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# What Percentage of the Security Forces at MacDill AFB Experience Exposure to Noise in Excess of the OSHA PEL and the Air Force OEEL?

Julian Joseph Krusely

*University of South Florida*, [jkrusely@health.usf.edu](mailto:jkrusely@health.usf.edu)

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What Percentage of the Security Forces at MacDill AFB Experience Exposure to Noise in  
Excess of the OSHA PEL and the Air Force OEEL?

by

Julian Krusely

A thesis submitted in partial fulfillment  
of the requirements for the degree of  
Master of Science in Public Health  
Department of Industrial Hygiene  
College of Public Health  
University of South Florida

Major Professor: Steven Mlynarek, Ph.D.  
Thomas Bernard, Ph.D.  
Rene Salazar, Ph.D.

Date of Approval:

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## **Dedication**

This thesis is dedicated to my wife, Kate Krusely. Thank you for sticking by me and supporting me when I decided to go down this path, and through this long hard road of furthering my education and achieving my dreams. We did it! I love you, and I appreciate you.

## **Acknowledgements**

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### **List of Abbreviations and Acronyms**

|       |                                                           |
|-------|-----------------------------------------------------------|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| AFB   | Air Force Base                                            |
| OEEL  | Occupational and Environmental Exposure Limit             |
| US    | United States of America                                  |
| dBA   | Decibels, A-weighting                                     |
| NIHL  | Noise-Induced Hearing Loss                                |
| NIOSH | National Institutes for Occupational Safety and Health    |
| OSHA  | Occupational Safety and Health Administration             |
| PEL   | Permissible Exposure Limit                                |
| SLM   | Sound Level Meter                                         |
| TLV   | Threshold Limit Value                                     |
| TTS   | Temporary Threshold Shift                                 |
| TWA   | Time Weighted Average                                     |
| OEL   | Occupational Exposure Limit                               |
| CATM  | Combat Arms Training and Maintenance                      |

|       |                                            |
|-------|--------------------------------------------|
| IAW   | Information Assurance Workshop             |
| HP    | Horse Power                                |
| DOD   | Department of Defense                      |
| AFOSH | Air Force Occupational Safety & Health     |
| PMEL  | Precision Measurement Equipment Laboratory |
| Leq   | Equivalent Continuous Sound Level          |
| SPL   | Sound Pressure Level                       |
| BEF   | Bioenvironmental Engineering Flight        |
| ID    | Identification                             |
| FT    | Feet (as a measurement)                    |
| HCP   | Hearing Conservation Program               |
| CANS  | Central Auditory Nervous System            |
| NCO   | Noncommissioned Officer                    |
| LT    | Lieutenant                                 |
| COL   | Colonel                                    |

## **Abstract**

Noise-related hearing loss has been listed as one of the most prevalent occupational health concerns in the United States for more than 25 years with approximately 30 million people in the US alone occupationally exposed to hazardous noise according to the Occupational Safety and Health Organization. Many people are aware of some risks the military members take every day being at war, but very few think about the risks of the members on a base located stateside. To this point, not much research has been done on these risks, and even less has been done on the hazardous noise risks these service members are subjected to. These workers typically work many days a week as well as long hours while being around loud noises for extended periods of time.

The purpose of this research study was to collect data on personal noise exposure for security forces at multiple locations at MacDill Air Force Base (AFB) to compare the results with the Air Force Occupational and Environmental Exposure Limit (OEEL) of 85 dBA for an 8-hour time weighted average (TWA) and the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limit (PEL) of 90 dBA for an 8-hour TWA. Personal noise dosimeters were used for collecting personal noise exposure, and sound level meters were used for collecting area noise exposure. A Lieutenant at MacDill offered the data she was at liberty to divulge on the security forces for this study. Dosimetry testing was done at four locations, and sound level surveys were done at two locations, with one of the locations being tested by both, dosimeters and a sound level meter.

The results from this study show that the highest area noise is on the 26 ft Aluminum Boat at the helm with the sirens on while the boat moves at 25 knots with a noise level at 101.2 dBA, and the highest personal noise exposure was at the CATM section with an 8-hour TWA of 108.9 dBA. When taking the Air Force OEEL (>85 dBA) into account, three of the four locations were overexposed to noise hazards using personal noise dosimetry, but only one of the four locations were overexposed to noise hazards using personal noise dosimetry when using the OSHA PEL (>90 dBA).

## **Introduction and Background**

Noise-related hearing loss has been listed as one of the most prevalent occupational health concerns in the United States for more than 25 years (OSHA, 2016). Any sort of exposure to high levels of noise has the potential of creating permanent hearing loss, and since the year 2004, the Bureau of Labor Statistics has reported nearly 125,000 workers have suffered significant and permanent hearing loss (OSHA, 2016). Occupational sound can be any sound in any work environment, and the most well-known effect of excessive occupational noise exposure is hearing loss (OSHA, 2016).

Personal noise exposure is a concern in all aspects of work and life, but some elements tend to create an environment with more of a concern than others. Military bases often have areas with high levels of noise, but the military does a great job at keeping that information discreet. Not much research has been done about the personal noise exposure that security forces on military bases are subject to on a regular basis. The research and studies that have been published up until this point about security forces on military bases are mostly about the negative results of being exposed to gunfire and other extreme noises, as opposed to discovering what noise hazards they have been recently subjected to in a manner of creating awareness for prevention. Security forces at military bases often work many shifts throughout the week as well as working more than an 8-hour work day while being exposed to noise hazards throughout the entirety of their career.

The purpose of this research was to collect occupational noise exposure data for security forces at MacDill Air Force Base to determine what percentage of the workers experienced noise exposure in excess of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and the Air Force Occupational and Environmental Exposure Limit (OEEL). A total of five locations were used to collect personal noise sampling results from. The data was passed on to me from a Lieutenant on the base working out of the industrial hygiene department of the 6<sup>th</sup> Medical Group at MacDill Air Force Base, but she made it clear that no names of individuals who were tested or pictures from the base were allowed to be used in any way for the study. The sampling was done by the Bioenvironmental Engineering Flight department of MacDill Air Force Base.

The study sites are five separate security forces locations at MacDill Air Force Base that individuals work at regularly. The Combat Arms Training and Maintenance (CATM) section, Military Dog Kennel section, and Marine Patrol section all had dosimetry testing done at their locations. The Marina Boat section had a noise level survey done on their Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat with 200 HP Outboard Mercury engines, and the Tanker Way Gate ID Check station had dosimetry and sound level meter testing done. The CATM section, Kennel, Marine Patrol, and Marina Boat were all located on the back side of the base located on the water, and the Tanker Way Gate ID Check section is located on the front entrance of the base where automobiles from the road can access. The base itself employs about 12,000 military and 1,300 civilian personnel and is located on 5,767 acres of land (MacDill, 2016).

Multiple individuals work at each location every day, but this study shows the historical results only from three workers only being tested in personal area noise tests, one area being only

tested in a noise level survey, and another area tested for both, personal noise and area noise sound level meter testing.

The specific objectives of this study were:

1. Review data previously collected on personal noise exposure for security forces at multiple locations at MacDill Air Force Base (AFB) to compare the results with the Air Force OEEL of 85 dBA for an 8-hour time weighted average (TWA) and the OSHA PEL of 90 dBA for an 8-hour TWA.
2. Review data previously collected on area noise exposure for multiple locations at MacDill AFB.
3. Determine locations with the loudest noise exposure for the security forces at MacDill AFB.

The University of South Florida's Institutional Review Board (IRB) determined this study did not require their approval because no human subjects were personally used for this study.

## **Literature Review**

### **Occupational Noise Exposure and its Effects**

Every year, approximately 30 million people in the United States are occupationally exposed to hazardous noise (OSHA, 2015). Noise-related hearing loss has been listed as one of the most prevalent occupational health concerns in the United States for more than 25 years (OSHA, 2015). Microscopic hairs in the ear are what we hear with. They transform sound waves in the area to nerve impulses by swaying with vibrations felt from the sound waves, and this outcome is the sound we hear. Loud noises can lead to the deterioration of these microscopic hairs within the ear, and this is a negative effect on hearing as it can lead to irreversible hearing loss.

Thousands of workers suffer from preventable hearing loss from occupational noise exposure every year due to high workplace noise levels (OSHA, 2015). These types of exposures can lead to permanent hearing loss, and neither surgery nor a hearing aid can help correct this type of hearing loss (OSHA, 2015). Short term exposure to loud noise can also cause a temporary change in hearing (your ears may feel stuffed up) or a ringing in your ears (tinnitus) (OSHA, 2015). The short term exposures are likely to depart, but a constant exposure to these can lead to permanent tinnitus and/or hearing loss (OSHA, 2015).

Loud noise can also create physical and psychological stress, reduce productivity, interfere with communication and concentration, and contribute to workplace accidents and injuries by making it difficult to hear warning signals. Noise-induced hearing loss limits your ability to hear high frequency sounds, understand speech, and seriously impairs your ability to communicate

(OSHA, 2015). The effects of occupational noise exposure have the ability to be substantial, and this can negatively affect the way one lives their life. These effects can lead to individuals living lives of remoteness as well as a large increase in stress levels due to their inability to hear others and therefor communicate regularly in an everyday basis with the rest of society.

When sound waves enter the outer ear, the vibrations impact the ear drum and are transmitted to the middle and inner ear (OSHA, 2015). In the middle ear three small bones called the malleus (or hammer), the incus (or anvil), and the stapes (or stirrup) amplify and transmit the vibrations generated by the sound to the inner ear (OSHA, 2015). The cochlea is a snail-like structure within the inner ear, and this is where the fluid and microscopic hair cells reside (OSHA, 2015). The exposure to loud sounds can demolish these cells and cause hearing loss (OSHA, 2015).

The ear typically recovers from most of the hearing loss and humming and/ringing in between shifts of work, but there are warning signs that individuals can keep aware of to make sure they are staying within a safe work environments for their long term health. Some of these warning signs are if a person experiences hearing loss when leaving work, if they experience ringing or humming within their ears once they have departed from work, and if they find themselves having to shout to others who are an arm length's away or less while at work (OSHA, 2015). The noise spoken of here is measured in sound pressure levels called decibels, named after Alexander Graham Bell, using A-weighted sound levels (dBA) (OSHA, 2015). We use the A-weighted scale because the sound levels closely match the perception of loudness by the human ear (OSHA, 2015). Decibels are measured on a logarithmic scale which means that a small change in the number of decibels results in a huge change in the amount of noise and the potential damage to a person's hearing (OSHA, 2015).

OSHA sets legal limits on noise exposure in the workplace, and these limits are based on a worker's time weighted average over an 8 hour day (OSHA, 2015). In regards to noise, OSHA's 29 CFR 1910.95 Occupational Noise Exposure Standard sets a permissible exposure limit (PEL) is 90 dBA for all workers for an 8 hour day (OSHA, 2015). The OSHA standard uses a 5 dBA exchange rate, and this means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half (OSHA, 2015). To put this into an example, with the 5 dB exchange rate, a dose of 60 dB is twice the exchange rate of 55 dB when the period of the exposure is the same in every way.

To the contrary to OSHA's regulation, The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss (OSHA, 2015). NIOSH has found that significant noise-induced hearing loss occurs at the exposure levels equivalent to the OSHA PEL (OSHA, 2015). NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time (OSHA, 2015). Additionally, The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value (TLV) of 85 dB for an 8-hour time weighted average (TWA) for noise exposure (OSHA, 2015). These guidelines are based on a 3dB exchange rate as opposed to the 5dB mandated by OSHA (3) but the use of Slow time weighting and an 80 dB threshold remain (Robinson & Tingay 2014).

OSHA's standards require employers to reduce workplace noise levels if they are above the standards through engineering and administrative controls as well as put in place a hearing conservation program when employees is either reaching or excelling across the action limit of 85 dB for an 8-hour TWA to help the employees (OSHA, 2015). These hearing conservation

programs are forced to have a noise monitoring program, hearing proper hearing personal protective equipment (PPE), and audiometric testing yearly to the employees working in conditions that are exposed to the action limit or exceeding it (OSHA, 2015).

This study is based on historical research done with by the US Air Force, and the noise standards they use, along with OSHA noise standards. The US Air Force and the US Army both abide by an 85 dBA permissible exposure limit (PEL) and a 3 dB exchange rate (Robinson & Tingay, 2014). The 90 dB criterion level applied to businesses under the ruling of OSHA will be a little different than that of the criterion level for the individuals of this study.

## **Related Studies**

Captain In Seok Moon (2007) conducted a study on seven soldiers in the Korean Air Force 20<sup>th</sup> fighter Wing, ranging from ages 20 – 30 years old, who regularly performed periodic gunfire exercise without wearing personal protective equipment. None of the subjects had a history of hearing impairment, and they were all right-handed. He performed physical examination, pure-tone audiometry, and impedance audiometry, etc. were performed. Pure-tone audiometry was performed at 0.25, 0.5, 1.0, 2.0, 3.0, 4.0, and 8.0 kHz. Six of the seven patients had to be treated with oral steroid agents (Prednisolone, 60 mg/day) beginning the day after visiting the aeromedical squadron and continuing for five days. The dose was reduced gradually after that for the following five days. The hearing ability of the subjects was measured for two weeks every three days after visiting the squadron. Afterwards, it was measured for four months in 1-month intervals. Because of them all shooting with their right hands, they all showed signs of tinnitus in their left ears, and

their recovery times ranged from 4 days to 72 days. Their post exposure hearing in their right ears ranged from 5.5 – 8.5 dB, and their left ears ranged from 19.1 – 45.6 dB.

In a following gunfire exercise conducted by soldiers in the Korean Air Force 20<sup>th</sup> Fighter Wing, personal hearing protection devices with 29 dB noise-masking effect foam-type earplug were supplied to the soldiers. They were educated on the repercussions of noise hazards and instructed to wear the earplug on the left ear for right handed soldiers and on the right ear for left handed soldiers. Immediately after firing, oral investigation was performed on these soldiers who fired to determine whether they had hearing loss or not and there were no cases of hearing loss and tinnitus. According to Moon's statistics, it showed that the hearing protection effect of personal hearing protection devices is significant in statistics ( $p = 0.008$ ).

Doctors Warner, Fuente, and Hickson (2015) did a study on the continued prevalence of hearing related disabilities accepted as eligible for compensation and treatment under the Australian Department of Veterans' Affairs (Military Medicine, 2015). With their study, they were investigating the link between jet fuel, noise, and the central auditory nervous system (CANS). As anticipated, their results suggested there was an association between aromatic solvents, including jet fuel, in combination with noise and central auditory dysfunction/hearing loss (Military Medicine, 2015). This study compared many other studies and did not provide data of its own.

Tightened hearing protection would be a way to increase the protection to individuals at risk of hearing loss that work in an area that exceeds the OSHA PEL and Air Force Occupational and Environmental Exposure Limit (OEEL). Mrena, Savolainen, Kiukaaniemi, Yikoski, and Makitie, did a study on the effect of tightened hearing protection regulations on military noise-induced tinnitus (Informational Journal of Audiology, 2009). They focused their study on army

personnel and the difference of tinnitus in officers and NCO's (noncommissioned officers) within two periods. The first period took place from 1984 – 1986 (Period I), and the second period took place from 2003 – 2005 (Period II). They studied all different tinnitus reports from both periods. All of their data ended being statistically insignificant with the exception of the prevalence of constant or disturbing tinnitus as it was shown to have a significantly decreased hazard ratio for more severe tinnitus for Period II (Informational Journal of Audiology, 2009).

In Lt. Col. Carmichael's study on Noise Health Hazards in the Air Force, he does a great job elaborating on the noise health hazards and the establishment of engineering controls (Public Health Reports, 1955). The report discusses the establishment of damage-risk criteria, criteria for speech communication, criteria for residential living, environmental noise surveys, corrective actions to be taken, and personal protective measures, but it does not present any data to support its claims (Public Health Reports, 1955).

## **Methods**

### **Study Site Selection**

All noise results (personal and area) used in this research is from historical data. Multiple exposure assessment tests were chosen throughout the course of five years at the choosing of the MacDill AFB industrial hygienists for the security forces at MacDill Air Force Base. This was done by examining relevant records of noise exposure at MacDill AFB. The sampling took place different moments in time from December 17, 2008 to, February 4, 2014.

The personal noise sampling at the Marine Patrol section assessed the personnel's average noise exposure on December 17, 2008, and this will be referred to as "Personal Noise 1". The next personal noise sampling at the Combat Arms Training and Maintenance (CATM) section assessed personnel's average noise exposure as well on November 18 and 19, 2008 as well as January 23, 2009. This study will be referred to as "Personal Noise 2". Next, personal noise was tested at the Kennel section to assess personnel's average noise exposure on January 14, 2008. This testing will be referred to as "Personal Noise 3". The next survey was for Security Forces Flight at the tanker way gate, Information Assurance Workshop (IAW) on February 4, 2014, and this testing will be referred to as "Personal Noise 4", and is also personal noise.

The fifth testing conducted a noise level survey of the Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat, with dual 200 HP Outboard Mercury engines, and this was done on February 23, 2011. This study will be referred to as "Survey 1". The sixth and final testing

conducted a sound level survey in the Tanker Way gate ID check station on January 31, 2014, and this study will be referred to as “Survey 2”.

### **Personal Noise Exposure**

The noise dosimeters used at four different locations measured the personal noise exposure of the armed forces members working within those quarters. Noise dosimetry is a representative measure of hazardous noise exposure of personnel conducting work. Dosimetry 1 personnel were exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with Marine Patrol boat operations. The personnel working at this location were using E.A.R. ear plugs at the time of the study. With the Dosimetry 2 study, personnel being tested were exposed to various hazardous noise producing equipment during the workday including, but not limited to those associated with combat weapons operations. Personnel at the CATM section were using the following hearing protection while the studies took place: 3M 1100 ear plugs, Howard Leight Laserlite ear plugs, Westone Custom ear plugs, Elves Quattro ear plugs, and Tasco Blackhawk ear muffins.

With Dosimetry 3 at the Kennel, personnel were exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with Military working dogs. The personnel at this location were using North Earmuffs 22NRR at the time of testing. Dosimetry 4 for Security Forces Flight at the tanker way gate, IAW. The purpose of this survey was to quantify workers exposure to continuous noise levels during a representative work shift and whether enrollment on the base Hearing Conservation Program

(HCP) was warranted. For this testing three workers were given a Quest Edge Dosimeter (serial number: ESK110041, ESK110048, and ESP110051) to wear for an 8 hour shift. The dosimeters were given to a pit personnel, a screening personnel, and a shift supervisor. Dosimeters were calibrated on July 31, 2013.

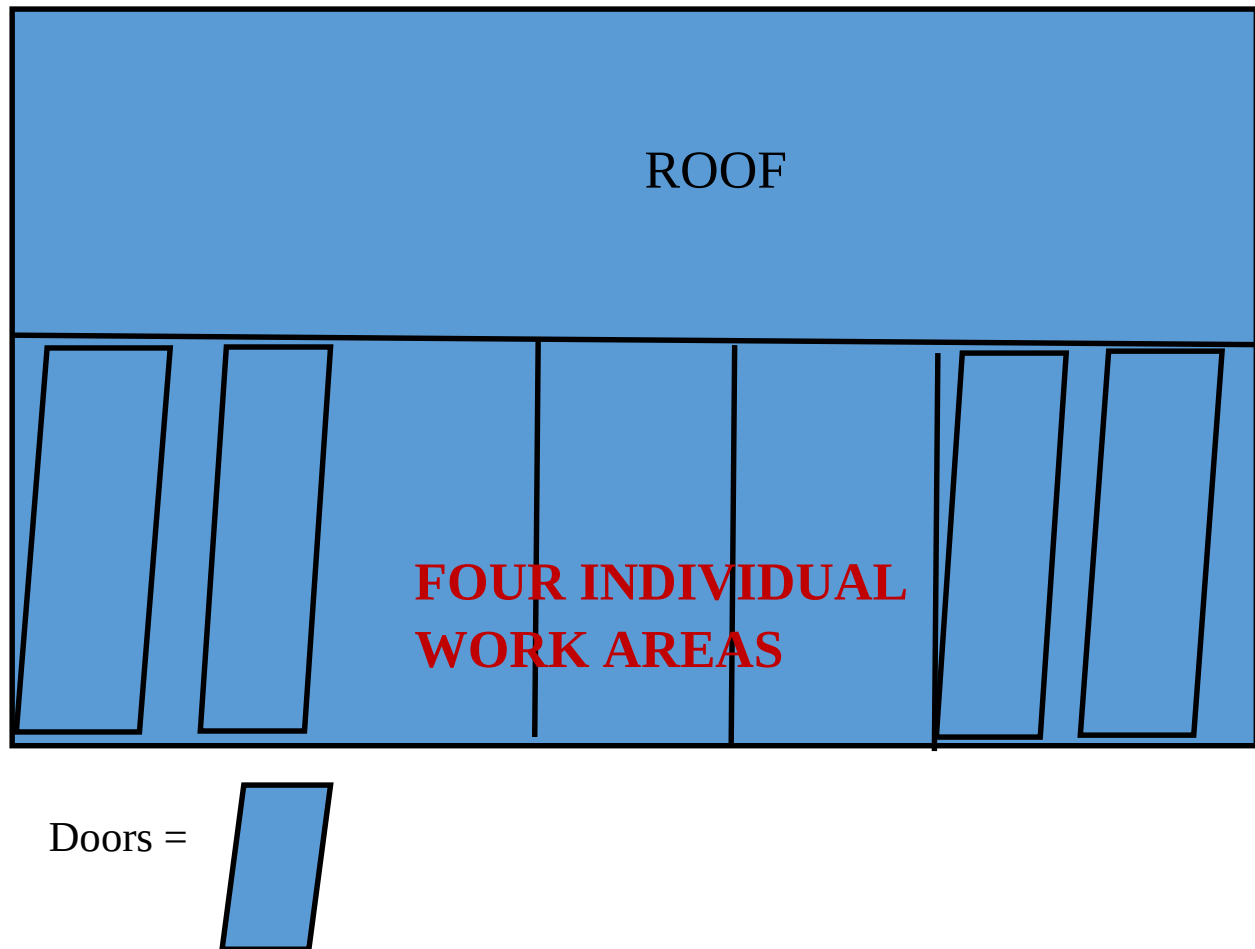
### **Area Noise Assessment**

The area noise level results used in this research were tested on February 23, 2011 of the Bioenvironmental Engineering Flight with a noise level survey of the Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat, with dual 200 horsepower (HP) Outboard Mercury engines, in accordance with the criteria established in the DOD Instruction 6055.12, *DOD Hearing Conservation Program* and AFOSH standard 48-20, *Hearing Conservation Program*. Quest Model 2700 (serial number HUB040037) was used to conduct the survey. These instruments were calibrated by PMEL on October 27, 2009 (calibration valid for two years).

The area of the Tanker Way gate ID check station was tested on January 31, 2014 with a sound level survey. The sound level measurements of the workplaces' ambient noise levels were obtained at the operator's position closest to the heater motor in order to determine if workers were potentially exposed to hazardous noise. A Quest Technologies, model 2700, Sound Level Meter (serial number HUA090019) was used to conduct the survey. This instrument was calibrated on April 18, 2013. A pre and post calibration was completed on January 31, 2014.

The following figures are schematics of the multiple locations tested for area and personal noise for this project.

### Front View



Each Work Area:

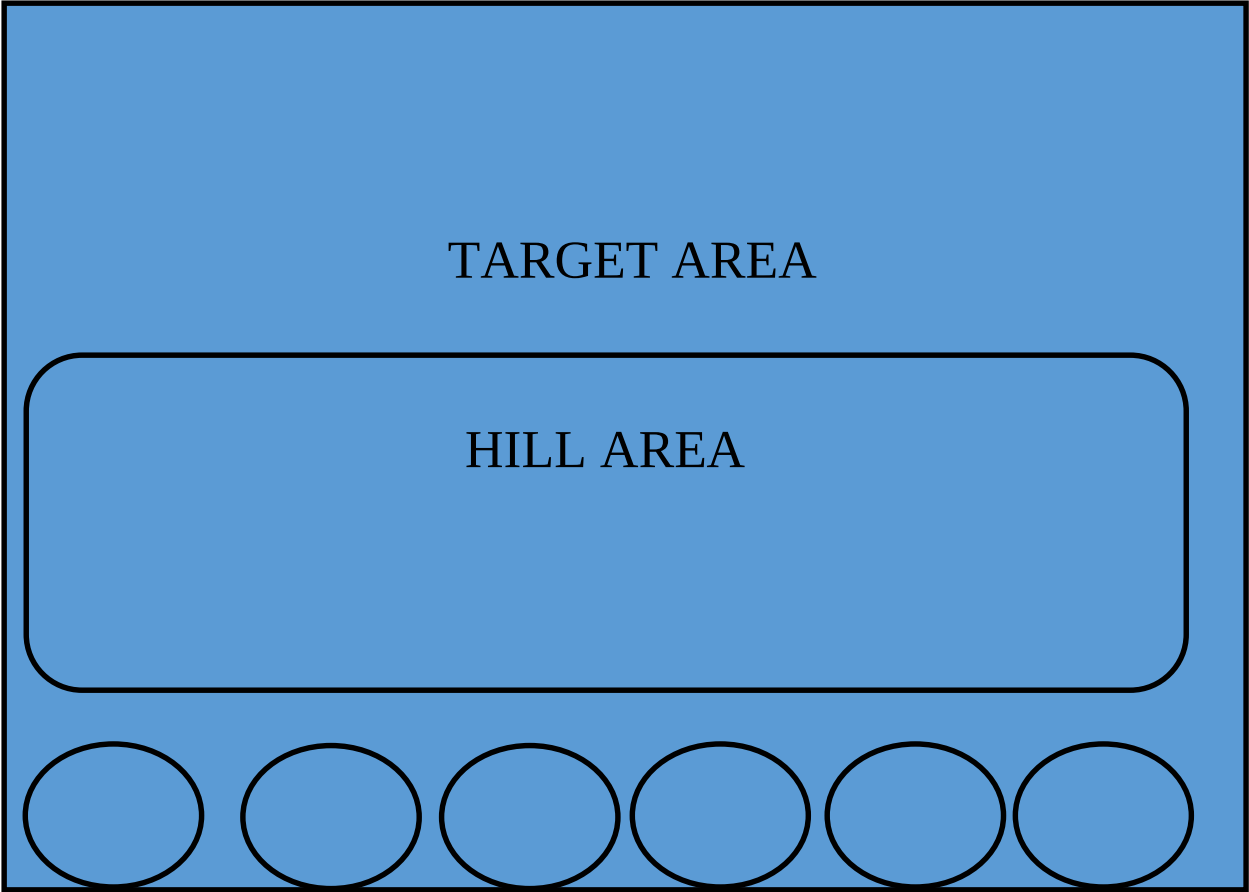
W: 10' L:10' H:20

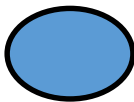
**NOT TO SCALE**

Created by: J. Krusely

**Figure 1: Schematic of Marine Patrol Section Layout**

Front View



Shooter Stands = 

\*There are 22 Stands

NOT TO SCALE

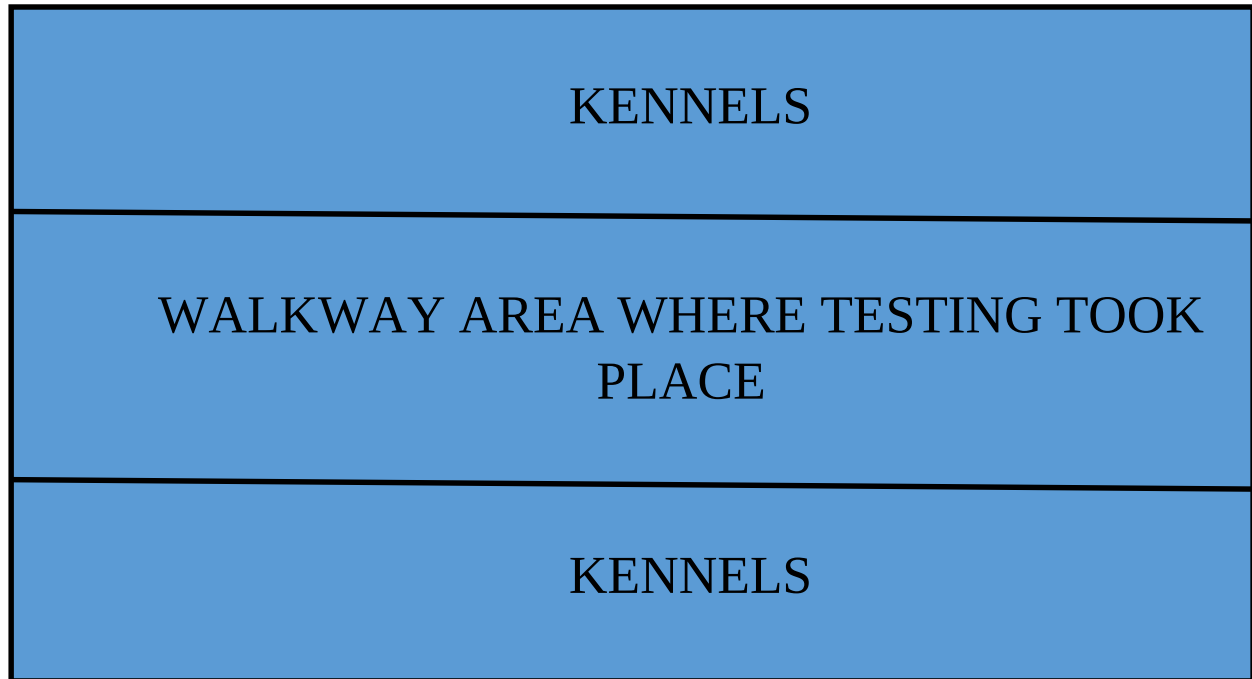
\*Roof Overhead of Shooting Area for 22 Shooters:

L: 75' W: 12' H: 12'

Created by: J. Krusely

**Figure 2: Schematic of CATM Section Layout**

## Overhead View



Room Dimensions:

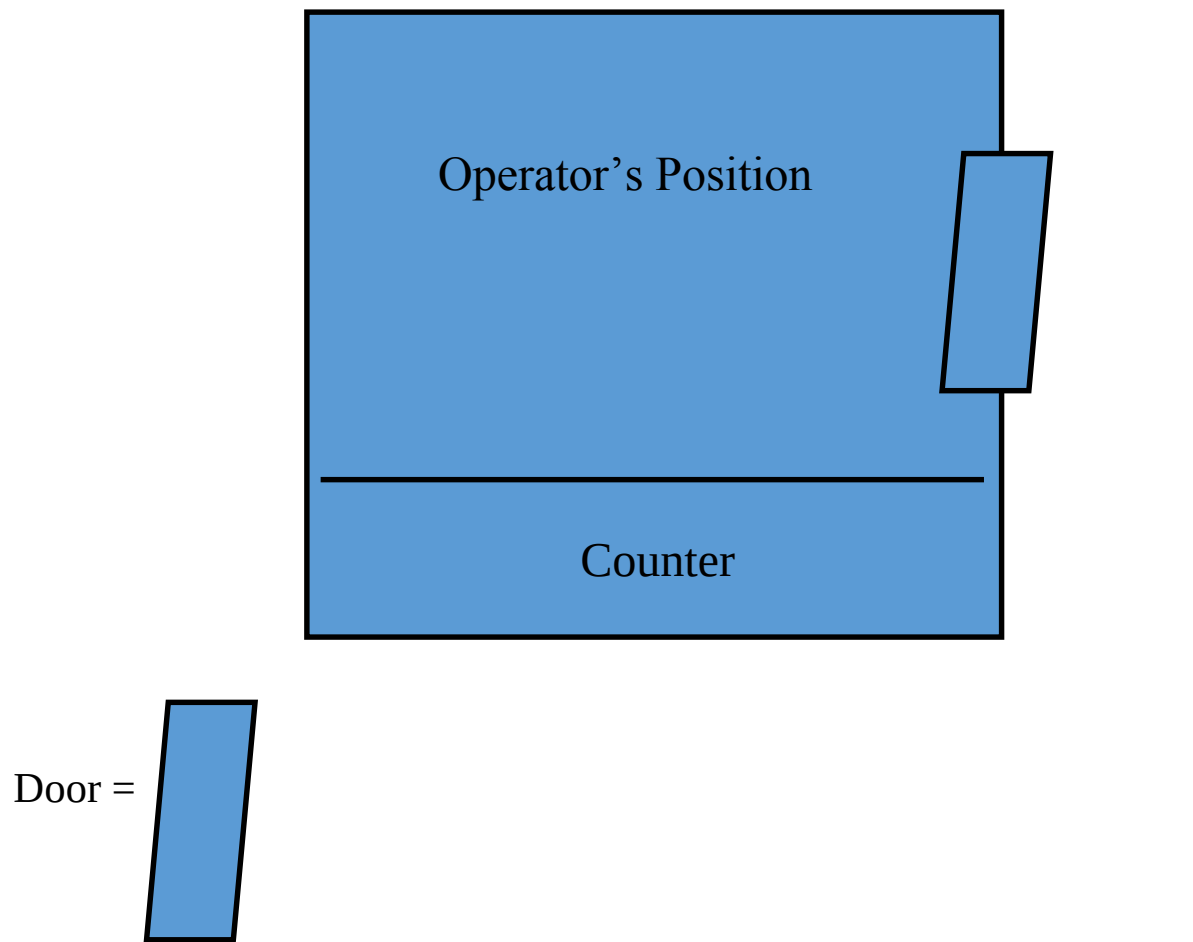
W: 22' L:54' H:12'

**NOT TO SCALE**

**Figure 3: Schematic of Kennel Section Layout**

Created by: J. Krusely

## Overhead View



NOT TO SCALE

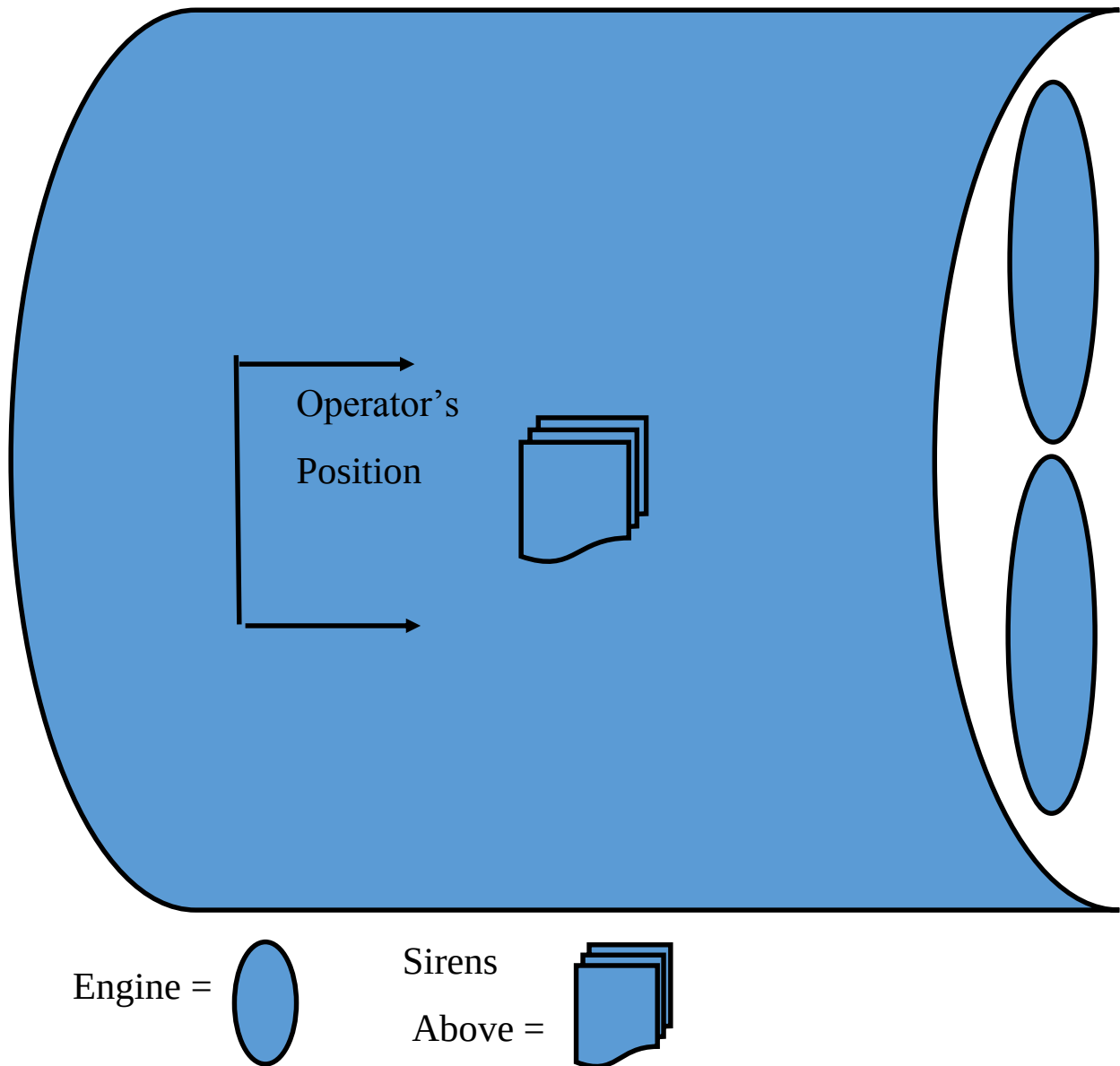
Operator's Position Location:

W: 7' L:7' H:8'

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**Figure 4: Schematic of Tanker Way Gate ID Check Section Layout**

## Overhead View



Operator's Position:

Windshield: W: 6' H: 7'

Overhead Rain Guard: W: 6' H: 7' L: 4'

**NOT TO SCALE**

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**Figure 5: Schematic of Pilot House Aluminum Boat Section Layout**

## Results

### Noise Results

The results from noise sampling for each study session are presented in the tables and figures below.

### Personal Noise Exposure Results

#### Personal Noise 1

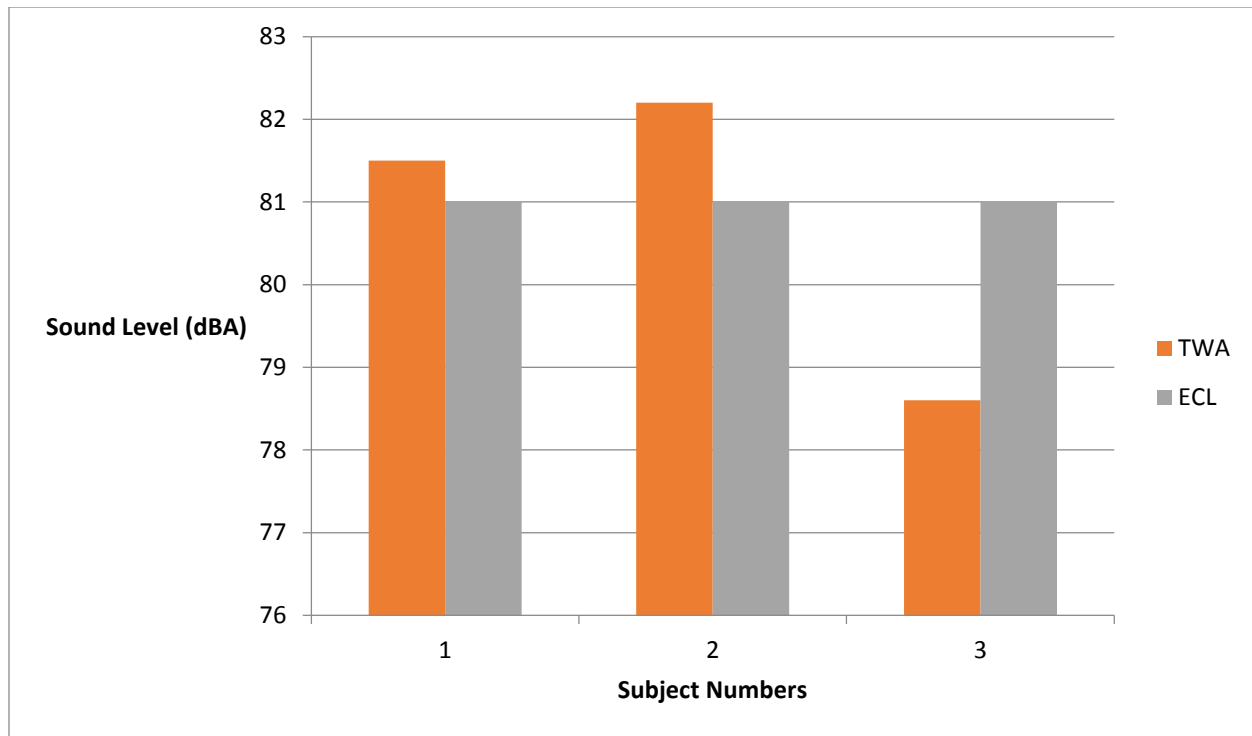
Table I: Dosimetry at Marine Patrol Section and Figure 6: Comparison of TWA and Leq for Subjects 1 – 3 display the results from the personal noise sampling done at the Marine Patrol Station.

**Table I: Dosimetry at Marine Patrol Section**

| Name      | Date       | 8 hour TWA*<br>(dBA) | 3 Day Leq*<br>(dBA) |
|-----------|------------|----------------------|---------------------|
| Subject 1 | 12/17/2008 | 81.5                 | 81.0                |
| Subject 2 | 12/17/2008 | 82.2                 | 81.0                |
| Subject 3 | 12/17/2008 | 78.6                 | 81.0                |

*\*TWA – Time Weighted Average; dBA – decibels A-weighting*

*\*\* Leq – Equivalent Continuous Exposure Level*



**Figure 6: Comparison of TWA and Leq for Subjects 1 – 3**

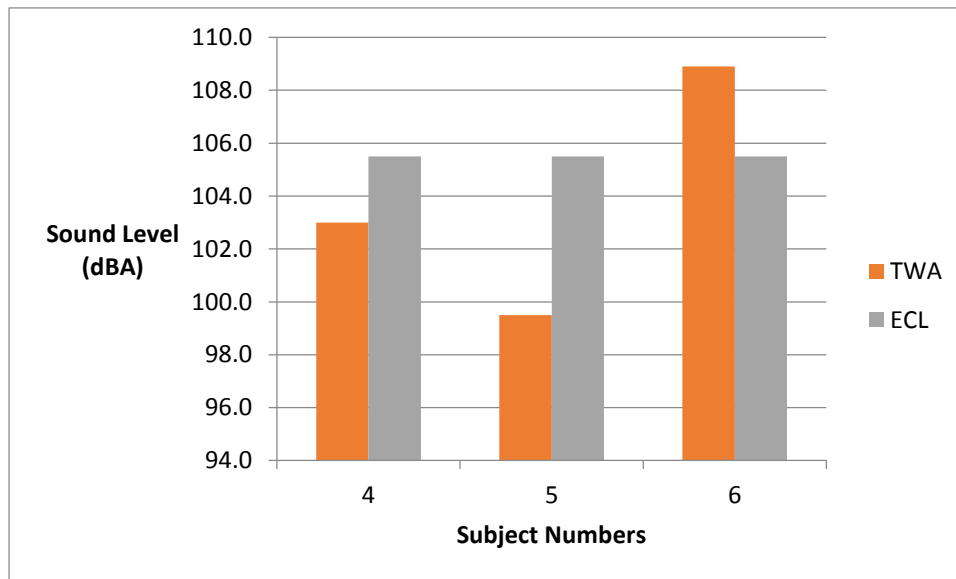
Subjects 1, 2 and 3 had 8 hour TWA's ranging from 78.6 dBA to 82.2 dB(A) for their work shifts. All three subjects were subject to an Equivalent Continuous Exposure Level (Leq) of 81.0 dBA throughout their workdays. The ECL is used as the average noise level during a noise experiment. The highest exposure of this study was 82.2 dBA, and this was with Subject 2. None of the subjects tested exceeded the OSHA PEL of 90 dBA or The United States Air Force's OEL of 85 dBA. All three samples were taken in the same day on three separate individuals working within the Marine Patrol Section.

## Personal Noise 2

Table II: Dosimetry at Combat Arms Training and Maintenance Section and Figure 7: Comparison of TWA and Leq for Subjects 4 – 6 display the results from the personal noise sampling done at the Combat Arms Training and Maintenance Section.

**Table II: Dosimetry at Combat Arms Training and Maintenance Section**

| Name      | Date       | 8 hour TWA (dBA) | 3 Day ECL (dBA) |
|-----------|------------|------------------|-----------------|
| Subject 4 | 11/18/2008 | 103.0            | 105.5           |
| Subject 5 | 11/19/2008 | 99.5             | 105.5           |
| Subject 6 | 1/23/2009  | 108.9            | 105.5           |



**Figure 7: Comparison of TWA and ECL for Subjects 4 - 6**

Subjects 4, 5 and 6 had 8 hour TWA's ranging from 99.5 dBA to 108.9 dBA for their work shifts. All three subjects were subject to an Equivalent Continuous Exposure Level (Leq) of 105.5

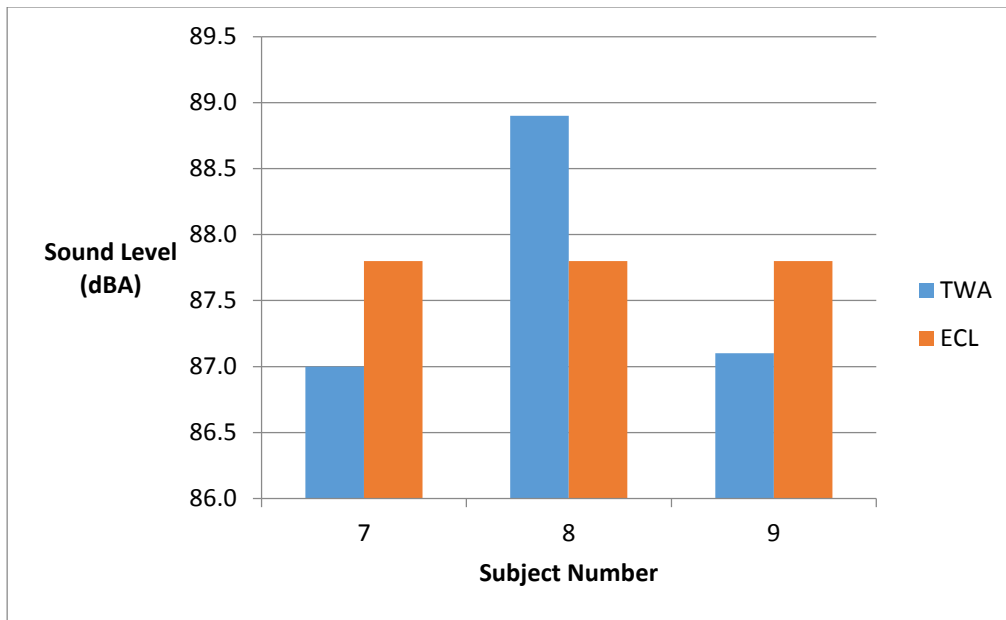
dBa throughout their workdays. The ECL is used as the average noise level during a noise experiment. The highest exposure of this study was 108.9 dBA, and this was with Subject 6. Subjects 4, 5 and 6 were over the OSHA PEL of 90 dBA and the 85 dBA OEL for The United States Air Force Noise Standards. All three samples were taken different days on three individuals working similar jobs each time of study at the CATM Section.

### **Personal Noise 3**

Table III: Dosimetry at Kennel Section and Figure 8: Comparison of TWA and Leq for Subjects 7 – 9 display the results from the personal noise sampling done at the Kennel Section.

**Table III: Dosimetry at Kennel Section**

| <b>Name</b> | <b>Date</b> | <b>8 hour TWA<br/>(dBA)</b> | <b>3 Day ECL<br/>(dBA)</b> |
|-------------|-------------|-----------------------------|----------------------------|
| Subject 7   | 1/14/2008   | 87.0                        | 87.8                       |
| Subject 8   | 1/14/2008   | 88.9                        | 87.8                       |
| Subject 9   | 1/14/2008   | 87.1                        | 87.8                       |



**Figure 8: Comparison of TWA and ECL for Subjects 7 - 9**

Subjects 7, 8 and 9 had 8 hour TWA's ranging from 87.0 dBA to 88.9 dBA for their work shifts. All three subjects were subject to an Equivalent Continuous Exposure Level (Leq) of 87.8 dBA throughout their workdays. The highest exposure of this study was 88.9 dBA, and this was with Subject 8. Subjects 7, 8 and 9 did not exceed the 85 dBA OEL for The United States Air Force Noise Standards, but at no time in the study was the OSHA PEL of 90 dBA exceeded. All three samples were taken in the same day on three separate individuals working within the Kennel Section.

#### **Personal Noise 4**

Table IV: Dosimetry at Tanker Way Gate ID Check Station displays the results from the personal noise sampling done at the Tanker Way Gate ID Check Station.

**Table IV: Dosimetry at Tanker Way Gate ID Check Station**

| <b>Name</b>         | <b>Dosimeter S/N</b> | <b>TWA</b> |
|---------------------|----------------------|------------|
| Pit Personnel       | ESK110041            | 84.7 dB(A) |
| Screening Personnel | ESK110048            | 76.2 dB(A) |
| Shift Supervisor    | ESK110051            | 86.7 dB(A) |

The sound level survey measurements were obtained from pit personnel, screening personnel, and a shift supervisor all on the same day, February, 4 2014. The highest decibel rating for the Shift Supervisor with 86.7 dBA. The noise level is not above the OSHA PEL of 90.0 dBA, but it does exceed The United States Air Force OEL of 85 dBA in only the location of the Shift Supervisor. The other two members of the study did not exceed the OSHA PEL or The US Air Force's OEL.

## Area Noise Exposure Results

### Survey 1

Table V: Sound Level Survey at Pilot House Aluminum Boat displays the results from the area noise sampling done at the Pilot House Aluminum Boat.

**Table V: Sound Level Survey at Pilot House Aluminum Boat**

| Measurement Location                  | Decibels A Weighting dB(A) |
|---------------------------------------|----------------------------|
| Helm Area Idle Speed                  | 64.9                       |
| Helm Area at Cruise Speed 25 Knots    | 84.9                       |
| Helm Area w/Sirens at Idle Speed      | 97.2                       |
| Helm Area w/Sirens at Cruise 25 Knots | 101.2                      |

The sound level survey measurements were obtained from the operator's position all on the same day, February, 23 2011. The highest decibel rating was at the measurement location of the Helm Area with Sirens at Cruise 25 Knots with 101.2 dBA. The noise level is above the OSHA PEL of 90.0 dBA and The United States Air Force OEL of 85 dBA in both locations when the sirens are on.

## Survey 2

Table VI: Sound Level Survey at the Tanker Way Gate ID Check Station displays the results from the area noise sampling done at the Tanker Way Gate ID Check Station.

**Table VI: Sound Level Survey at the Tanker Way Gate ID Check Station**

| Measurement Location                  | Decibels A Weighting dB(A) |
|---------------------------------------|----------------------------|
| Operator Position by the heater motor | 87.5                       |

The sound level survey measurement was obtained from the operator's position, closest to the heater motor. The sound level measured in this study does not exceed the OSHA PEL of 90.0 dBA, but it does exceed the Air Force OEEL of 85.0 dBA.

## **Discussion**

Four personal noise sampling tests were found and evaluates, and each of them were taken on three separate individuals over the same 8 hour work shift. The work these individuals got done over these amounts of time varied for each of them on each day, even the ones working at the same locations. The three other tests taken, the two sound level surveys and the octave band analysis were not done using people, but testing the areas the individuals spend their time working at each day. During an informal interview with the individual who granted permission for the data to be used for this study, she mentioned that they, as a base in whole, stress the use of proper personal protective equipment to be used at all times because they know they deal with loud noises on a daily basis.

### **Personal Noise Exposure**

There were three individuals tested while conducting work in Garrison (the home station) for the Marine Patrol section by using noise dosimetry as a representative measure of hazardous noise exposure. The Bioenvironmental Engineering Flight (BEF) crew conducted this study. For this job task, the personnel tested were exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with Marine Patrol boat operations. The personnel working here spend much of their time inside an open shed that is built like a canopy with four sections. It is covered on top with no walls on the east or west sides of the shed. The tools they use regularly are very loud, but they were not using these tools

consistently throughout the day, and all workers were using ear plugs while the testing was undergone.

The three personnel members working at the Marine Patrol had exposures ranging from 78.6 dBA to 82.2 dBA, so they were not exposed to noise above 85 dBA; therefor, they did not exceed the Air Force OEEL, and the personnel here do not need to be placed in the HCP. None of the personnel were exceeding the 90 dBA either, so they were did not exceed the OSHA PEL.

There were three individuals tested while conducting work at the combat arms training and maintenance (CATM) section by using noise dosimetry as a representative measure of hazardous noise exposure. The BEF crew conducted this study. For this job task, the personnel tested were exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with combat weapons operations. The personnel working here spend much of their time inside an open shed that is built like a canopy with 22 small sections for personnel to fire their weapons from. It is covered on top with no walls on any sides of the canopy with the exception of the furthest points on the east and west ends of the canopy. The combat weapons they use regularly are extremely loud, but they were not using these tools consistently throughout the day, and all workers were using ear plugs, and/or ear muffs while the testing was undergone.

The three personnel members working at the CATM section had exposures ranging from 99.5 dBA to 108.9 dBA, so they were exposed to noise above 85 dBA; therefor, they did exceed the Air Force OEEL, and the personnel here need to be placed in the HCP. All of the personnel were exceeding the 90 dBA as well, so all personnel working at the combat arms training and maintenance section exceeded the OSHA PEL.

There were three individuals tested while conducting work at the Dog Kennel section of the base by using noise dosimetry as a representative measure of hazardous noise exposure. The Bioenvironmental Engineering Flight (BEF) crew conducted this study as well. For this job task, the personnel tested were exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with Military working dogs. The personnel working here spend much of their time inside a building with rooms filled with loud barking dogs, as well as in a fenced in yard for the dogs to roam. They will spend time in an office at times as well as running in and out of the building periodically for miniscule tasks. The Military dogs they work with are at times very loud, but they were not barking consistently throughout the day. All workers were using ear muffs while the testing was undergone.

The three personnel members working at the Kennel section had exposures ranging from 87.0 dBA to 88.9 dBA, so they were exposed to noise above 85 dBA; therefor, they did exceed the Air Force OEEL, and the personnel here need to be placed in the HCP. None of the personnel working here were exceeding the 90 dBA, so all personnel working at the Military Working Dogs Kennel section did not exceed the OSHA PEL.

The three individuals working for Security Forces Flight at the tanker way gate were a member of the pit personnel, screening personnel, and a shift supervisor. Their job tasks rely heavily on being located at and around the gate in order to screen individuals and vehicles trying to enter. They spend some of their time within a small building that is 8 feet long by 8 feet wide by 10 feet tall, and they spend the rest of their time outside the small building either screening vehicles or awaiting the presence of the next vehicle to appear in order for them to screen.

According to the DOD Hearing Conservation Program and AFOSH Std. 48-20, Occupational Noise and Hearing Conservation Program, workers exposed to a continuous occupational and environmental limit (OEEL) over 85 decibels, in an 8-hour period, need to be enrolled in the HCP. The three individuals working at the tanker way gate had exposures ranging from 76.2 dBA to 86.7 dBA, so they were exposed to noise above 85 dBA; therefore, they did exceed the Air Force OEEL, and the personnel here do need to be placed in the HCP.

When the OSHA PEL method considered, all of these time weighted averages are below 90 dBA, so zero percent of them are above the OSHA PEL. According to AIHA, OSHA regulatory requirements are considered to be outdated and inadequate because they do not properly protect against hearing loss (AIHA, 2011). Because ACGIH believe these requirements set by OSHA are too tranquil, they too have recommended higher standards (ACGIH, 2015).

### **Area Noise Exposure**

There were four different measurement locations conducted for the Armstrong Monohull Wide Body Pilot House 26 foot Aluminum Boat, with dual 200 HP Outboard Mercury engines. This survey was conducted while the boat ran at an idle speed, at a cruising speed of 25 knots, at an idle speed with the sirens on, and at a cruising speed of 25 knots with the sirens on. The Bioenvironmental Engineering Flight (BEF) crew conducted this study. For this job task, the pre-survey and post-survey calibrations were reportedly performed correctly, and the manufacturer's calibration was still valid. The personnel that would work within the confines of this boat would be subject to working in any of these conditions on any day. The noise being recorded in this survey for the three loudest measurement locations is typically for a short period of time and not a consistent noise. The sirens are usually on only until the boat reaches its destination, and the boat returns to idle speed once the destination is reached as well. The measurements were taken from

the operator's position on the boat, which is about ten feet from the front of the boat and in the center.

The three measurement locations tested in this survey at the Aluminum Boat outside of the idle speed with a 64.9 dBA were 84.9 dBA at cruise speed of 25 knots, 97.2 dBA while the sirens rang but at idle speed, and 101.2 dBA at cruise speed of 25 knots and the siren ringing. They workers would be exposed to noise above 85 dBA; therefore, they would exceed the Air Force OEEL if they were around this noise for an 8-hour period, and the personnel here would need to be placed in the HCP if this were the case. All of the personnel that would be working on this boat would be exceeding the 90 dBA if they were in these conditions for an 8 hour period.

One measurement location was tested for the sound level survey conducted in the Tanker Way gate ID check station to monitor the workplace's ambient noise levels. This survey was conducted from the operator position by the heater motor to determine if workers were potentially exposed to hazardous noise while working in this specific location at the Tanker Way gate ID check station. The Bioenvironmental Engineering Flight (BEF) crew conducted this study. For this job task, the pre-survey and post-survey calibrations were reportedly performed correctly, and the manufacturer's calibration was valid as well. The personnel that would work within the confines of this location would be subject to working with the recorded level of noise at all times while within the operator's position at this gate ID check station. The sound level measurement taken in this survey was put in place to determine if workers at this location were potentially exposed to hazardous noise, but an estimation of time and an exact amount of time spent in this area by a worker was not recorded, leaving it difficult to make an accusation if an individual is overexposed because the amount of time necessary to make a TWA was unavailable.

The measurement location in this survey was recorded at a noise level of 87.5 dBA. They workers would be exposed to noise above 85 dBA; therefor, they would exceed the Air Force OEEL if they were around this noise for an 8-hour period, and the personnel here would need to be placed in the HCP if this were the case. None of the personnel that would be working at this gate ID check station would be exceeding the 90 dBA if they were in these conditions for an 8 hour period. The personnel working in this location are required to wear hearing protection, ear plugs, while working at this location, but the workers consider it difficult to wear the hearing protection while performing the ID checks for each vehicle entering into the Tanker Way gate ID check station.

### **Comparison of Personal Noise Exposures**

In Dosimetry 1 at Marine Patrol Section, none of the workers tested were exceeding the Air Force OEEL or the OSHA PEL. In Dosimetry 2 at the combat arms training and maintenance section, all three of the personnel tested exceeded the Air Force OEEL and the OSHA PEL. For Dosimetry 3 at the Kennel section, all three of the personnel tested exceeded the Air Force OEEL but not the OSHA PEL. Finally, for Dosimetry 4 at the tank way gate, only one of the three workers tested were exceeding the Air Force OEEL, but none of the three workers were exceeding the OSHA PEL. The differences are due to the different locations across MacDill Air Force Base that they are assigned to work.

### **Peak Noise**

The peak noise came from Dosimetry 2 at the CATM section where the personnel were exposed to various hazardous noises, but not limited to those associated with combat weapons operations. The peak TWA recorded was 108.9 dBA by Subject 6 of our study. This is about the

same decibel level as a live rock concert (108 – 114 dB) (Industrial Noise Control, 2016). It is the average human pain threshold and about 16 times as loud as 70 dB (Industrial Noise Control, 2016). This is the time weighted average over an 8 hour period, so the impact noise would be louder as this is weighted out with moments of ambient noise. The personnel working at this location currently wear either ear muffs or ear plugs at all times while in the general area of the CATM section. The loudest moments were when the weapons were fired, but those impact noises were not recorded.

### **Area Noise**

According to the Lieutenant who issued the data for this project, in an informal interview, the sound level meters (SLM) were held in the hand of the individual doing the testing and held out in front of them. The area noise in this project was recorded in Survey 1 at the Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat with dual 200 HP Outboard Mercury engines and in Survey 2 at the Tanker Way gate ID check station. In the same informal interview, the Lieutenant mentioned that the data recorded states that each test was recorded one time in each measurement location.

The measurement location with the highest area noise was at the Aluminum Boat with the sirens on and the boat running at 25 knots with an area noise of 101.2 dBA. This was taken within a small space on an open 26 ft boat, known as the helm or the operator's position. This area was an open space with a covering overhead at about seven feet and a front cover for the helm and a windshield to protect the operator. The second highest area noise recorded was at the same operator's position on the Aluminum Boat with the sirens on at an idle speed, and the speed was recorded at 97.2 dBA. This demonstrates that the sirens are extremely loud, but this is necessary

for the purpose of the sirens to alert other boats on the water to stop and make room for this boat to pass. Both of these recordings were exceeding the Air Force OEEL and the OSHA PEL.

The sound level survey taken at the Tanker Way gate ID check station was recorded at 87.5 dBA, and this was the third loudest area noise reading recorded. This recording was exceeding the Air Force OEEL, but not exceeding the OSHA PEL. The reading was taken at the operator's position inside a little shed as mentioned in a previous section. The lowest measurement location recorded was from the Aluminum Boat in the helm area at idle speed. This was recorded at 64.9 dBA. This provides evidence stating that the faster the boat runs, the louder the noise is, and if the sirens are running, that adds an increased level of noise to the area as well. The area at helm on the boat is not terribly loud on its own, but when the added elements of the speed of the boat and the sirens are added, the noise becomes uncomfortable and exceeds both the Air Force OEEL and the OSHA PEL. Because the operator's position has a front windshield and an overhead covering, it is possible the sound waves bounce off of these to increase the sound being heard at the operator's position. The evidence from both operator's positions at the Tanker Way gate ID check station and the Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat prove that any individuals working in these areas may be overexposed to noise according to the Air Force OEEL and the OSHA PEL.

### **Comparison with Previous Studies**

Studies mentioned in the literature review portion focused on noise exposure, hearing loss, and hearing loss in the military, but none focused on the security forces specifically and the hearing loss they are subject to due to their job requirements. The distinctness of this study is that it took dosimetry from four separate locations with workers protecting the security of MacDill Air Force Base as well as the area noise from two separate locations where workers do tasks daily for the

security of the base. Captain In Seok Moon's (2007) study reported subjects having tinnitus in their left ears and the recovery time it took to recover from this, but that study did not take the TWA's of the combat arms workers being tested as this study has done. Warner, Fuente, and Hickson did not come up with exact data when their study was complete, so it does not compare to a study that has data to support a claim like this one (Military Medicine, 2015).

The study done in the Informational Journal of Audiology was focused on tinnitus and if the effect of tightened hearing protection regulations has had a positive effect, and although it seems that it may have, the majority of their findings through their data came up statistically insignificant (Informational Journal of Audiology, 2009). In this study, Mrena, Savolainen, Kiukaaniemi, Yikoski, and Makitie do show a statistically significant decreased hazard ratio for constant and disturbing tinnitus for the later of the two periods (Informational Journal of Audiology, 2009). This is a good sign because as the data from the CATM section displays, workers are subject to high TWA's daily. If the personal protective equipment can diminish the rate of tinnitus at all for these workers, it will benefit them greatly because it would be difficult to have security forces doing their jobs to the best of their abilities without being around these hazards.

For when it was written, Lt. Col. Carmichael's study on Noise Health Hazards in the Air Force did a splendid job on elaborating on how to handle multiple scenarios, but it does not compare fairly to this study because Lt. Carmichael did not present data with the study (Public Health Reports, 1955). Carmichael provided a chart that displayed noise levels in frequency bands covering proposed criteria for damage risk, speech communication, and residential living, and this is beneficial, but it did not take into account personal noise measurement, which is what this study primarily focuses on.

## **Study Limitations**

This study was limited due to the data all being passed down to the researcher as opposed to the researcher taking the data personally. This put into place many limitations such as not being able to speak with the people orchestrating the testing or being tested themselves, not being able to see the weather conditions when the testing took place, not being able to make sure the workers using the dosimeters were professional with the equipment at all times, etc. Survey 2 was difficult to take into consideration with having only been tested at one location at the Tanker Way gate ID check station, one time. This could have been the loudest time, the quietest time, or anything in between. The notes that came along with the data do not mention much that occurred other than the testing itself. This limits the study because it makes it difficult to know if something or someone ever became an obstruction to the data. Another limitation of this study is it not being able to display photographs of the exact location because they are on an active military base, so it would be illegal to publish pictures of anything on the base. Finally, although the researcher was given all of the data, there may be areas security forces work that were not mentioned because they could not dispose with the information, so this is a limitation given not all of the data may be present.

## **Future Research**

Future research should be tested with the researcher present at all times and with a larger sample size. Impact noise should be recorded in all areas, especially at the CATM section to see if workers should only be permitted to be working in that location for a shortened period of time. Long-term epidemiological studies could be beneficial to conclude if permanent hearing loss from these security forces job regulations is taking place. Research should be conducted on how long the workers are working each shift as well as on a 8-hour TWA scale to determine if these workers

are working 8 hours and then leaving or if the dosimeter is being turned off then but the workers are continuing their job responsibilities and being exposed for longer periods of time.

## **Conclusion**

The purpose of this research was to collect historical occupational noise exposure data for security forces at MacDill Air Force Base to determine what percentage of the workers experienced noise exposure in excess of the OSHA PEL and the Air Force OEEL. The historical data collected and presented in this study suggests that of the locations and individuals tested in this specific study, workers at 75% of the security forces locations were exposed to noise in excess of the Air Force OEEL, and 25% were exceeding the OSHA PEL. We concluded that individuals in this study working at the CATM section on MacDill Air Force Base are regularly exposed to noise in excess of the OSHA PEL and the Air Force OEEL. We also concluded that individuals within this study working at the Marine Patrol section on MacDill Air Force Base are not regularly exposed to noise in excess of the OSHA PEL or the Air Force OEEL. Finally, we concluded that the individuals in this study working at the Kennel section and the Tanker Way Gate ID Check Station on MacDill Air Force Base are not regularly exposed to noise in excess of the OSHA PEL, but they are exposed to noise in excess of the Air Force OEEL. The large differences in noise levels for these sections suggest that the locations of the different security forces on the base affect the noise levels heard by workers the most.

Area noise measurement is not a measure of personal noise exposure, but from this study we can conclude that security forces in this study in the operator's position at the Tanker Way Gate were potentially exposed to noise levels in excess of the Air Force OEEL but not the OSHA PEL. We can also conclude security forces in the operator's position of the Armstrong Monohull

Wide Body Pilot House 26 ft Aluminum Boat with dual 200 HP Outboard Mercury engines were potentially exposed to noise levels in excess of the Air Force OEEL and the OSHA PEL when the sirens were turned on.

These security forces are obligated to be within the standards of the Air Force OEEL, and if they are not, they must provide proper personal protective equipment and be placed in the Air Force's hearing conservation program. We were unable to conclude exactly what percentage of the security forces at MacDill AFB experience exposure to noise in excess of the OSHA PEL and the Air Force OEEL, but we were able to conclude what percentage of the workers in this particular study were in excess of them.

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## **Appendix A:**

### **List of Equipment and Instrumentation**

Armstrong Monohull Wide Body Pilot House 26 ft. Aluminum Boat with 200 HP Outboard Mercury Engines

Quest Edge Dosimeter  
Serial Number: ESK110041

Quest Edge Dosimeter  
Serial Number: ESK110048

Quest Edge Dosimeter  
Serial Number: ESK110051

Quest Technologies Sound Level Meter  
Model 2700  
Serial Number: HUB040037

Quest Technologies Sound Level Meter  
Model 2700  
Serial Number: HUA090019

Combat Weapons

Military Working Dogs

Marine Patrol Boat

Dosimeter

E.A.R. Ear Plugs

3M 1100 Ear Plugs

Howard Leight Laserlite Ear Plugs

Westone Custom Ear Plugs

Elves Quattro Ear Plugs

Tasco Blackhawk Ear Muffs

North Earmuffs 22NRR

## Appendix B:

### Personal Noise Monitoring Reports



DEPARTMENT OF THE AIR FORCE  
6TH AIR MOBILITY WING (AMC)  
MACDILL AIR FORCE BASE FLORIDA

12 February 2009

MEMORANDUM FOR 6 SFS/SPTC

FROM: 6 AMDS/SGPB

SUBJECT: Noise Dosimetry for the 6 SFS CATM section (WPID: 0120-BAXX-405A)

1. Introduction: On 18 and 19 November 08 and 23 January 09, [REDACTED] of the Bioenvironmental Engineering Flight conducted noise dosimetry at the CATM section to assess personnel's average noise exposure.

2. Background: Noise dosimetry is a representative measure of hazardous noise exposure for personnel conducting work while in Garrison (at home station). In this section, personnel are exposed to various hazardous noise producing equipment during the workday including, but not limited to those associated with combat weapons operations. Personnel currently use the following hearing protection: 3M 1100 ear plugs, Howard Leight Laserlite ear plugs, Westone Custom ear plugs, Elves Quattro ear plugs, and Tasco Blackhawk ear muffs.

3. Results:

| Name       | Date        | 8 Hour TWA (dBA) | 3 Day ECL (dBA) |
|------------|-------------|------------------|-----------------|
| [REDACTED] | 18 Nov 2008 | 103              | 105.5           |
| [REDACTED] | 19 Nov 2008 | 99.5             |                 |
| [REDACTED] | 23 Jan 2009 | 108.9            |                 |

TWA- Time Weighted Average; dBA- decibels A-weighting;  
ECL- Equivalent Continuous Exposure Level

4. Recommendations/Conclusions: AFOSH Standard 48-20, *Occupational Noise and Hearing Conservation Program*, defines placing individuals on the Hearing Conservation Program (HCP) when it is likely that their routine exposure exceeds 85 dBA in an 8-hour TWA. The results from this dosimetry showed exposures ranging from 99.5 to 108.9 dBA for an 8-hour work day. Based on these results, personnel are considered to be routinely exposed to hazardous noise (defined as any daily result at or greater than 85 dBA). The Occupational and Environmental Health Working Group has decided that CATM personnel are to remain enrolled in the HCP. Personnel must continue wearing proper hearing protection while conducting operations as instructed in the following attachment.

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5. If you have any questions, please contact [REDACTED] at 827-9586.

[REDACTED] USAF  
Chief, Occupational Health Element

Attachment:  
Hazardous Noise Producing Equipment and Required Controls – 6 SFS CATM

cc:  
6 SFS/CC  
6 AMDS/SGPM  
6 AMW/SEG



DEPARTMENT OF THE AIR FORCE  
6TH AIR MOBILITY WING (AMC)  
MACDILL AIR FORCE BASE FLORIDA

26 January 2009

MEMORANDUM FOR 6 SFS

FROM: 6 AMDS/SGPB

SUBJECT: Noise Dosimetry for the 6 SFS Kennels section (WPID: 0120-BAXX-829)

1. Introduction: On 14 January 2009, [REDACTED] of the Bioenvironmental Engineering Flight conducted noise dosimetry at the Kennel section to assess personnel's average noise exposure.
2. Background: Noise dosimetry is a representative measure of hazardous noise exposure for personnel conducting work while in Garrison (at home station). In this section, personnel are exposed to various hazardous noise producing tools and equipment during the workday including, but not limited to those associated with Military working dogs. Personnel currently use the following hearing protection: North Earmuffs 22NRR.
3. Results:

| Name       | Date        | 8 Hour TWA (dBA) | 3 Day ECL (dBA) |
|------------|-------------|------------------|-----------------|
| [REDACTED] | 14 Jan 2008 | 87               | 87.8            |
| [REDACTED] | 14 Jan 2008 | 88.9             |                 |
| [REDACTED] | 14 Jan 2008 | 87.1             |                 |

TWA- Time Weighted Average; dBA- decibels A-weighting;  
ECL- Equivalent Continuous Exposure Level

4. Recommendations/Conclusions: AFOSH Standard 48-20, *Occupational Noise and Hearing Conservation Program*, defines placing individuals on the Hearing Conservation Program (HCP) when it is likely that their routine exposure exceeds 85 dBA in an 8-hour TWA. The results from this dosimetry showed exposures ranging from 87 to 88.9 dBA for an 8-hour work day. Based on these results, personnel are not considered to be routinely exposed to hazardous noise (defined as any daily result at or greater than 85 dBA). The Occupational and Environmental Health Working Group has decided that Kennels personnel be enrolled in the HCP. Personnel must continue wearing proper hearing protection while conducting operations as instructed in the following attachment.

UNRIVALED GLOBAL REACH FOR AMERICA...ALWAYS

5. If you have any questions, please contact [REDACTED] at 817-9586.

[REDACTED]  
Chief, Occupational Health Element

Attachment:  
Hazardous Noise Producing Equipment and Required Controls – 6 SFS Kennels

cc:  
6 SFS/CC  
6 AMDS/SGPM  
6 AMW/SEG



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AIR MOBILITY COMMAND

06 January 2009

MEMORANDUM FOR 6 SFS/SFMOP

FROM: 6 AMDS/SGPB

SUBJECT: Noise Dosimetry for the 6 SFS Marine Patrol section (WPID: 0120-BAXX-828A)

- 1. Introduction:** On 17 December 08 [REDACTED] of the Bioenvironmental Engineering Flight (BEF) conducted noise dosimetry at the Marine Patrol section to assess personnel's average noise exposure.
- 2. Background:** Noise dosimetry is a representative measure of hazardous noise exposure for personnel conducting work while in Garrison (at home station). In this section, personnel are exposed to various hazardous noise producing tools & equipment during the workday including, but not limited to those associated with Marine Patrol boat operations. Personnel currently use the following hearing protection: E.A.R. ear plugs.
- 3. Results:**

| Name       | Date        | 8 Hour TWA (dBA) | 3 Day ECL (dBA) |
|------------|-------------|------------------|-----------------|
| [REDACTED] | 17 Dec 2008 | 81.5             | 81.0            |
| [REDACTED] | 17 Dec 2008 | 82.2             |                 |
| [REDACTED] | 17 Dec 2008 | 78.6             |                 |

TWA- Time Weighted Average; dBA- decibels A-weighting;  
ECL- Equivalent Continuous Exposure Level

- 4. Recommendations/Conclusions:** AFOSH Standard 48-20; *Occupational Noise and Hearing Conservation Program*, defines placing individuals on the Hearing Conservation Program (HCP) when it is likely that their routine exposure exceeds 85 dBA in an 8-hour TWA. The results from this dosimetry showed exposures ranging from 78.6 dBA to 82.2 dBA for an 8-hour work day. Based on these results, personnel are not considered to be routinely exposed to hazardous noise (defined as any daily result at or greater than 85 dBA). A recommendation will be made to the Occupational and Environmental Health Working Group (OEHWG) for Marine Patrol personnel to remain not enrolled in the HCP. Personnel must continue wearing proper hearing protection while conducting operations as instructed in the following attachment.

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5. If you have any questions please contact [REDACTED] at 827-9586.

[REDACTED] USAF  
Chief, Occupational Health Element

Attachment:  
Hazardous Noise Producing Equipment and Required Controls – 6 SFS Marine Patrol

cc:  
6 SFS/CC  
6 AMDS/SGPM  
6 AMW/SEG



DEPARTMENT OF THE AIR FORCE  
6TH AIR MOBILITY WING (AMC)  
MACDILL AIR FORCE BASE FLORIDA

7 February 2014

MEMORANDUM FOR 6 SFS/SGE

FROM: 6 AMDS/SGPB

SUBJECT: Noise Dosimetry, 6 SFS Security Forces

1. **Background:** On 4 February 2014, [REDACTED] from Bioenvironmental Engineering (BE) conducted a noise dosimetry survey for Security Forces Flight at the tanker way gate, IAW the criteria established in DoD Instruction 6055.12, *DoD Hearing Conservation Program* and AFOSH Standard 48-20, *Hearing Conservation Program*. The purpose of this survey was to quantify workers exposure to continuous noise levels during a representative work shift and whether enrollment on the base Hearing Conservation Program (HCP) is warranted.

2. **Survey Details:** Three workers were given a Quest Edge Dosimeter (serial numbers: ESK110041, ESK110048, and ESK110051) to wear for an 8 hour work shift. The dosimeters were given to a pit personnel, a screening personnel, and a shift supervisor. Dosimeters were calibrated on 31 July 2013. The results from the survey are contained in the table below:

| Worker     | Dosimeter S/N | TWA        |
|------------|---------------|------------|
| [REDACTED] | ESK110041     | 84.7 dB(A) |
| [REDACTED] | ESK110048     | 76.2 dB(A) |
| [REDACTED] | ESK110051     | 86.7 dB(A) |

\*TWA = Time Weighted Average

4. **Conclusion:** Results indicate workers were exposed to an ECL (estimated continuous level) of 86.7 dB(A) during an 8-hr shift. IAW DoD Instruction 6055.12, *DoD Hearing Conservation Program* & AFOSH Std 48-20, *Occupational Noise and Hearing Conservation Program*, Workers exposed to a continuous occupational and environmental exposure limit (OUEL) over 85 decibels, in an 8-hour period, shall be enrolled on the HCP. BE recommends that the tanker way gate personnel remain on the HCP due to noise dosimetry results over the OUEL.

5. If you have any further questions concerning this survey, please contact [REDACTED] at 827-9570.

[REDACTED] DAF  
Occupational Health Element Chief

cc:  
6 AMDS/SGPM  
6 AMW/SEG

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DEPARTMENT OF THE AIR FORCE  
6TH AIR MOBILITY WING (AMC)  
MACDILL AIR FORCE BASE FLORIDA

23 February 2011

MEMORANDUM FOR: 6 SFS/SFSG-MP WPID 828A

FROM: 6 AMDS/SGPB

SUBJECT: Noise Survey, Marina Police, WPID 828A

1. **Background:** On 23 February 2011, [REDACTED] of the Bioenvironmental Engineering Flight conducted a noise level survey of the, Armstrong Monohull Wide Body Pilot House 26 ft Aluminum Boat, with dual 200 HP Outboard Mercury engines, in accordance with the criteria established in DOD Instruction 6055.12, *DOD Hearing Conservation Program* and AFOSH Standard 48-20, *Hearing Conservation Program*.

2. **Survey Instrumentation:** Quest Model 2700 (serial number HUB040037) was used to conduct the survey. These instruments were calibrated by PMEL on 27 Oct 2009 (calibration valid for two years). SrA Holmes performed a pre-survey and post-survey calibration on 23 February 2011.

3. **Findings:** Measurements were obtained from the operator's position. Measurements were as follows:

| Measurement Location                      | Decibel: A weighting<br>dB(A) | Decibels: C weighting<br>dB(C) | 85 dB(A) line<br>Ft |
|-------------------------------------------|-------------------------------|--------------------------------|---------------------|
| Helm Area at Idle Speed                   | 64.9                          | 71.1                           | N/A                 |
| Helm Area at Cruise Speed<br>25 Knots     | 84.9                          | 90.2                           | N/A                 |
| Helm Area w/ Sirens at Idle<br>Speed      | 97.2                          | 98.2                           | N/A                 |
| Helm Area w/ Sirens at Cruise<br>25 Knots | 101.2                         | 101.1                          | N/A                 |

4. **Conclusion:** AFOSH Std 48-20, *Occupational Noise and Hearing Conservation Program*, defines "Hazardous Noise" as noise levels that exceed 85 decibels ("A" weighted). Based on the noise level results above, single hearing protection is adequate and recommended while sirens are active, continue to use E.A.R. plugs. If you have any further questions concerning this evaluation, please contact SrA Holmes at extension 7-9370.

[REDACTED] DAF  
Bioenvironmental Engineering Flight Director

cc: 6 AMDS/SGPM  
6 AMW/SEG

UNRIVALED GLOBAL REACH FOR AMERICA...ALWAYS!



DEPARTMENT OF THE AIR FORCE  
6TH AIR MOBILITY WING (AMC)  
MACDILL AIR FORCE BASE, FLORIDA

31 January 2014

MEMORANDUM FOR: 6 SFS/ S3OS  
FROM: 6 AMDS/SGPB

SUBJECT: Sound Level Survey for Security Forces Tanker Way Gate

1. On 31 January 2014, [REDACTED] of Bioenvironmental Engineering Flight conducted a sound level survey in the Tanker Way gate ID check station. Sound level measurements of the workplaces' ambient noise levels were obtained at the operator's position closest to the heater motor in order to determine if workers are potentially exposed to hazardous noise.

2. Instrument: A Quest Technologies, model 2700, Sound Level Meter, serial number HUA090019, was used to conduct the survey. This instrument was calibrated on 18 April 2013. A pre and post calibration was completed on 31 January 2014 by SSgt Strong.

| Measurement Location                  | Decibels A weighting dBA |
|---------------------------------------|--------------------------|
| Operator Position by the heater motor | 87.5                     |

4. Recommendations: AFOSH Std 46-20, *Occupational Noise and Hearing Conservation Program*, defines "Hazardous Noise" as a noise level that exceeds 85 decibels ("A" weighted). Based on our survey results, the noise levels at the Security Forces Tanker Way gate are above 85 dBA; therefore, personnel working in this area are exposed to hazardous noise and are required to wear hearing protection. However, it may not be feasible for personnel to wear hearing protection devices (ear plugs) while performing ID checks. If personnel do not exceed 302 minutes of unprotected exposure to hazardous noise at 87 dBA the risk for hearing damage is low.

5. If you have any further questions concerning this survey, please contact [REDACTED]

[REDACTED], DAF  
Occupational Health Element Chief

cc:  
6 SFS/CC