An Evaluation on Norms of Aircraft Mechanics in Selected Maintenance Repair and Overhaul (MRO) Company

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Abstract- ***One of the problems in the aviation industry, especially in the field of maintenance, is safety. There are many contributing factors why safety was being compromised in the maintenance side of aviation, and one of those contributing factors was norms. Norms may have a positive effect on the maintenance of the aircraft, but also there are negative norms, also known as killer norms, which may lead to accidents and incidents not only for the aircraft but also for aircraft mechanics who are working with aircraft. This study demonstrated the use of feedback from aircraft mechanics working in Aviation Partnership Philippines (A+) to create a model for the negative norms to be eliminated on the maintenance side. The study determined the following: norms were frequently happening in the maintenance facility, the level of awareness of aircraft mechanics to the effects of norms in maintenance, and how norms affect the performance of aircraft mechanics. A 4-point Likert survey was used in the study. Three (3) types of 4-point Likert survey was namely; level of frequency, level of agreement and level of awareness of the participants when it comes to positive and negative norms. Where 4 stands for Always/Strongly Agree/Very Aware, 3 stands for Often/Agree/Aware, 2 stands for Rarely/Disagree/Slightly Aware and 1 stands for Never/Strongly Disagree/Not Aware. The survey was participated by 20 mechanics from component shop and 20 mechanics from line maintenance. A total of 40 mechanics of (A+) answered the survey questionnaire. Using mean distribution, the results of the positive norms frequently happening in maintenance facility was rated always while the negative norms were rated rarely. In the level of awareness on the effects of norms, positive norms were rated aware and negative norms were rated slightly aware. And lastly, the participants agree on how norms can affect their performance inside their workplace. Key informant Interviews (KIIs) were performed on the selected mechanics of (A+). The KII questionnaire included the root cause of why mechanics practice norms and recommendations on how negative norms can be eliminated on the side of maintenance of A+. Also questions about other positive and negative norms being practice by mechanics in their workplace based on their experiences was also raised by the researcher during the interview. During the interview, securing the area/workplace free from any foreign object debris (FOD), meeting every 7am before the start of work for a short briefing about the tasks and wearing personal protective equipment during maintenance tasks which is also included in the survey questionnaire were mentioned by the interviewees for the positive norms. While installing the landing gear without checking if the tire pressure is proper, not using manuals during removal and installation of tires, case drain filter, etc. and not using the appropriate tools and mechanics are using their memory instead of manuals were mentioned by the participants for the other negative norms being practiced in their company. All in all, participants in the interview mentioned 1 positive norm and 2 negative norms included in the survey questionnaire which means these norms were the most types of norms that are being practiced by mechanics until now in their workplace. The researcher used the Fogg's model of behavioral change in order to improve the practice of positive norms in the workplace and also used the said model to eliminate the negative norms that are being practice by the mechanics that can compromise their safety and the safety of the aircrafts.***

I. INTRODUCTION

Maintenance is crucial to aviation safety. When performed improperly, it causes a substantial fraction of accidents and incidents. Examples of maintenance mistakes include installing parts incorrectly, not performing necessary tests, and missing parts (Actechbooks 2018). The late 1980s and early 1990s had a wide range of maintenance-related aviation accidents and incidents, according to Aviationhunt (2021). Since then, human factors have significantly impacted numerous accidents and occurrences. However, many maintenance professionals have made mistakes and errors due to the numerous influencing elements that influence performance when performing maintenance tasks. According to Chatzi (2019), a greater knowledge of human factors has become critical in aviation, and numerous models and technologies have been developed and applied in an ongoing effort to forecast and eliminate human error.
Twelve contributing factors were examined to provide information on how people affect workplace accidents and incidents and those in the aviation sector. The "dirty dozen" is another name for these twelve factors. For example, the Dirty Dozen lists the top twelve likely reasons maintenance workers could make mistakes or errors while performing their duties. These twelve factors are the following: the lack of communication, lack of teamwork, lack of knowledge, pressure, complacency, distraction, fatigue, lack of awareness, lack of resources, stress, pressure, and norms.

People must also be aware of all those human factors in order to prevent these contributing factors. For example, maintenance personnel can reduce workplace risks and hazards that could affect the safety of people and aircraft by analyzing the most common contributing factors.

One major factor that influences and jeopardizes the aircraft's safety is norms. Most aviation mechanics disregard the rules, nonetheless, because doing so can make their work as maintenance technicians easier. Norms is a shortened form for "normal," or how things are typically done. The majority of organizations follow or tolerate these unwritten standards. Negative social norms can weaken the set safety standard and result in an accident (FAA 2018). Maintenance workers must know that even some of the most basic methods for finishing a task could not be the correct or industry-standard approach

Some norms are dangerous because they are ineffective or subtract from the group's productivity. For example, unsafe standards include taking shortcuts in aviation maintenance, working from memory, and failing to follow protocols (FAA 2000). However, to ascertain how norms affect results and imperil the safety of aircraft, crews, and passengers, the researcher decided to focus on the Norms. Even though norms are one of the Dirty Dozen, people frequently ignore them even though they substantially impact aviation safety, team performance, and individual performance.

II. PROCEDURE

- Research Design

The study aimed to evaluate the effects and awareness of aircraft mechanics in Aviation Partnership Philippines/Cebu Pacific regarding norms.

The study was basically a mixed method which has a survey in a form of questionnaire, and an interview on some of the mechanics in the selected maintenance repair and overhaul (MRO) company.

- Population and Sampling

The study used purposive sampling technique, also known as judgmental, selective, or subjective sampling. It is a form of non-probability sampling in which researchers rely on their own judgment when choosing members of the population to participate in their surveys

Among the respondents were aircraft mechanics in the selected maintenance repair and overhaul company. This includes 40 mechanics, 20 of them are from the line maintenance and the remaining 20 mechanics are from the component shops. Also, there are 3 mechanics who are interviewed to gather other norms which are not mentioned on the survey questionnaire.

- Data Gathering Procedure

The data gathering procedure of this study was done through on site and online. The survey questionnaire was first validated by qualified and experts in the field

of aviation to gather a valid and reliable data. The questionnaire consists of 4 close ended questions. The first set of question is the demographic profile of the participants. The second set is about the evaluation of the participants on frequency of committing norms inside the maintenance facility. The third set is the level of awareness on the effects of norms in maintenance and lastly how do norms affect the performance of aircraft mechanics.

The researched sought the permission of the Human resource management department of the selected maintenance repair and overhaul prior to conduct the study. After securing permission, the researcher facilitated the questionnaires to the mechanics on site and via google forms. The gathered data were treated, analyzed and interpreted.

- Statistical Treatment of Data

The following statistical tools for the interpretation of results according to frequency and percentage, weighted mean, T test which was used for testing the significant difference in the evaluation of the participants on norms frequently practiced inside the maintenance facility when grouped according to sex and department profile and Kruskal-Wallis H- Test

ANOVA which was used for testing the significant difference in the evaluation of the participants on norms frequently practiced inside the maintenance facility when grouped according to age, position and length of service of the participants

III. RESULTS

Table 1
Frequency and Percentage Distribution of the Demographic Profile of the Participants

AGE	Frequency f	Percentage %
20-25 years old	9	22.50
26-30 years old	12	30.00
31-40 years old	12	30.00
41 years old and above	7	17.50
TOTAL	40	100%
SEX	Frequency f	Percentage %
Male	30	75.00
Female	10	25.00
TOTAL	40	100%
POSITION	Frequency f	Percentage %
Junior Mechanic	7	17.50
Mechanic A	11	27.50
Mechanic B	7	17.50
Mechanic C	5	12.50
Master A/B	9	22.50
Unit Chief	1	2.50
Operation Manager	-	-
TOTAL	40	100%
AGE	Frequency f	Percentage %
Line Maintenance	20	50.00
Component Shop	20	50.00
TOTAL	40	100%
LENGTH OF SERVICE IN THE COMPANY	Frequency f	Percentage %
less than a year	8	20.00
1-5 years	7	17.50
6-10 years	12	30.00
11 years and above	13	32.50
TOTAL	40	100%

As shown in the Table 1, the age group ranging from 26 – 30 and 31 – 40 years old have the greatest number of participants at the same frequency of 12 or 30 percent; followed by 20 – 25 years old in the middle with a frequency of nine (9) or 22.50 percent, and the least number of participants belonged to the age group of 41 years old and above with a frequency of seven (7) or 17.50 percent. out of the 40(100%) participants, the majority were male with a frequency of 30 or 75 percent, while the female had a frequency of ten (10) or 25 percent. Out of 40 participants (100%) surveyed, Mechanic A accounted for the majority of participants with 11 or 27.50 percent, followed by Master A/B with nine (9) or 22.50 percent and the lowest number from Unit Chief participants with only one (1) or 2.50

percent. Surprisingly, no participant for Operation Manager was accounted for. The data showed an equal distribution of participants from Line Maintenance and Component Shop, with a frequency of 20 or 50 percent.

The majority of the participants (13) were 11 years and above in the service, which comprised 32.50 percent; followed by six (6) – 10 years in service with a frequency of 12 or 30.00 percent; and less than a year in service with a frequency of eight (8) or 20.00 percent and lastly, one (1) – five (5) years in service with a frequency of seven (7) or 17.50 percent.

Table 2
Summary Mean Distribution on the Norms Frequently Happening Inside the Maintenance Facility

VARIABLES	MEAN	STANDARD DEVIATION	VERBAL INTERPRETATION	RANK
1. Positive Norms	3.58	0.340	Always	1
2. Negative Norms	2.20	0.342	Rarely	2
WEIGHTED MEAN	2.89	0.229	Often	

The summary and results on the norms that are frequently happening inside the maintenance facility are shown in Table 2 received an overall weighted mean of 2.89, an SD of 0.229 and verbally interpreted as Often. This data showed that overall, the participants from the line maintenance and component shop were giving scant attention on what norm are prevalent within the organization. Specifically, positive norms got a mean of 3.58 and standard deviation of 0.340 verbally interpreted as Always while negative norms got a mean of 2.20 with standard deviation of 0.340 and verbally interpreted as Rarely. Arguably, between positive and negative norm, worker prefer to follow positive norms in the workplace as a standard rather negative norm.

Table 3
Summary Mean Distribution on the Level of Awareness on the Effects of Norms of Aircraft Mechanics in Maintenance

VARIABLES	MEAN	STANDARD DEVIATION	VERBAL INTERPRETATION	RANK
Positive Norms	2.48	0.271	Aware	1
Negative Norms	1.98	0.530	Slightly Aware	2
WEIGHTED MEAN	2.73	0.258	Aware	

The summary and results on the level of awareness on the effects of norms of the aircraft mechanics in maintenance are shown in Table 3 received an overall weighted mean of 2.73, an SD of 0.258 and interpreted as Aware. Between the two norms, the positive norms ranked first with a mean of 2.48 and standard deviation of 0.271 verbally interpreted as Aware while the negative norms ranked in second with a mean of 1.98 with standard deviation of 0.530 and verbally interpreted as Slightly Aware. The result on Negative

norm showed a gap in participants' appreciation on the importance of error avoidance in the workplace.

Table 4
Significant Difference in The Evaluation of Norms Frequently Practiced Inside the Maintenance Facility When Grouped According to Demographic Profile of The Participants

Significant Difference on Positive Norms						
Particulars		Age	Sex	Position	Department	Length of Service
Statistical Treatment	Kruskal Wallis H	2.24		3.62		3.79
	Mann Whitney U		148		189	
Degrees of Freedom		3		5		3
P-value		0.525	0.962	0.606	0.772	0.285
Decision H_0		Accept H_0	Accept H_0	Accept H_0	Accept H_0	Accept H_0
Conclusion		Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Significant Difference on Negative Norms						
Particulars		Age	Sex	Position	Department	Length of Service
Statistical Treatment	Kruskal Wallis H	5.83		10.6		1.45
	Mann Whitney U		108		196	
Degrees of Freedom		3		5		3
P-value		0.120	0.178	0.061	0.912	0.693
Decision H_0		Accept H_0	Accept H_0	Accept H_0	Accept H_0	Accept H_0
Conclusion		Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

The Table above proved there is no significant difference in the evaluation on positive norms as assessed by the participants when grouped according to Age (H (3) =12.24, P=0.525), Sex (W=148, P=0.962), Position (H (5) =3.62, P= 0.606), Department (W=189, P=0.772), and Length of Service (H (3) =3.79, P=0.285). Therefore, based on the derived data the null hypothesis should be accepted based on the Decision Matrix of the study.

Similarly, there is no significant difference in the evaluation on negative norms as assessed by the participants when grouped according to Age (H (3) =5.83, P=0.120), Sex (W=108, P=0.178), Position (H (5) =10.6, P= 0.061), Department (W=196, P=0.912), and Length of Service (H (3) =1.45, P=0.693). Therefore, the decision is to accept the null hypothesis based on the Decision Matrix of the study.

Table 5
Results of the Key Informant Interview Revealed the Following other Norms in the Workplace

OTHER NORMS IN THE WORKPLACE	
POSITIVE	NEGATIVE
Securing the area/workplace free from any FOD	Not using manuals during removal and installation of tires, case drain filter, etc.

	(N.B. Included norm in the SQ)
Wearing PPE during maintenance task B. Included norm in the SQ)	Installing the landing gear without checking if the tire pressure is proper
Meeting every 7am before the start of work for a short briefing about the tasks	Not using the appropriate tools and mechanics are using their memory instead of manuals (N.B. Included norm in the SQ)

Table 5 shows the result of the interview which revealed other norms in the workplace that are not mentioned in the questionnaires given to the other participants workplace.

CONCLUSION

1. For the demographic profile of the participants, the equal distribution of participants for both line maintenance and component shop department. Majority of the participants were Mechanic A with a length of service of 11 years and above.

2. The evaluation of the participants on norms frequently practiced inside the maintenance facility in terms of positive norms was rated as Always while for negative norms it was rated as Rarely which marks a gap in the safety practices of the organization on both the Line Maintenance and Component Shop Departments.

3. The level of awareness of the participants on the effects of norms, the Aircraft mechanics were found to be very aware which is a good indicator for safety. However, on the negative norms, the aircraft mechanics were found to be slightly aware only.

Intervention must be done to address this situation so that negative norms must be recognized at all times as this would exacerbate the unsafe condition in the workplace.

4. Norms revealed that it affected the performance of aircraft mechanics in the maintenance facility. Though there were norms which may have a good effect to their performance, there were also negative norms that may lead to low quality of work and may also lead to accident and incident.

5. There was no significant difference in the evaluation of the participants on norms frequently practiced inside the maintenance facility when grouped according to their demographic profile.

6. Key Informant Interview of participants reveals other norms in the workplace such as: For Other Positive Norms. *(a)* Securing the area/workplace free from any FOD*; and (b)* Meeting every 7:00A.M. before the start of the work for a short briefing about the task while for other Negative Norms (a) Installing the landing gear without checking if the tire pressure is proper.

7. Proposed Model to Improve Positive Norms and Eliminate Negative Norms.

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