Development of an Occupational Noise Exposure Reduction Project for Defence in Australia

Peter TEAGUE[1]; James CONOMOS[1]; Vasos ALEXANDROU[1]; Martin JENNINGS[2]

[1] Vipac Engineers & Scientists Ltd, Australia

[2] Department of Defence/DCOHS, Australia

ABSTRACT

Noise is the most prominent and widespread hazard to which Australian Defence Organisation (ADO) personnel are exposed. Recent advances have been made though the development of a 5 year Noise Exposure Reduction Project for occupational/workplace noise for the ADO by Vipac Engineers & Scientists Ltd. This project was informed by an initial Exposure Reduction Plan (ERP) phase that included a complete review and assessment of noise management practices across Defence and identified a range of deficiencies and recommendations for action. The ERP is based upon a continuous improvement approach and its goals are initially to ensure compliance with Work Health & Safety (WHS) legislation, then to proactively deliver minimisation of noise exposure and management of hearing loss risk throughout the whole of Defence. A coordinated and systematic approach, including best-practice noise surveys and assessments at a representative sample of Defence Bases, has provided an evidence-based dataset to inform effective noise control actions. The project and noise survey findings to date are highlighted. Tailored Noise Management Plans (NMP), with prioritised and practical noise control measures, and innovative noise management tools have been formulated to improve noise control practices across Defence.

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1. INTRODUCTION

The Department of Defence (DoD) in Australia has established an innovative project to reduce occupational noise exposure in all workplaces across Defence. Vipac Engineers & Scientists Ltd (VIPAC) has recently worked with the Defence Centre for Occupational Health & Safety (DCOHS) to develop an Exposure Reduction Plan (ERP) for workplace/occupational noise for the Australian Defence Organisation (ADO) (1, 2, 3).

The ADO comprises the ADF Services of the Royal Australian Air Force (RAAF), the Royal Australian Navy (RAN) and the Army, and the supporting Defence Groups including Defence Materiel Organisation (DMO), Defence Support & Reform Group (DSRG), Defence Science & Technology Organisation (DSTO) and various Joint Commands (including the Joint Health Command, JHC).

Workplace or occupational noise has been identified by the DCOHS as a significant WHS hazard and one of the aims of the project is to understand the impacts (e.g. performance, capability, financial) of occupational noise across Defence, and how to develop an improved noise management system.

Development of an ERP for Occupational Noise will assist Defence in meeting objectives of the current Defence WHS Strategy 2012-17 (4); in particular, Objective 4: *Preventative Measures – Defence maximises the prevention of injury, illness and disease by identifying the threats to the workforce by process, procedure or materiel*. The ERP project also forms part of the implementation of key Defence plans, including the Defence Occupational Medicine and Occupational Hygiene (OMOH) capability and the Defence Occupational Hygiene Plan (DOHP).

[1] petert@vipac.com.au

[2] martin.jennings@defence.gov.au

2. BACKGROUND

2.1 Initial ERP Project

In the initial phase of the ERP project, a Defence-wide review and assessment of noise management practices was conducted and this identified a range of deficiencies and recommendations for action (1). The evidence based approach involved extensive stakeholder consultation and the analysis of large quantities of data, which then highlighted areas where the most significant benefits could be realised.

The levels of noise encountered in Defence exceed those experienced in virtually any other industry or work environment, and Defence operations can involve extended periods in close proximity to major noise sources with some of the highest noise levels of any workplace. The damage is evidenced by hearing loss results from audiometric tests and DVA compensation claims data. Permanent noise induced hearing loss (NIHL) can be one of the most prevalent occupational health conditions in Defence, but is irreversible and can be minimized or eliminated through effective management.

Analysis of the Defence organisation and culture indicated that a number of factors pointed to the need to introduce a new approach – these factors included the multiplicity of stakeholders; communication/coordination issues; operational tempo; the posting cycle; that noise is regarded as something that came with the job; failure of the current approach with no resultant improvement.

The ERP was devised to address the cultural and organisational impediments to noise management. The approach needed to be evidence based and involve expert analysis and interpretation of data from monitoring programs, which are then used to determine most the appropriate course of action and controls. Noise controls need to be not only effective but enduring, to ensure that there is no slippage and to ensure that gains are captured and used as a basis for further gains.

2.2 Control Measures in Defence

Evidence throughout Defence and across the ADF Services shows that there is a reliance on lower level noise control measures that involve administrative controls (e.g. change of process or personnel task rotation, PPE/hearing protection) rather than engineering noise control (1). The alternative of engineering controls, however, often cannot be implemented quickly and is not necessarily practical in many cases in Defence due to physical or operational constraints, impracticalities or logistical issues. Many platforms (e.g. vessels, aircraft and vehicles) in Defence are quite old and are either scheduled for upgrade or complete replacement and thereby may not justify control costs now.

Noise control requirements need to be incorporated early in the procurement and design phase of a platform or system. For some platforms procured overseas, installing effective engineering treatments may be difficult and the use of administrative and PPE options may be the only alternative. However, this has the danger that a residual liability for workplace noise may exist for the service life of the equipment or platform. Therefore, it is important for Defence to focus on eliminating or minimising noise hazards associated with plant or systems at, or prior to, the point of entry, where practicable.

2.3 ERP Project Outcomes

Initial ERP project outcomes included Exposure Reduction Plans (2) developed for each of the stakeholder Services and Groups, with prioritised higher-level strategies and initiatives to improve noise management. The benefits to Defence would include: 1) demonstrated WHS compliance, 2) reduced costs and lower liability for claims, 3) improved capability, as soldiers are less likely to be downgraded for medical reasons, 4) Defence's reputation as an employer.

The subsequent preparatory phase of the project involved best-practice noise surveys and assessments at a representative sample of ADF Bases. This systematic approach generated a comprehensive evidence-based dataset, which allowed the development of effective noise control actions in the form of tailored Noise Management Plans (NMP) for each Base (3).

2.4 WHS Legislation

The recently harmonized Commonwealth Work Health and Safety (WHS) Legislation, the WHS Act 2011 and WHS Regulations 2011, came into effect on the 1st January 2012 (5). One of the most significant changes is the move away from the old employer-employee duty of care relationship, to a new 'person conducting a business or undertaking' (PCBU) with a slightly different responsibility in addition to specific workers' responsibilities.

The WHS Regulations 2011 mandates that the PCBU must ensure that the noise that a worker is exposed to at the workplace does not exceed the exposure standard for noise and that they must

manage risks to health and safety relating to hearing loss associated with noise. The WHS Act 2011 states that where noise hazards are identified in the workplace, they are to be eliminated, or at least minimized 'so far as is reasonably practicable (SFARP)'.

For plant, such as machinery and platforms (i.e. 'materiel'), supplied or imported by Defence, the relevant parts of Defence that are responsible for plant procurement and supply must take all reasonable steps to obtain information about the noise emission values for the applicable operating conditions of the plant, and provide that information to any person to whom the plant is supplied (Regulation 59).

Noise surveys and associated measurements must be done in accordance with the methodology in the WHS Regulations 56–57, the Approved WHS Code of Practice – *Managing Noise and Preventing Hearing Loss at Work* and Australian/New Zealand standard AS/NZS 1269.1 (or an equivalent or higher standard method). Noise measurement surveys should be done by a competent person in accordance with AS/NZS 1269.1 and the WHS Code of Practice.

Other WHS Regulations also apply, including in the areas of: identifying, assessing and managing WHS risks (Regulations 33 to 35), hierarchy, maintenance and review of control measures (Regulations 36 to 38), provision of information and training (Regulation 39) and provision of personal protective equipment (Regulations 44 to 47).

Audiometric testing must be provided for workers who are frequently required to use personal protective equipment (PPE) as a control measure, such as hearing protection, within 3 months of the worker commencing work, and in any event, at least every 2 years (Regulation 58).

2.5 Defence Policies and Procedures

Defence's top-level workplace safety document is the Defence Work Health and Safety (WHS) Manual (formerly known as *SAFETYMAN*) (6). The WHS Manual contains the WHS policies and procedures that apply to the whole of the ADO and all Defence workers.

The new Defence WHS Manual (6) is currently in the process of development, and it contains the Policies (Volume 2) and Procedures (Volume 3) that incorporate a revision of the previous Manual and align with the requirements of the new WHS legislation (5). The new policy and procedures for *Noise and Hearing Management* have recently been developed.

The ADF Services have also developed separate Service-specific WHS policy and procedure manuals, which are aligned with the latest Defence WHS Manual. Other Defence documents that provide policy directives include the ADF Health Manual, Defence Instructions, Health Directives, DEFGRAMS and DEF(AUST) specification documents.

The policy and procedures state that noise hazard risks must be identified, assessed, managed, reviewed and communicated. Noise hazards are defined as sources, areas or activities in the workplace that generate, or contribute to, excessive or hazardous noise exposure that can lead to exceeding the workplace exposure standard for noise and can lead to hearing loss. It is important that Defence has a focus on reducing the extent and impact of the major noise sources/hazards and high noise exposure groups, activities and areas.

3. PROJECT PROGRESS AND OUTCOMES

3.1 Initial Findings

The current status of Defence occupational noise management was reviewed by performing:

1) a detailed evaluation of the current standards, practices and levels of compliance, and
2) identification of limitations and deficiencies in the system through a gap analysis.

This first project phase involved extensive consultation with a wide range of Defence stakeholders in Canberra and Defence establishments around Australia (1). Previous papers (7, 8) described the process and findings from the initial project work. This paper provides an overview of the results and outcomes from the project to date.

In summary overall, even though some parts of Services and Groups are well resourced, it was found that there is limited coordination and cooperation across Defence and therefore substantial inefficiencies as a result. In addition, there are major constraints due to entrenched practices.

Given the variability throughout Defence in the amount and quality of data (and frequency of data collection), a program of best-practice systematic noise surveys and assessments was instigated at a representative sample of ADF Bases (2, 3).

3.2 Noise Surveys and Assessment

A new best-practice Statement of Work (SOW) for carrying out noise surveys and assessments was recently developed by the project team for adoption throughout Defence (which aligns with the new WHS legislation). Table 1 provides an overview of the noise identification and evaluation process.

Table 1 – Overview of the noise identification and evaluation process

Step	Action
1	*Review available information* – collate and review relevant workplace data, previous reports etc.
2	*Routine or baseline survey* – basic or preliminary assessment, e.g. walk-through inspection.
3	*Detailed or targeted survey* – noise measurement survey, analysis and risk assessment.
4	*Outputs from survey* – noise survey report and noise controls (noise management plan).
5	*Stakeholder involvement and action* – coordination, review, signoff and implement control action plan.
6	*Ongoing review* – regular follow-up, checks, review and improvement.

Utilizing the new SOW process, comprehensive noise surveys were performed at a total of 8 ADF facilities throughout Australia including a field survey of Army combat exercise activities (3). As part of each noise survey, a review was undertaken of the following:

1) The ADF Facility workplace composition and units/sections.
2) The WHS and Noise Management System currently in place at the ADF Facility.
3) Previous noise surveys, reports and data at the ADF Facility (including compliance).
4) Range of trades, personnel and Similar Exposure Groups (SEGs).

Noise measurements of all Base Units, areas, tasks and noise sources were performed, including sufficient personal noise dosimetry samples (over representative work shift periods), extent of impulse noise and noise frequency spectra (i.e. octave or third octave bands) of major noise sources.

The measurement results from these noise surveys were assessed against the regulatory Exposure Standard for Noise; namely, $L_{Aeq,8h}$ 85 dB(A) and L_{Cpeak} 140 dB(C).

The noise assessments must take account of any ototoxic substances (such as fuels, solvents, heavy metals etc.) and/or vibration (particularly hand-arm vibration) that are present in combination with any noise. It is recommended that a lower noise exposure standard (such as 80 dB(A) instead of 85 dB(A) L_{Aeq}) should be applied in such cases. For workers regularly exposed to the combination of high levels of noise (e.g. such as 100 dB(A) or more) and ototoxic substances (e.g. such as aircraft refuellers), then an even lower noise exposure standard may need to be considered.

Subsequent analysis and assessment of the noise survey data allowed determination of:

a) noise exposure levels and extent of exceedance relative to the standard,
b) identification and ranking of noise hazards for each workplace unit or section,
c) exposure risk profiles for Similar Exposure Groups (SEGs), and
d) level of noise control measures required to meet the requirements.

A wide range in noise levels and noise exposures were measured at the various ADF facilities (3). The 8-hour equivalent $L_{Aeq,8h}$ noise exposure levels were often over 85 dB(A), and many areas (such as workshops, maintenance sections, hangars, flightlines etc.) showed exposure levels over 90 and 100 dB(A). In some cases, L_{Aeq} noise levels reached between 110 and 120 dB(A) during some tasks (such as vehicle maintenance tasks, hand tools, sand blasting etc.).

Very high to extreme impulse noise levels are experienced within the ADF. The L_{Cpeak} levels often exceed the exposure standard of 140 dB(C) during specific activities, such as maintenance tasks (impacts during hand tool use), and reach up to 180 dB(C) during weapons firing (e.g. large calibre artillery). Controls for such activities would include double hearing protection (ear muffs and ear plugs), minimum distance limits, maximum exposure times and a maximum allowable number of

rounds per day, in the case of artillery firing.

An example of measured noise dosimetry graphs over a typical shift period for different trades in the ADF is shown in Figure 1. Note that the cumulative noise exposure rises significantly during relatively brief and intense tasks (such as riveting, drilling, grinding, cutting, hammering, rattle/needle guns, surface finishing, composite work etc.) and remains quite high, and in fact well above the exposure standard, until the end of the shift period.

Noise sources (and SEGs) were ranked and prioritised for treatment based on a risk assessment, such as assigning a risk level from a matrix of likelihood and consequence/severity. The risk level associated with a noise source or SEG was based on information about the magnitude of the noise exposure levels, the frequency of exposure (during a shift or longer periods), the applicable hearing protection area (HPA) zone/s, observations of hearing protection use etc.

The existing Hearing Protection Areas (HPAs), their designation and signage, and the HPA zones required from the analysis, were also evaluated. The assessment also reviewed the currently provided Hearing Protection Devices (HPDs), the specified and actual in-ear attenuation levels and observations about the use and fitting of HPDs.

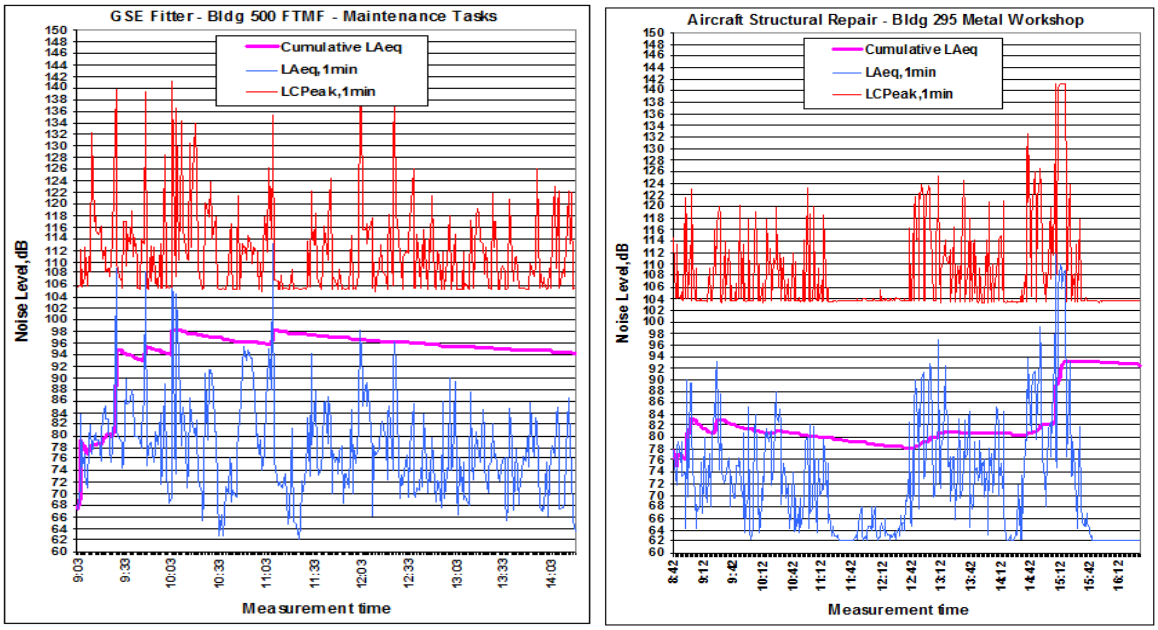

Figure 1 – Example noise dosimetry graphs over a shift period for different ADF trades

3.3 Noise Exposure Extent

Overall, most of the ADF facilities surveyed did not demonstrate legislative compliance in all areas nor did they fully meet Defence's own requirements (3).

In general, the noise surveys confirmed that Defence showed:

1) Large number of high noise exposure areas throughout Defence.
2) Widespread significant exceedances of noise exposure standard.
3) Likely high levels and extent of hearing impairment (NIHL).
4) Limited noise control measures and noise management plans.
5) Incorrectly or non-existent signposted HPAs and insufficient type or use of HPDs.
6) Limited knowledge of synergistic effects of noise and ototoxic agents, vibration etc.

A Similar Exposure Group (SEG) risk assessment, based on a WHS consequence and likelihood matrix, showed that a wide range of trades/SEGs display moderate, high and very high risk ratings, with some specific groups registering extreme risk ratings. The purpose of this is to identify the most at-risk groups to focus priority control action.

The trades or Similar Exposure Groups (SEGs) that experience some of the highest exposure levels include fitters, vehicle mechanics, maintainers, welders, metalsmiths, structural repair technicians, aircrew, aircraft/avionics technicians, aircraft refuellers, air terminal/hangar operators, ordnance loaders/operators, artillery or combat troops etc. Notably, many of these trades are also exposed to a range of ototoxic substances (e.g. solvents and fuels) and hand-arm vibration.

A resultant exposure risk profile for a particular facility was determined from the SEG noise risk assessment. An example of a risk profile from a major ADF facility is shown in Figure 2.

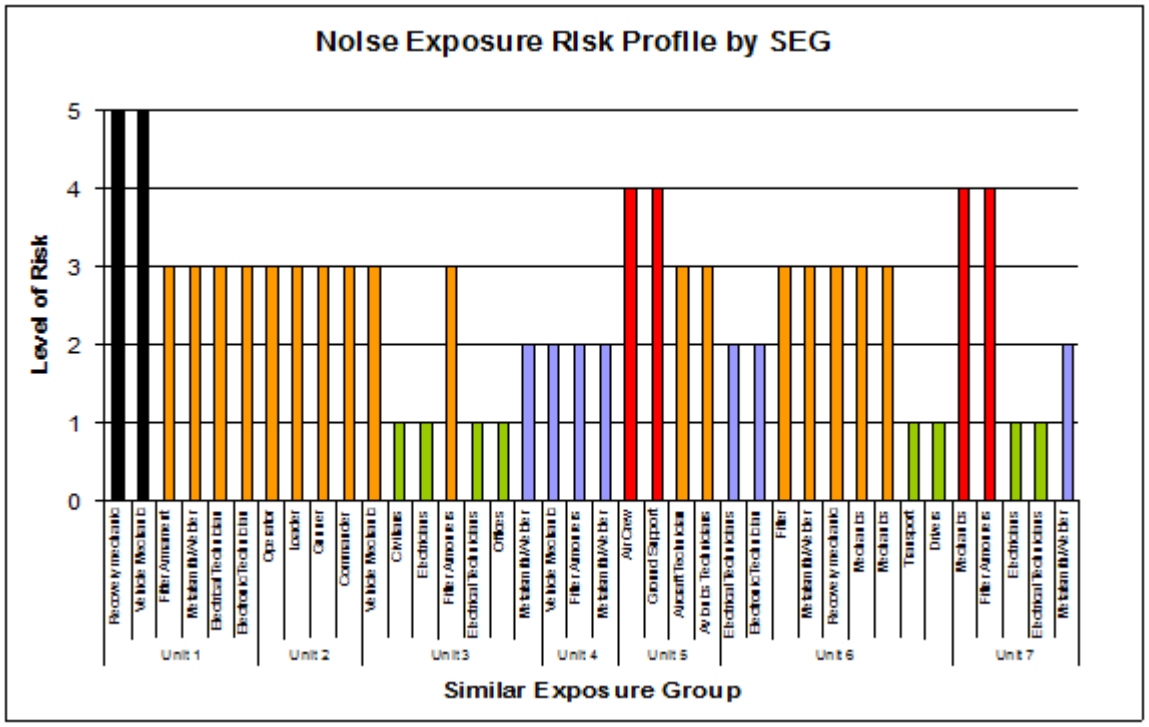

Figure 2 – Example exposure risk profile for the range of SEGs at a major ADF facility

3.4 Adjustments for Extended Work Shifts

A lower exposure standard should be considered and applied for workers that work *extended work shifts* greater than 8 hours per day (which can occur in Defence). In such cases, the equivalent noise level over an X-hour shift (i.e. $L_{Aeq,Xh}$) should be converted and normalized to an 8-hour equivalent $L_{Aeq,8h}$. Then an adjustment (from +1 to +3 dB) is required to be added to the normalized $L_{Aeq,8h}$ depending on the value of X (in accordance with the WHS Code of Practice and AS/NZS 1269.1).

Alternatively, instead of converting to a normalized 8-hour equivalent $L_{Aeq,8h}$, a lower exposure standard could be used over a shift for application to regular extended work shifts. For example, a lower exposure standard of 82 dB(A) $L_{Aeq,12h}$ may be applicable for 12-hour shifts, and 80 dB(A) $L_{Aeq,16h}$ may be applicable for 16-hour shifts.

A lower exposure standard should be considered and applied for workers that work *extended work weeks* greater than 5 days. In such cases, the equivalent noise level over an X day week (i.e. $L_{Aeq,Xday}$) should be converted and normalized to a 5 day week, $L_{Aeq,5day}$ (in accordance with the WHS Code of Practice and AS/NZS 1269.1).

Alternatively, a lower exposure standard could be used over a period for regular extended work weeks, and in cases of both extended work shifts and work weeks (e.g. such as the case for naval vessel personnel at sea for extended periods). Note that the hearing risk increases for a shorter hearing recovery time (between successive work shifts) and in cases when reasonably high noise levels occur during the recovery time (e.g. greater than 75 dB(A)). For example, a lower noise exposure standard of 80 dB(A) $L_{Aeq,12h}$ may be applicable each day for contiguous 7 day 12-hour shifts, and 78 dB(A) $L_{Aeq,16h}$ may be applicable each day for contiguous 7 day 16-hour shifts.

Other noise exposure standards or adjustments may need to be applied for special or complex situations, such as exposure to *high intensity impulse noise* (for example, in situations such as weapons use or explosive ordnance activities). Other standards (e.g. US military standard MIL-STD-1474D) provide guidance on the different exposure metrics that may apply in such cases.

3.5 Key Performance Indicators

A number of Key Performance Indicators (KPIs) were developed to measure the current level of compliance and maturity at ADF facilities in relation to noise management (3). These include a range of lead and lag KPIs that can be used to measure the actual change and progress over time.

KPI scores were determined for 10 distinct KPI areas for each ADF Facility covering the:

a) Extant WHS Management System in place at the ADF Facility, and the
b) Noise Survey Assessment Results from the recent noise survey performed.

The total KPI score provides a realistic measure of the current WHS noise management system at the facility and a measure of the completeness of the recent noise survey and assessment. It also enables commanders and managers to see how they perform when compared to other facilities, and how they can improve their performance.

Figure 3 shows a schematic comparison chart of these KPI results for the ADF facilities surveyed.

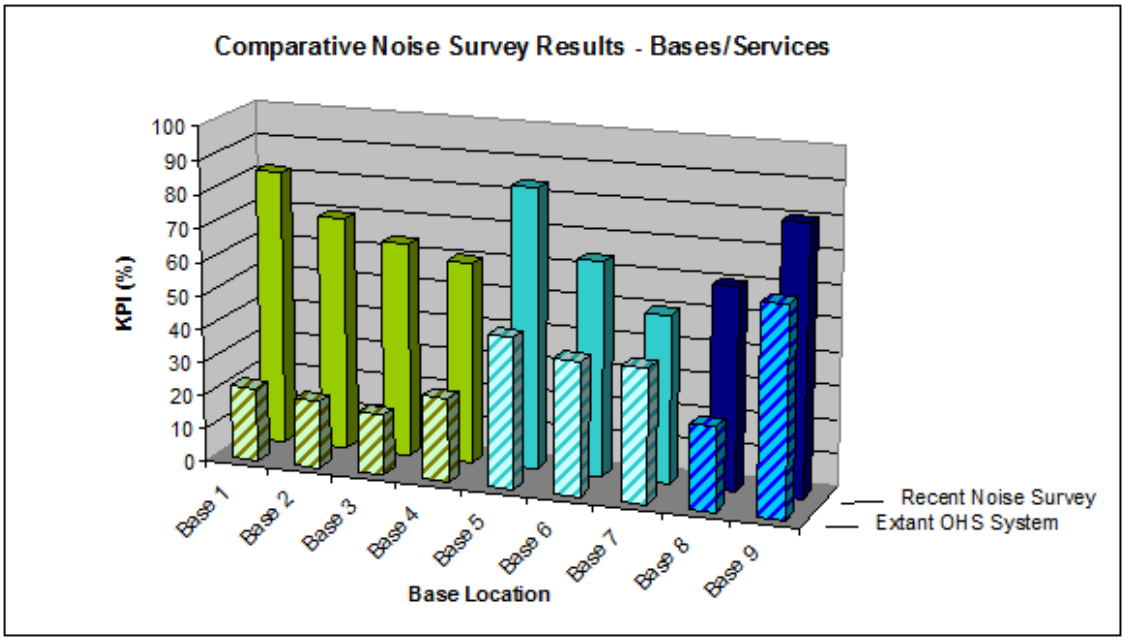

Figure 3 – Comparison of Noise Survey Results and KPI Score between Services and Bases

4. NOISE CONTROL AND MANAGEMENT MEASURES

4.1 Noise Control Measures

Recommended noise control actions, including engineering controls where practicable, were provided in the noise survey reports for each ADF facility in the form of detailed Noise Management Plans (NMPs) for each unit or section.

The actions to improve the noise management process at each of the ADF facilities surveyed were provided in the following areas:

1) Engineering noise control.
2) Administrative controls.
3) Hearing Protection Devices (HPDs) and Hearing Protection Areas (HPAs).
4) Further measurement data and audiometric testing.
5) New platforms/systems and procurement process.
6) Improved assessment and management tools.
7) Training and awareness, and revise policies/procedures.
8) Noise Management Plans (NMPs).

Noise control measures were prioritised based on the hierarchy of control and the action type and level/urgency required. The noise control measures were targeted, realistic and practical, and took into account any functionality and performance constraints that may apply.

Example engineering and substitution noise controls included the following (but not limited to):

Buy quiet equipment (e.g. new equipment introduced):

- Low noise specification workshop tools, such as air guns, rattle/needle guns, grinders;
- Quieter vehicles/platforms (e.g. installed engine/machine shrouding, exhaust mufflers);
- Maintenance programs, to reduce effects of wear and tear with age.

Acoustic screens / barriers (e.g. workshops, tyre/welding bays, noisy offices):

- Enclose noisy areas (partitions/walls or sealed enclosures);
- Mobile or portable acoustic screens;

- Absorptive baffles or barriers (between areas);
- Absorptive lining/insulation on ceilings/walls;
- Barriers around noisy plant and weapons emplacements.

Silencers and low noise fittings (e.g. workshops, maintenance tools, vehicles):

- Quieter nozzles and exhaust silencers on pneumatic tools;
- Silencers for compressed air release and generator sets;
- Motor shrouding and exhaust mufflers on vehicles.

Administrative control measures could include: job rotation, work scheduling, changing work processes, limiting times for certain tasks, limiting distances from noise hazards, limiting exposure to ototoxic substances and hand-arm vibration, equipment maintenance and management tools.

Recommended actions included improved provision and use of, and fitting/training for, hearing protection for all ADF facility personnel. Personal hearing protectors should be selected and maintained in accordance with WHS Regulation 44, the Code of Practice and AS/NZS 1269.3. Defence should involve workers in the selection process and offer a reasonable choice of hearing protector types. In addition, HPA signage needs to be improved throughout most facilities and ensure that the HPA areas are effectively sign-posted and that the HPA boundaries are clearly defined.

Regular audiometric testing, for 6-monthly to annual intervals, has been recommended for a range of the more exposed SEGs. In addition, results of the audiograms must be reviewed by the relevant manager and any changes to hearing thresholds should be noted and recorded with follow-up action.

It is worthy to note that a Noise Management Plan (NMP) can be part of: 1) an ongoing Noise Management Program (as part of an overarching Noise Hazard or Exposure Reduction Program), 2) the procurement and introduction of new equipment (noise sources) process, and 3) developed specifically in response to in-service noise assessments, incidents or workplace changes.

In addition, there is a critical need in Defence for better general and specific noise awareness and training programs in addition to running more regular refresher courses.

Risk assessments and control measures must be reviewed periodically, and revised where needed, at regular periods. Reviews are also required in situations when existing control measures are no longer effective (e.g. due to degradation over time), when there are significant changes to noise sources and workplace environment or conditions, when there are adverse health surveillance results or incidents and in response to noise surveys and assessments.

4.2 Plant Procurement Requirements

New equipment, plant and platforms being considered for purchase must have the lowest sound emission levels that are technologically and economically feasible and compatible with performance and environmental requirements. Defence must identify new alternate quieter noise sources (i.e. “buy quiet”) and processes, where available and practicable, which could minimise worker exposure.

It is recommended that Defence have a *design aim of 80 dB(A)* for all plant and equipment (to be measured at 1 metre or nearest distance to worker/operator), where possible. This plant design aim is 5 dB(A) less than the WHS noise exposure standard so as to reasonably: 1) align with the Code of Practice and accepted industry practice, 2) provide a safety margin relative to manufacturers’ noise data, 3) partly account for the impact of plant items being installed with other noise sources (and contributing to overall noise levels) in a workplace section, 4) partly account for the degradation due to wear/maintenance issues over time, 5) noting the effects from exposure to ototoxins, vibration, long work shifts, 6) noting hearing protection often is not used all the time or used/fitted incorrectly.

If the design aim is not reasonably achievable, then Defence should design to as low as reasonably practicable. All possible and available noise control measures are to be considered and applied where practicable. Any residual risk needs to be addressed by the application of the hierarchy of controls.

It is important that noise controls are implemented during the procurement phase and may include redesign or engineering noise controls implemented by the original equipment manufacturer (OEM) for new materiel. A redesign or retrofitting off-the-shelf (e.g. commercial or military) noise control treatments may be required in cases such as 1) the procurement of secondhand materiel (e.g. from other countries or agencies), 2) any in-service procurement (i.e. outside of the normal technical regulatory framework or major acquisition processes) and 3) the in-service modification of plant.

4.3 Noise Management Tools

A number of specialised tools were developed to support project implementation and improve the noise management process throughout Defence (3).

A detailed Statement of Work (SOW) was developed to provide the minimum scope requirements

for carrying out noise survey assessments (and aligns with the new WHS legislation). The development of a standard SOW was in response to the identified problem of inconsistent and poor quality reports, for uninformed clients. The SOW will assist commanders and managers in their contractor procurement process and help ensure a consistent best-practice approach across Defence. This consistency allows for comparisons across Defence, and longitudinally for repeat surveys.

A new innovative tool was developed for application to the primary noise sources in Defence, such as major plant, machinery and platforms. A Noise Safety Data Sheet (NSDS) provides a snapshot of the noise properties of the source (or platform) and highlights the noise safety requirements associated with its operation, use and maintenance.

The one-page NSDS clearly provides the measured noise levels (at the operator and different distances) and the octave band noise spectrum for the plant item. Safety requirements are provided, including maximum exposure time without hearing protection (HP), minimum safe distance (without HP), the applicable Defence HPA zone and the minimum HP requirement. NSDSs should assist ADF managers and commanders in achieving better management of workplace noise.

A clear Noise Management Plan (NMP) template has been developed for application to individual units at a Base. Each NMP action, with a separate identifier, is described in plain terms and is given an action type based on the priority level and whether it is near, medium or long-term or whether it requires minor or major effort and resources. Noise control measures were developed based on the hierarchy of control. The NMP should be monitored and kept up-to-date by the relevant ADF managers, along with regular audit by DCOHS for monitoring and evaluation of progress against the recommended actions and agreed KPIs.

Given the distinct lack of risk registers in Defence, tailored noise-specific Risk or Hazard Registers should be generated for use by each Unit and Base. In addition, noise-specific Standard Operating Procedures (SOPs) should be developed for all Units at Bases.

A guide on Buying Quiet Equipment should be developed for application to different areas. Importantly, a guide is needed on the critical aspects of platform procurement and at what stages (and how) to consider noise properties and their exposure risk implications.

An effective communication strategy needs to be developed with DCOHS. This would include development of clear information/awareness products for the WHS website and other existing Defence systems. Easily accessible information is needed to communicate key aspects associated with noise exposure, likely impacts, risk levels and noise control methods.

5. RECOMMENDATIONS FOR THE WAY FORWARD

Recommendations have been developed in this project to:

a) ensure compliance with relevant standards, WHS legislation and Defence policies,
b) address key deficiencies in workplace noise management and reduce noise exposure,
c) provide a platform to enable a best practice approach into the future.

Actions detailed in the Noise Management Plans (NMPs) have been developed and prioritised to achieve real measurable improvements in the near and medium term. It is critical that Defence enables on-going monitoring and evaluation of these actions and workplace noise management programs, including formal auditing processes with relevant KPIs.

The next implementation phase will require commitment and ownership by all Groups. Workplace noise solutions will require the coordinated action of personnel across the ADF Services and Groups, in addition to the need for better communication flow; this in turn will align with the new WHS legislation emphasis in this area.

An important requirement therefore is to ensure continual monitoring, evaluation, assurance audits and reviews with regular reporting to the relevant command levels, committees and stakeholders. The resulting follow-up actions for managers and commanders require accountability and traceability so as to close out residual risk issues and ensure continuous improvement.

Ongoing review of the original ERP strategies and actions should be undertaken along with monitoring the change in KPI score for each strategy or action. Strategies should be reprioritised over time depending on the KPIs/progress achieved and any changes to Defence requirements.

Implementing the recommendations will provide corrective and preventative measures that reduce the extent and impact of workplace noise throughout Defence, reduce the level of noise-induced hearing loss and claims, and provide substantial cost savings over time as well as improving Defence's capability and reputation. Future phases of the project require commitment by Defence to enable compliance with WHS legislation and continuous improvement in the area of workplace noise.

6. CONCLUSIONS

A new ambitious and forward-looking project has been established to reduce occupational noise exposure in all workplaces across Defence in Australia. By conducting stakeholder consultation and a review and assessment of noise management practices across Defence, a range of deficiencies and recommendations for action were identified.

A systematic approach involving best-practice noise surveys and assessments at a representative sample of Defence Bases has provided an evidence-based dataset to inform the development of effective noise control actions. The formulation of specifically tailored noise management plans (with prioritised and practical noise control measures) and innovative noise management tools will provide a robust framework for the improvement of noise control practices across Defence.

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