think concussion)*

(4) *Are you aware of any other country who imposes daily firer limits, is so how many and who?*

f. **Summarised responses were:**

(1) **Combat School:**

(a) BLUF: 30x rds per day is acceptable (over an extended period of time). Units use the rifle suppressed which reduces the recoil and over-pressure effect. From a training perspective a 24hr stand-down period between firing necessitates scheduling burden and the School would rather not interrupt firing days.

(b) Currently the AMR cse is structured to suit 30 rds a day w/ 24hr respite in-between. This impacts on the sequence of learning for the students (ie; they can learn something, go onto the range and shoot/test what has just been taught then have to wait 24hrs before they can shoot again, so are taught something else in the mean-time). This is manageable with sequencing with no severe impact on learning.

(c) It would be good to remove the 24hr stand-down period between firing periods. 30 rds spread over a day *'has a limited impact on firer'*. Firing should not impact other personnel in vicinity. Note: The original Operating constraint signal limited the firer to 30 rds per day for the *"purpose of minimising any probable risk of cumulative effect of excessive recoil"*. [12]

(d) Personnel within 50m (spotter, SS, RCO etc) should NOT be included in limits.

(e) Combat School are NOT aware of mTBI type symptoms caused by firing.

[11] User interview summarised later.

[12] Signal: 10081. Operating Constraint M107A1 Anti-Material Rifle dated 050430Z Aug 19.

(f) Combat School IS aware of daily firing limits in the US, Aus, & Canada, however those limits are unknown.

(2) **SOCC (accepted as NZDF SME due to international significant experience):**

(a) The unit is able to meet training (operational readiness) requirements within the current firing limit of 30x shots per firer per day (in the past this was 16x).

(b) The unit builds a 3x high sandbag wall, just back from the muzzle either side of the barrel to deflect blast, this reduces blast exposure to the operator and observer.

(c) *"30x rounds per firer a day is more than enough to maintain skill and capability. There is also a reduced range round that can be used as a training medium to lessen blast exposure. If there is a need for people to be within 50m, ideally, they are in some form of cover (3x high sandbag wall) or below the line of fire".*

(d) *"Reduced range ammunition (with a corresponding reduced blast effect) is available and used wherever possible".*

(e) Before using a sandbag wall the unit did have people report mTBI symptoms (headaches), on occurrence firing stopped for that day.

(f) Canada has a firing limit and this was the source of the original 16x round limit.

(g) *"30rds a day as a firer is enough and you feel it at the end of the day. The limit has a greater effect on the planners as you can't pump through serials or shooting training/tests like you used to. The net effect is any LFF has to be longer and spread over multiple days ie our AMR test shoot is 14 rounds (under review), by day and night so it takes a full 24hrs just to do a shooting test day and night once without any other rounds in between. The other issue we have is our snipers have .308, .338 and AMR .50. The .338 has a 30rd limit which is accumulative between AMR and .338. So we have had to look at the way we run our training and do live firing over double the amount of days and intersperse the shooting with other training which has its own issues, again the main issue is on the planners side…"*

(i) Note: SOCC seemed to have a very well understood and mature approach to risk management and have been using the capability for some time with other nations. SOCC were aware cognitive abilities were imperative for personnel conducting many tasks during high risk activities.

(3) **1 RNZIR:**

(a) *"1 RNZIR is able to meet training (operational readiness) requirements within the current firing limit but does so over multiple days when the unit could achieve training outcomes in just 1x day without restrictions".*

(b) The unit perceives there to be a difference of effect depending on the 'rate' of fire. For example: 30x rounds fired in 10 minutes is more harmful that 30x rounds fired of 6 hours. The unit would like to increase daily firing limits after research and testing.

(c) Personnel within 50m (spotter, SS, RCO etc.) should NOT be included in limits because these persons can be positioned outside the blast area and do not suffer the same forces as the firer. Including these pers would increase the time to meet training requirements as they are often rotate through as a firers.

(i) Note: There is NO NZDF 'defined safe distance'. Firers who act as safety supervisors and RCO are therefore likely exposed to cumulative blast in excess of the daily limit; harm is likely unless a safety distance is specified.

(d) 1 RNZIR is NOT aware of signs/symptoms of mTBI from 50.Cal AMR use using the 30x rd a day limit. It was noted a person experienced headache after firing 130x

rounds in a day which included multi-target engagements engaging up to 5 targets with 2x rds as fast as possible. The unit did not mention reduced accuracy or cognitive ability during use.

(e) 1 RNZIR is aware the US and AUS have daily firer limits, but they are unknown.

(4) **2/1 RNZIR:**

(a) *"The unit is able to meet training (operational readiness) requirements within the current firing limit".*

(b) AARMRD Platoon identified the main area for skill fade is ancillaries. Training (approved by DEMO) to maintain/refresh ancillary skills has used DMW as an alternative weapon. AMR live firing drills can be trained using live firing, dry firing and scenario based training. There would be benefit for the AMR to be hooked up to the WTS.

(c) The unit recommended retaining the daily firing limits and that a safety limit of 5m be applied to safety supervisors and RCOs (any person within 5m of the wpn ought to have a 30 round daily limit applied).

(d) Personnel have experienced (and seen in others) mTBI signs/symptoms after a shoot (without suppressors). Both shooters and spotters felt mild dizziness, headaches and nausea. This occurred within the 30x daily limit. These effects lasted about 24hrs and had no reported noticeable long lasting effects.

(i) On occasion symptoms were experienced after only 3x unsuppressed rounds were fired and headaches lasted more than 24hrs.

(ii) *'A student on the last handler's course got an instant nose bleed from the 1st round due to the overpressure whilst doing his LFTT qual'.*

(e) The unit found the suppressor noticeably reduces overpressure so now typically only fires with a suppressor fitted.

(f) Members of the unit reported awareness that UK forces have had problems with the concussive effects of firing .50 cal particularly with hearing damage and consequently, there is a resulting 10x rounds live fire daily limit.

(g) The unit was unaware of the practice to use sandbags to create a buffer wall.

(h) The unit strongly recommends:

(i) A head incident assessment (HIA) is to be incorporated into the weapon system (*"like in rugby and league"*) and operators tested after any shoot.

(ii) Guidance is provided for the spotter's position to be directly behind the firer (as the tactical situation allows) to reduce proximity concussive effect and better observe the fall-of-shot.

(iii) The AMR is used suppressed whenever possible.

(iv) The SS and RCO maintain a separation distance of at least 5m from the firer.

(v) No amendment is made to the limits.

(vi) Note: In this units feedback there was no mention of medical assessment or referral; it can only be assumed no medical treatment was sought nor SEMT entry made. It suggests harm may be under reported and accepted as a simple consequence of business.

(5) **RSM 5/7 RNZIR (NZ Army Combat Shooting Team SME):**

(a) *'Definite increase in blast when fired without a suppressor fitted'.*

(b) *'Significant reduction in blast when fired through a 'sandbag wall' which removes much of the 'Back blast' from the muzzle break'.*

(c) *'With no wall or suppressor firing off the bipod gets uncomfortable within 6x – 8x rds (quickly) and the operator often starts to flinch'.*

11. **NZDF and legislative requirements.**

a. **Health and safety at Work Act 2015 (HSWA).** The HSWA requires, as a primary duty, a person conducting a business or undertaking (PCBU), to ensure, so far as is reasonably practicable, the health and safety of workers is not put at risk by work. In the high risk work environment that the NZDF operates in control measures are implemented to minimise risk:

(1) Published Worksafe guidance notes health risks to workers that arise from harmful exposure, such as mTBI, need to be managed. In some circumstances, this could mean monitoring worker exposure (exposure monitoring) and monitoring the health of workers (health monitoring). Exposure monitoring measures and evaluates what workers are being exposed to while they are at work. Health monitoring looks at whether a worker's health is being harmed because of what they are being exposed to while they are at work.

b. **New Zealand Accident Compensation Corporation (ACC).** ACC guidance notes terms routinely used to describe the severity of TBI, such as mTBI, may be unacceptable to people with brain injury within this category, as the impact to health and functioning as a result of the injury may be *'far from mild'*. ACC also notes use of the term can lead to the injured person feeling dismissed and the full extent of problems are not accepted. ACC has a Traumatic Brain Injury Strategy and Action Plan which requires focus within existing ACC injury prevention programmes. As an ACC AEP organisation NZDF likely has an obligation to contribute to such programmes, prevention using daily exposure controls and monitoring is a method of achieving this.

c. **Treaty of Waitangi and impact on Māori.** In New Zealand, there are significant ethnic disparities in the prevalence of TBI. Māori have high incidence rates of TBI, evidence suggests that TBI is under-reported and Māori are at risk of poorer outcomes following TBI. As a Crown entity NZDF likely has an obligation to consider the needs of Māori.

d. **NZDF policies.** NZDF policy to blast over pressure or harmful exposures seem fragmented.

(1) Current NZDF practice Explosive Breeching (IAW Vol 7 Book 3, Ch 4, Sect 4, Annex D) requires self evaluation and record keeping of blast exposure at unit level.

(2) Current NZDF practice restricts exposure to some identified practices (such as .50cal and 84mm) by imposing daily limits to firers. A system wide review and standard approach is not evident, nor is study of actual blast exposure.

12. **Exposure monitoring.** Standards are ineffective if they are not enforced. In practice, firing limits can be violated in training so should not be left to individuals to self-police. Any symptom which includes cognitive deficiency should never be left to the affected person to identify and treat. In some environments, surrounding soldiers (such as spotters, safety supervisors and RCOs) can receive a similar exposure to firers, far exceeding limits; exposure should be recorded for those within an observable distance 'bubble' (ie 10m) and not just firers.

a. Exposure monitoring requires data and personal identifier management and security; so must be held on the existing NZDF restricted system (DXIS).

(1) Note: This is a particular requirement for SOCC personnel.

b. Held data must be searchable and retrievable (even after service); so existing systems such as PROFILE and SAP HRM must be used.

13. **Operational exposure monitoring.** During operational deployments and for HQJFNZ sponsored overseas engagement activities, HQJFNZ Annex H Casualty Co-ordinating Instructions require 'Potential Harm Exposure Reporting'. The Contingent Comd (SNO) is responsible for reporting all incidents of exposure or possible exposure to hazardous substances or stressful incidents to J1 Health Branch, HQ JFNZ. This includes mTBI events or other exposures.

a. On receipt of the SNO notification or NOTICAS J1 Health will make an entry into PROFILE. PROFILE is a MIC level database and medical management tool that records an in-service medical history and is accessible by NZDF medical professionals for the purpose of diagnosing, patient referral and assessing medical deploy-ability and employability. It also provides evidence to ACC and Veterans Affairs.

b. J1 Health will likely recommend the patient is referred for medical examination (if this has not occurred already), the appropriate diagnosis and specialist referral will also being noted in PROFILE. An entry into SEMT ought to also be made by the individual.

14. **Operational imperative to train.** It is vital operators train on the AMR to grow and maintain operational capability. Without live-firing the AMR capability cannot be realised.

a. **Alternatives.** Sim, dry firing and theory instruction is available but live fire remains an absolute necessity. However, these can be woven into training, a DMW can be used for ancillary training and reduced range ammunition can be used.

15. **Risk assessment if LwCAR-SRR/AMR-02 is not resolved:** NZDF holds SIGNIFICANT legal risk which is LIKELY to be realised in the short term.

Recommendations:

16. NZDF (Directorate of Safety) is requested to recognise any personnel surrounding heavy weapons (such as artillery, mortars, 84mm MRAAW, 72mm SRAAW and .50 cal AMR) or explosions can be exposed to harmful blast overpressure (above 3.0 PSI). Note: This applies existing knowledge and practise to other weapon systems.

17. NZDF (Directorate of Safety) is requested to release a Safety Alert educating personnel on the harmful effect of blast overpressure (above 3.0 PSI), what symptoms are, suggested behaviour regarding mixing contact sports and alcohol and what actions to follow if symptoms occur. Note: This follows an existing educative practice.

18. NZDF (Directorate of Safety) establish (without delay) a method of recording exposure to [potentially] harmful events and substances. Until this is capability is introduced, NZDF immediately establish a method of data capture of .50 cal serials and total daily exposure. This could be in SAP, loaded by the RCO as a 'qualification' viewable on ESS. Note: This is a new procedure.

19. NZDF (Directorate of Health) record in personnel medical records (PROFILE) suspected mTBI presentations to a health professional, and an entry is also made in SEMT by the individual. Note: This follows an existing practise and be further reinforced in NZDF medic DMTP training.

20. NZDF (DTA) is requested to conduct research to study blast, noise and recoil during weapon practices (involving any blast) to better understand NZDF risk, identify exposures to 3.0 PSI + and to inform future methods of work. Note: This continues current practice of research, will expand existing knowledge and contribute to the international body of knowledge.

21. NZDF (Weapons and Range Safety) is directed to recognise blast over pressure (and recoil) can cause mTBI and information to this effect is published in DFO (A) Vol 2**,** DFO (A) Vol 7, Book 1 and NZ P99 Book 17. The content and format similar to the information contained for explosive breeching found at DFO (A) Vol 7, Book 3, Chap 4, Sect 4 and specifically Annex D. Note: This is new work.

22. NZDF (Weapons and Range Safety) is directed to include mTBI danger and signs and symptoms in applicable safety briefs[13]; and provide direction that in the event of experiencing any symptoms personnel are to present themselves without delay to a medical facility for assessment. Note: This is a new practise.

23. NZDF (Weapons and Range Safety) is directed to maintain daily firer limits of 30x round per day and extend the limits to those within 5m of the firer (e.g potentially spotter and safety supervisor). Note: This maintains existing practise and practically extends it to others. The practice does not impinge the ability to meet operational readiness or training outcomes. Indeed, overuse creates diminishing returns as operators flinch.

24. NZDF (Weapons and Range Safety) amend DFO (A) Vol 7, Book 1, Ch 6, Sect 1 Annex B to note in serial 5, .50 cal Field Firing Practices must be attended by a NZDF Medic. Note: This practically reinforces existing practise and removes the ability for 'waivers'.

25. NZDF (Weapons and Range Safety) confirm the AMR scope and spotting scope are laser eye-safe and make comment as such in each area of the P99 Book 17. Note: This is a new procedure.

26. NZDF (Weapons and Range Safety) is directed to add the requirement in NZP99, Book 17 (and any other pertinent publication):

a. Note the possibility of user harm from over pressure and recoil (suggest in Chap 2, Sect 1).

b. Trainers are taught to sequence training, where possible, to reduce single prolonged exposure events (ie, spread training periods out) and employ theory, SIM, dry firing and substitute weapons (e.g DMW to train on ancillaries). Note: This formalises current SME practice and shares the practice to other users, it will also require a culture shift.

c. Trainers, where possible, require all users to conduct symptom self-assessment, to lodge exposure and any harmful symptoms; stopping any practice immediately on onset. To refrain from alcohol and contact sports and be self-aware following any practice. Note: This may require a substantial culture shift.

d. Trainers, where possible, create a 3x sandbag wall either side of the barrel to reduce 'over-pressure back-blast'. Note: This formalises current SME practice and shares the practice to other users.

e. RCOs and planners, plan, where possible, to employ the suppressor, long barrel and reduced range ammunition (singularly or in combination). Note: This formalises current SME practice and shares the practice to other users.

s.9(2)(g)(i)

Trial Manager

[13] Such as in DFO(A) Vol 7, Book 3, Chap 4, Sect 4, Annex D.