Noise Induced Hearing Loss Threats Awareness among Part 145 Line Maintenance Employees

Abdul Ghani Abdul Samad, Siti Nornajwa Hashimi

Abstract: ***Noise induced hearing loss becoming one of the biggest threats for the maintenance personnel in aviation maintenance company. Lot of studies had been conducted and showed on how it can affect the work performance which every single mistake can lead to worst case scenario in the industry itself. This research is mainly comprised in evaluating awareness level and the results from it can be guidance for recommend the proper safety measures to protect their health. Also, for the methodology, this research is carried out with quantitative measures for better analysis and using questionnaire for collecting all data. All the data analysed for the results of the overall study for this thesis study.***

Keywords: Noise-induced hearing loss threats, Part 145 Line maintenance technicians, SPSS

I. INTRODUCTION

Overview

Generally, outside the hangar is the line environment while base environment is usually inside the hangar or the workshop. Aircraft maintenance engineer expected to work in these two-working environments either day or night. They are exposed to the hazards and health threats while working in this aviation field including noise pollution due to running aircraft engines or auxiliary power units and so on [1].

Prolong exposure to the loud environment may cause the noise induced hearing loss which one of the leading causes for about one quarter of the hearing difficulty caused by occupational exposures among US workers. Other than that, about 22 million workers are exposed to hazardous noise each year [2].

Statement of Problem

The one who works in the aviation industry should be safe from any hazards which can threat their health and safety including the hearing impairment after working for long time in the loud environment of line maintenance. Lacking safety awareness including not wearing the personal protection equipment for ear in the loud environment of the line maintenance mostly cause the maintenance engineer in risk to lose their hearing capability after a time or usually known as noise induced hearing loss (NIHL). Safety awareness in line maintenance should be enhanced by improving reliability of ear muff used during working in the loud environment of line maintenance.

Revised Manuscript Received on December 22, 2018.

Abdul Ghani Abdul Samad, Universiti Kuala Lumpur, Malaysian Institute of Aviation Technology, Dengkil, Selangor, Malaysia

Siti Nornajwa Hashimi, Universiti Kuala Lumpur, Malaysian Institute of Aviation Technology, Dengkil, Selangor, Malaysia

Objectives

Significantly, this study focused on reducing the amount of line maintenance engineer suffering from hearing impairment risk due to lack of safety awareness in the line maintenance and raise awareness of ear personal protection equipment importance during work besides enhancing the safety culture in the aviation wholly.

Scope and Limitation

The scope of research is the Part 145 line maintenance employees in Hammock Helicopter Sdn. Bhd., Subang. Specifically, the respondents of the questionnaire comprise of maintenance personnel who working in the line maintenance field.

The limitation basically based on limited findings for evaluating which only by analysing the questionnaire paper distributed the respective respondents. It may not reflect all the maintenance personnel opinion in the aviation throughout the country. Other than that, the limiting factor in this research is some details cannot be enclosed to the public due to the terms and policies of the organization itself.

II. LITERATURE REVIEW

Hearing

The organ responsible to the hearing sense is ear. Basically, the ear function is to detect sound by receiving vibrations in the air. Typical sensitivity of human ear for sound is between 20 and 20000 Hz with greatest sensitivity at 3000 Hz but the performance of the ear could be deteriorated due to certain health problems. Decibels (dB) is the sound intensity unit. Table 1 below will show the certain level of intensity in various activity.

Table. 2-1 Noise Level Range

Noise Level Examples	Class	SLC80dB	Allowable Noise Level Range	
Ringing Telephone - 80dB	1	10 to 13	Less than 90db	SAFE AREA
Loud Radio - 80dB	1	10 to 13	Less than 90db	
Busy Traffic - 80dB	1	10 to 13	Less than 90db	
Band Saws - 85dB	2	14 to 17	Less than 90db	
Power Lawn Mower - 90dB	2	14 to 17	90 - 95db	RISK AREA
Belt Sander - 93dB	2	14 to 17	90 - 95db	
Tractor - 96dB	3	18 to 21	95 - 100db	
Electric Drill - 98dB	3	18 to 21	95 - 100db	
Bulldozer - 105dB	4	22 to 25	100 - 105db	
Blasting - 110dB	5	26 to 36	110 - 115db	HARMFUL RANGE
Nail Gun - 110dB	5	26 to 36	110 - 115db	
Chainsaw - 120dB	5	26 to 36	115 - 120db	
Propeller Aircraft - 120dB	5	26 to 36	115 - 120db	
Gun Shot - 130dB	5	26 to 36	125 - 130db	
Rivetting Hammers - 130dB	5	26 to 36	125 - 130db	
Jet Engine Aircraft - 140dB	5	26 to 36	135 - 140db	

To determine good ear condition, monaural hearing (sound reception on one ear) is slightly less acute than binaural hearing (sound reception on two ears) when ear is turning to the sound source. But, if the head is turned in the opposite direction, hearing may be reduced by as much as 20 dB in some frequencies as cited in ICAO (2012) page 389 [3].

Ear protection

Basically, ear protectors have no adverse effects on understanding speech in noise, provided the voice is raised above background noise level, either in face-to-face communication, loudspeaker communication or communication under a headset (insert protectors used with communication earphones or earphones incorporated into ear muffs). Problems in speech communication depend on the type and the amount of noise, the type of ear protector, and the hearing status of the individual [4].

Ear protectors may cause medical problems in various ways. The materials from which the ear protectors are made may cause allergic or toxic reactions. Cases of external otitis are rare when the material is inert, such as neoprene, polyvinyl plastic or rubber. Stiff ear inserts may cause injuries if a blow on the ear causes the insert to penetrate more deeply. Inserts with too tight a fit may contribute to barotrauma. Pressure-reducing ear inserts are ineffective and should be avoided. Insertion of ear plugs may result in impacted cerumen in the ear canal. Failure to keep ear protectors clean can result in disease. Ear protectors should not be worn when there is existing external otitis or skin infection [5].

Noise in Aviation Industry

Aircraft noise originates principally from propellers (for piston and turbo-prop aircraft), the engines and exhaust (with different characteristics for jet, turbo-fan, turbo-prop and piston engines), and aerodynamic flow or slipstream (speed, take-off, landing). The intensity of sound (noise) decreases proportionally to the square of the distance [6].

The noise background for speech and communications is primarily the flight-deck noise. Communication equipment might be an additional noise source, although static and radio beams, which used to be disturbing for flight crews in the earlier days of air transport, have now practically disappeared with improved equipment.

Noise-induced hearing loss

Noise-induced hearing loss (NIHL) is the most common occupational disease in Malaysia, accounting for about three quarter of all work-related diseases, ahead of respiratory and musculoskeletal problems [7].

According to the European Agency for Safety and Health at Work (2005), NIHL is usually caused by prolonged exposure to loud noise. The first symptom is normally the inability to hear highpitched sounds. Unless the problem of excessive noise is addressed, a person's hearing will deteriorate further, including difficulties detecting lower-pitched sounds. This will normally occur in both ears. The damage of NIHL is permanent [8].

III. METHODOLOGY

In statistics, it has been stated that explaining any phenomenon by collecting numerical data that are analysed using mathematically based method explain what means of quantitative method mentioned above [9].

Data of this research were collected by referring to questionnaires that had been distributed among the maintenance personnel. A set of questionnaires containing a few questions that had been divided to four sections.

Section A consist of personal detail of maintenance personnel, which include gender, age, education level, type of license that maintenance personnel have and working experience in aviation industry.

Section B are divided into four subsections. The first subsection focusing on maintenance personal knowledge regarding noise induced hearing loss. This section gives pictures on symptoms of noise induced hearing loss basically while second subsection concentrate on effect on noise hearing loss to a worker and the company, he/she is working with. The result of this section can raise awareness about effect of noise induced hearing loss to a person and the company their working with. Third subsection will determine the usage of hearing protection and last subsections it will focus on management roles in raising awareness on threats of NIHL at the company which is Hammock Helicopter Sdn. Bhd. The research is to determine the awareness of the part 145 maintenance employees regarding the threat of the noise induced hearing loss. The maintenance personnel in the approved maintenance organization become the sample for the survey conducted. The result can be used as suggestions and recommend safety measures to improve the noise induced hearing loss awareness status of the personnel at the company.

IV. ANALYSIS

The final result will be presented based on the answers on the questionnaires obtained from the respondents which are part 145 line maintenance employees from the Hammock Helicopter Sdn. Bhd. The data is tabulated and analysed to obtain the results on the noise induced hearing loss threats awareness. From the result analysis, the data will show the vital aspects of the study and confirmed the hypothesis tested.A total of 38 sets of questionnaires were distributed to the respondents who are working in Hammock Helicopter Sdn. Bhd. The response rate is 100% as all of 38 sets of questionnaires were received back from respondents.

Reliability Analysis

In this study, the survey was conducted at the Galaxy Aerospace in UniKL MIAT Subang. The researcher decides to apply simple random sampling method because it guarantees that every sample chosen is representative of the population. The pilot test survey was conducted from the population of Galaxy Aerospace. A set of questionnaires was distributed to achieve the objective of the research.

The use of SPSS sampling in Table 1 show 0.928 percentages of the 42 questionnaires distributed which indicated the reliability of the questions.

Table. 1 Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
0.811	25

Noise Induced Hearing Loss Threats Awareness among Part 145 Line Maintenance Employees

This subtopic is divided into four subsections that comprise of section 1, section 2, section 3 and section 4. Section 1 is on maintenance personal knowledge regarding noise induced hearing loss (NIHL). Section 2 is on sign of hearing loss on line maintenance employees while section 3 is on usage of hearing protection and the last, section 4 is on management roles in raising awareness on NIHL threats. This section indicated with Likert scale which range from strongly disagree to strongly agree and carry point from 1 to 5 respectively.

Section 1 – Maintenance personal knowledge regarding noise induced hearing loss

1. I understand how ears function.

Table. 2 Q1-1

Scale	1	2	3	4	5
(%)	0	0	15.8	47.4	36.8

Based on the figure above, majority of the respondents choose agree option (47.4%) followed by strongly agree (36.8%). 15.8% of the respondents responded neutral and no one choose to strongly disagree and disagree. Hence overall of the respondents mostly exposed on how their ears function and how it related to their work performance during their previous study.

2. I know how to protect my hearing.

Table. 3 Q2-1

Scale	1	2	3	4	5
(%)	0	0	15.8	42.1	42.1

Based on the figure above, both agree and strongly agree option were chosen by most of the respondents which is 42.1% respectively. Only 15.8% of the respondents are neutral to this question. It can be concluded majority of the respondents know how to protect their hearing as it is compulsory at the workplace of the personnel itself.

3. I am aware tinnitus could be sign of hearing loss

Table. 4 Q3-1

Scale	1	2	3	4	5
(%)	0	0	26.3	57.9	15.8

Based on the figure above, half of the respondents chose agree option with the percentage of 57.9. It is followed by neutral option where other quarter of the respondents chose for this question. (26.3%). The least option chosen are strongly agree (15.8%). So, from the data above, most of the respondents were aware with the sign of hearing loss including tinnitus or buzzing ears.

4. I know high noise levels might cause me hearing loss

Table. 5 Q4-1

Scale	1	2	3	4	5
(%)	0	5.3	0	31.6	63.2

Based on the figure above, majority of the respondents chose to agree and strongly agree with percentage of 63.2% and 31.6% respectively and it can be concluded most of the respondents know it from the sign provided by workplace. Only a few chose to disagree as their choice (5.3%) because they might be ignorance on their health.

5. I know prolonged exposure to noise might cause me hearing loss

Table. 6 Q5-1

Scale	1	2	3	4	5
(%)	0	0	0	42.1	57.9

Based on the figure above, more than half of the respondents chose to strongly agree (57.9%). It is followed by agree option with the percentage of 42.1%. Contrary to the question above, all the respondents agree the prolong exposure to noise might cause them hearing loss as they are being exposed to the health risk while they are working in this field.

Section 2 – Sign of Hearing Loss on Line Maintenance Employees

1. I had difficulties to hear colleagues while working.

Table. 7 Q1-2

Scale	1	2	3	4	5
(%)	31.6	31.6	15.8	21.1	0

Based on the figure above, most respondents chose to strongly disagree and disagree for this question and both options have the same percentage chosen (31.6%). The respondents might not experience any difficulty as they do not have any hearing problems for now. It is followed by agree option which is other one fifth of the respondents (21.1%) and the least are neutral option (15.8%). As for the respondents who chose agree option they might start suffer from mild hearing loss as they could not hear during working with their teammates.

2. I do not listen when someone speaks in a whisper

Table. 8 Q2-2

Scale	1	2	3	4	5
(%)	26.3	36.8	21.1	15.8	0

Based on the figure above, almost two fifth of the respondents had chosen disagree option (36.8%). It is followed by strongly disagree (26.3%) and neutral option (21.1%). Hence it can be concluded they do not have any problem to hear when someone whisper as they have good hearing condition. The least option is agreeing which is 15.8% of the respondents chose. These respondents start showing the sign of noise induced hearing loss.

3. I feel embarrassed to meet anyone because I could not hear

Table. 9 Q3-2

Scale	1	2	3	4	5
(%)	57.9	21.1	15.8	0	5.3

Based on the figure above, more than half of the respondents chose to strongly disagree (57.9%) while other one fifth chose to disagree (21.1%). Based on the option that majority of the respondents chosen, they absolutely do not have encounter any embarrassing moment due to hearing problem. It is followed by neutral (15.9%) and strongly agree (5.3%). Contrary to the majority, persons who chose to strongly agree might experience any problems with their hearing problem which cause their confidence level down.

4. I argue with my colleagues I struggle to hear

Table. 10 Q4-2

Scale	1	2	3	4	5
(%)	52.6	31.6	10.5	5.3	0

Based on the figure above, majority of the respondents chose to strongly disagree and disagree with the percentage of 52.6 and 31.6 respectively followed by neutral (10.5%) and other 5.3% chose to agree. It can be concluded most of respondents do not have any arguments with their teammates due to hearing problems despite they are some of them who ever had miscommunications during working.

5. I have trouble hearing any audio that are loud enough for others

Table. 11 Q5-2

Scale	1	2	3	4	5
(%)	47.4	31.6	10.5	10.5	0

Based on the figure above, 47.4% of the respondents chose to strongly disagree while other 31.6% respondents chose to disagree. Neutral and agree option both have equal percentage which is 10.5. Most of the respondents chose to disagree might because they never experience any problem to listen any sound or audio which is unlike a few which chose to agree are believed to be more than 50 years which this problem commonly happen to the elderlies.

Section 3 – Usage of hearing protection

1. I wear hearing protection every time I work at the ramp

Table. 12 Q1-3

Scale	1	2	3	4	5
(%)	0	10.5	42.1	31.6	15.8

Based on the figure above, almost half of the respondents (42.1%) chose neutral and followed by agree (31.6%), strongly agree (15.6%) and disagree (10.5%). From the data above it can be concluded they wear hearing protection because of the strict rules of the ramp itself while the one who not might because of they forgot to do so or being thoughtless.

2. I wear hearing protection correctly every time

Table. 13 Q2-3

Scale	1	2	3	4	5
(%)	0	5.3	42.1	42.1	10.5

Based on the figure above, neutral and agree have same percentage which is 42.1%. It is followed by strongly agree (10.5%) and disagree (5.3%). Most respondents might feel the need to wear the hearing protection correctly because if the PPE being worn incorrectly might cause them uneasy feelings and uncomfortable which might affect their work performance.

3. I ensure the hearing protection in a good condition

Table. 14 Q3-3

Scale	1	2	3	4	5
(%)	0	10.5	31.6	31.6	26.3

Based on the figure above, 31.6% of the respondents chose neutral and other 31.6% chose to agree while strongly agree was chosen by 26.3% of the respondents. The least option selected by respondents is disagree (10.5%). Hence, from the data above, majority of the respondents ensure their PPE in a good condition because they aware if it does not in a wearable condition, it is completely impractical to protect their hearing.

4. I feel comfortable using hearing protection

Table. 15 Q4-3

Scale	1	2	3	4	5
(%)	5.3	10.5	31.6	36.9	15.8

Based on the figure above, almost two fifth of the respondents chose to agree while other 31.6% respondents chose neutral. It is followed by strongly agree (15.8%), disagree (10.5%) and strongly disagree (5.3%). Respondents mostly do not encounter any uncomfortable feeling wearing the PPE but still there are some of them who disagree to this statement. It might because they do not wear it properly, the PPE is not in good condition or the design of the PPE itself which cause them to feel unease.

5. I will start working only after I wear proper safety protection

Table. 16 Q5-3

Scale	1	2	3	4	5
(%)	0	5.3	31.6	42.1	21.1

Based on the figure above, more than two fifth of the respondents chose to agree (42.1%) and other 31.6% chose neutral. Other one fifth of the respondents chose to strongly agree (21.1%) and only 5.3% chose to disagree. Despite of majority of the respondents who start working only after they wear proper PPE because of they are told to do so besides of norm, they are a few of them who not might because they become ignorant of the workplace rules.

Section 4 – Management Roles in Raising Awareness on threats of NIHL

1. My company always reminds me to do audiogram test

Table. 17 Q1-4

Scale	1	2	3	4	5
(%)	26.3	31.6	15.8	10.5	15.8

Based on the figure above, almost one third of the respondents chose to disagree while other quarter chose to strongly disagree. Neutral and strongly agree have equal percentage which is 15.8% and followed by agree which is 10.5%. From the data above, it can be concluded most of them agree their company do not encourage them to do audiogram test regularly for ensure their good hearing condition even there are some of respondents always being reminded to do so.

2. My management ensures everyone wearing PPE

Table. 18 Q2-4

Scale	1	2	3	4	5
(%)	10.5	15.8	15.8	26.3	31.6

Based on the figure above, 31.6% of the respondents chose to strongly agree followed by agree which is 26.3%. Most of them might agree because their supervisor always being around, monitor their work and ensure all workers following the rules. Neutral and disagree have equal percentage (15.8%) and strongly disagree only chosen by 10.5% of the respondents. It is might because of some of them do not aware of the reminder itself.

3. My workplace has enough safety signs of PPE importance

Table. 19 Q3-4

Scale	1	2	3	4	5
(%)	26.3	52.6	15.8	5.3	0

Based on the figure above, more than half of the respondents chose to agree (52.6%) while 15.8% of the respondents chose to strongly disagree. Disagree, neutral and strongly agree option equally chosen which is 10.5%. From the data above, agree option is most voted option by the respondents because there are so many safety signs around their workplace. But there are some of them disagree to the statements because safety signs in the workplace are not clearly visible from their sight.

4. I am rewarded by management for following safety rules

Table. 20 Q4-4

Scale	1	2	3	4	5
(%)	15.8	10.5	36.8	21.1	15.8

Based on the figure above, more than one third of the respondents chose neutral (36.8%) and followed by agree which is one fifth of the respondents. Strongly agree and strongly disagree equally chosen by respondents which is 15.9% and the least option selected is disagree (10.5%). From the data above, even most of the respondents chose to be neutral on this statement, some of them agree if they are following the rules, they will be rewarded through some gesture (good worker award, bonus, etc.) by the management team.

5. I am exposed to the risk of hearing loss by management

Table. 21 Q5-4

Scale	1	2	3	4	5
(%)	26.3	52.6	15.8	5.3	0

Based on the figure above, 36.8% of the respondents chose neutral, followed by strongly agree which one fifth of the respondents (26.3%), and strongly disagree (15.8%). Disagree and agree equally chosen with percentage of 10.5%. Obviously even neutral is most selected option, respondents mostly agree to the statement that their management exposed them to the risk through providing the safety signs around the ramps and being reminded regularly by their supervisors.

Summary

The results are differentiated by the mean of each question in each section.

Section 1

Table. 22 Means of Section 1

Mean	Q1-1	Q1-2	Q1-3	Q1-4	Q1-5
	4.2105	4.2632	3.8947	4.5263	4.5789

From the table above, it can be concluded question 1-3 got the lowest mean compared to the other questions. The question is “I aware tinnitus could be sign of hearing loss.” Hence, most of the employees have average personal knowledge regarding noise induced hearing loss because they do not aware the tinnitus or buzzing ears is one of the signs they might suffer from hearing loss.

Section 2

Table. 23 Means of Section 2

Mean	Q2-1	Q2-2	Q2-3	Q2-4	Q2-5
	2.2632	2.2632	1.7368	1.6842	1.8421

From the data tabulated above, the lowest mean for this section is on question 2-4 “I argue with my colleagues when I struggle to hear.” Obviously, some maintenance personnel

might suffer mild noise induced hearing loss when they show one or more signs stated in the questions. When they are struggling to listen commonly arguments would happen because of the miscommunication and the information needed for doing the job is not complete.

Section 3

Table. 24 Means of Section 3

Mean	Q3-1	Q3-2	Q3-3	Q3-4	Q3-5
	3.5263	3.5789	3.7368	3.4737	3.7895

Table above concluded that question 3-4 "I feel comfortable using hearing protection" got the lowest mean. So, from there, hearing protection for maintenance personnel is not comfortable enough then they tend to not wear hearing protection even it is compulsory every time working in line maintenance site.

Section 4

Table. 25 Means of Section 4

Mean	Q4-1	Q4-2	Q4-3	Q4-4	Q4-5
	2.5789	3.5263	3.3158	3.1053	3.2105

Table above shows the lowest mean is on question 4-1 "My company always remind me to do audiogram test." From here, obviously the management do not stress the importance of the audiogram test on their employees. Management should play a major role for ensure all personnel have a good hearing condition for working properly and reduce the risk of incidents due to hearing problem.

Summary

Thus, the overall results were able to serve all the purposes of this research. The findings itself shows the awareness level of the employees of the Part 145 line maintenance. It can be concluded that the study provides the overview of the awareness regarding on noise induced hearing loss and could help improving the awareness level on its threats.

V. CONCLUSION

Line maintenance personnel also should have a comfortable hearing protection and any further study can be conducted for designing a better personal protective equipment (PPE) for protecting hearing condition and ensure maintenance personnel health since there are some of respondents feeling impractical to wear PPE during working. Other than that, management must play a major role for ensure the safety of employees including their health. Hopefully, the results from this study would help the one who may it concern boosting the level of awareness while reducing maintenance personnel suffer from hearing disability. Besides that, for the other researchers, these findings might can serve the guidelines for further study.

Finally, the survey purposely to provide the practitioners with general overview which can allow more further informative discussions between human factor professionals and the practitioners itself to develop safety management programs in part 145 line maintenance and other divisions have been researching and are still currently working in the aviation industry; which include manufacturing [10-13], avionics [14-18], ergonomics [19-22], maintenance [23-36], and management of professional development [37-38].

REFERENCES

1. Civil Aviation Authority. (2002, January 22). Retrieved from Civil Aviation Authority: https://publicapps.caa.co.uk/docs/33/CAP715.PDF
2. Trung, N., Louise, V., Jane, L., & Westerberg, B. (2017). Current insights in noise-induced hearing loss: a literature review of the underlying mechanism, pathophysiology, asymmetry, and management options. *Journal of Otolaryngol - Head & Neck Surgery*, 1-15.
3. International Civil Aviation Organization. (2012, July). *ICAO Doc 9501 Volume 1*. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwivmOq24u_fAhUMK48KHeriCdcQFjABegQICRAC&url=https%3A%2F%2Fwww.icao.int%2Fenvironmentalprotection%2FDocuments%2FPublications%2FDoc_9501_V olume_I.pdf&usg=AOvVaw2DriFm0
4. Klee, G., & MacKenzie, C. (2015, June 1). *Occupational Health & Safety*. Retrieved from https://ohsonline.com/Articles/2015/06/01/Guide-to-Selecting-the-Right-Ear-Muff.aspx
5. International Civil Aviation Organization. (2013, January 2). *Manual of Civil Aviation Medicine*. Retrieved from https://www.icao.int/safety/aviationmedicine/Documents/8984_cons_en.pdf
6. International Civil Aviation Organization. (2018). *Aircraft Noise*. Retrieved from https://www.icao.int/environmentalprotection/pages/noise.aspx
7. Department of Occupational Safety and Health. (2015). *Occupational Diseases and Poisoning Investigation*. Retrieved from www.dosh.gov.my/index.php/en/archive/540media-resources/archive/archive-osh-info/2015-archive-oshinfo/392-occupational-diseases-and-poisoning-investigation
8. European Agency for Safety and Health at Work. (2005). *The impact of noise at work*. Bilbao: European Agency for Safety and Health at Work.
9. Yilmaz, K. (2013). Comparison of Quantitative and Qualitative Research Traditions: epistemological, theoretical, and methodological differences. *European Journal of Education*, 311-325. Retrieved from https://pdfs.semanticscholar.org/f45f/993702833849749b3ddd83e1673728d569eb.pdf
10. Ya'acob, A., Mohd Razali, M., Anwar, U., Mohd Radhi, M., Ishak, M., Minhat, M., . . . Teh, C. (2018). Investigation of closed compartment moulding for pull-winding process. *International Journal of Engineering and Technology*, 107111.
11. Muhd Zaimi, M., Nazran, M., & Basit, R. (2019). Design and Testing UniKL MIAT CF 700 AFT Fan Turbofan Fuel Tank with Indicator. International Journal of Innovative Technology and Exploring Engineering, 590-595.
12. Muhd Zaimi, M., Rosdi, I., & Dahdi, Y. (2019). Tensile Test on Sisal/Fibre Glass Reinforced Epoxy-based Hybrid Composites. International Journal of Innovative Technology and Exploring Engineering, 604-607.
13. Ya'acob, A., Razali, D., Anwar, U., Radhi, A., Ishak, A., Minhat, M., . . . Teh, C. (2017). Preliminary Study on GF/Carbon/Epoxy Composite Permeability in Designing Close Compartment Processing. *AeroMech17* (pp. 1-9). Pulau Pinang: IOP Publishing Ltd.
14. Jabarullah, N., Mauldin, C., Navarro, L., Golden, J., Madianos, L., & Kemp, N. (2017). Modelling and Simulation Analysis for the Prediction of the Performance of Intrinsic Conducting Polymer Current Limiting Device. *Advanced Science Letters*, 5117-5220.
15. Jabarullah, N., Verrelli, E., Gee, A., Mauldin, C., Navarro, L., Golden, J., & Kemp, N. (2016). Large dopant dependence of the current limiting properties of intrinsic conducting polymer surge protection devices. *RSC Advances*, 8571085717.
16. Jabarullah, N., Verrelli, E., Mauldin, C., Navarro, L., Golden, J., Madianos, L., & Kemp, N. (2014). Novel conducting polymer current limiting devices for low cost surge protection applications. *Journal of Applied Physics*, 164501.

17. Jabarullah, N., Verrelli, E., Mauldin, C., Navarro, L., Golden, J., Madianos, L., & Kemp, N. (2015). Superhydrophobic SAM Modified Electrodes for Enhanced Current Limiting Properties in Intrinsic Conducting Polymer Surge Protection Devices. *Langmuir*, 6253-6264.
18. Othman, R., Hossain, M., & Jabarullah, N. (2017). Synthesis and characterization of iron-and nitrogen-functionalized graphene catalysts for oxygen reduction reaction. *Applied Organometallic Chemistry*, e3738.
19. Amzar, M., Fard, M., Azari, M., Jazar, R., & Maeda, S. (2017). Influence of vibration on seated occupant drowsiness measured in simulated driving. *Applied Ergonomics Journal*, 348-355.
20. Azizan, M., & Padil, H. (2018). Lane keeping performances subjected to whole-body vibrations. *International Journal of Engineering & Technology*, 1-4.
21. Amzar, M., Fard, M., Azari, M., Benediktsdttir, B., Arnardttir, E., Jazar, R., & Maeda, S. (2016). Influence of vibration on seated occupant drowsiness. *Industrial Health Journal*, 1-12.
22. Azizan, M., Fard, M., & Azari, M. (2014). Characterization of the effects of vibration on seated driver alertness. *Nonlinear Engineering-Modelling and Application Journal*, 163168.
23. Abdul Samad, A., & Khahar, H. (2019). Human Factor Issue – Glare Effects towards Airline Personnel. International Journal of Innovative Technology and Exploring Engineering, 582-584.
24. Abdul Samad, A., & Mohd Tahir, A. (2019). Bird Strikes and Preventive Methods used at Malaysian Airport. International Journal of Innovative Technology and Exploring Engineering, 596-599.
25. Abdul Samad, A., & Omar, N. (2019). Shift and Schedule Affecting Line Maintenance. International Journal of Innovative Technology and Exploring Engineering, 585-589.
26. Abdul Samad, A., Haider, R., & Md Hairudin, K. (2019). Human Factors Affecting Avionics Workshop in MRO 145. International Journal of Innovative Technology and Exploring Engineering, 553-555.
27. Ishak, F., Johari, M., & Dolah, R. (2018). A case study of LEAN application for shortest lead time in composite repair shop. *International Journal of Engineering and Technology*, 112-119.
28. Khairuddin, M., Yahya, M., & Johari, M. (2017). Critical needs for piston engine overhaul centre in Malaysia. *IOP Conference Series: Materials Science and Engineering* (pp. 012013 (1-5)). Bristol: IOP Publishing Ltd.
29. Omar, S., Johari, M., & Abdul Samad, A. (2018). Assessment on risk management of helicopter services for offshore installations. *International Journal of Engineering & Technology*, 229-231.
30. Zainal Ariffin, M., Johari, M., & Ibrahim, H. (2018). The needs of aircraft avionics' radio line replaceable unit repair center at UniKL MIAT. *International Journal of Engineering and Technology*, 86-88.
31. Abd Latif, B., & Abdul Satar, M. (2019). Developing a Dual-Axis Solar Tracker System with Arduino. International Journal of Innovative Technology and Exploring Engineering, 578-581.
32. Azman, A., & Abdul Rahman, A. (2019). Potential and challenges of drop-in biojet fuel in Malaysia. International Journal of Innovative Technology and Exploring Engineering, 556-563.
33. Mohd Ali, M., & Ahmad Khairul Azman, N. (2019). Automated Deployable Protection Unit for Drones. International Journal of Innovative Technology and Exploring Engineering, 564-574.
34. Mohd Ali, M., & Husni, M. (2019). Efficiency of Solar Cells for UAV. International Journal of Innovative Technology and Exploring Engineering, 575-577.
35. Muhd Zaimi, M., & Zulkifli, M. (2019). Analysis on the Aerodynamic Efficiency of Modified Blended Wingtip. International Journal of Innovative Technology and Exploring Engineering, 600-603.
36. Johari, M., Jalil, M., & Mohd Shariff, M. (2018). Comparison of horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT). *International Journal of Engineering and Technology*, 74-80.
37. Bardai, A., Er, A., Johari, M., & Mohd Noor, A. (2017). A review of Kuala Lumpur International Airport (KLIA) as a competitive South-East Asia hub. *IOP Conference Series: Materials Science and Engineering* (pp. 012039 (1-10)). Bristol: IOP Publishing Ltd.
38. Johari, M. K., & Jamil, N. Z. (2014). Personal problems and english teachers: Are they always bad?*International Journal of Applied Linguistics and English Literature*, 163169.