



MAINTENANCE OFFICER INITIAL SKILLS TRAINING TIMELINE

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MARCH 2017

Aaron T. Vincent, Captain, USAF

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**DEPARTMENT OF THE AIR FORCE
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Degree of Master of Science in Logistics & Supply Chain Management

Aaron T. Vincent, BS

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Abstract

Currently the majority of training literature supports either formal classroom training or on-the-job training (OJT). Many organizations do not have an established training program that for optimally integrating OJT and formal classroom training. Specifically, in Aircraft Maintenance Officer (21A) initial skills training in the United States Air Force (USAF) there is currently a lack of standardization in regards to the timeline that new 21A Officers follow for OJT and formal classroom training. Therefore, the purpose of this research is to explore the best time to schedule new logistics managers to attend formal classroom training, or more specifically to explore the effect of the timing of Aircraft Maintenance Officer Course (AMOC) on 21A Officer development. To accomplish this purpose, this research developed and used two web-based surveys to collect data from recent AMOC graduates and from leadership within the 21A community on the benefits of OJT and its effect on AMOC. Of the 1,247 21A Officers surveyed, 334 Officers responded, achieving a response rate of 26.78%.

Roughly 90% of respondents felt that OJT helped a new 21A Officer before AMOC. Additionally, roughly 73% of recent AMOC graduates and roughly 74% of 21A leadership felt that OJT before AMOC added a frame of reference for new 21A Officers at AMOC that enabled them to retain more AMOC curriculum. This frame of reference also added more to the educational experience and discussion while at AMOC, benefiting not only the new 21A Officer but the entire AMOC class. Both survey samples suggested that OJT before AMOC should last a minimum of one to three months but no more than four to six months to avoid training stagnation. This research also discusses additional findings, recommendations, implications, limitations and future research opportunities.

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Table of Contents

Abstract.....	iv
Acknowledgments.....	v
List of Tables	ix
List of Figures.....	x
I. Introduction	1
Overview.....	1
Background & Motivation	1
Problem Statement.....	3
Purpose Statement.....	4
AMOC as an Example	5
Research Question	7
Investigative Questions.....	7
Theoretical Development.....	8
Methodology	10
<i>Data Collection Method</i>	11
<i>Data Analysis Method</i>	12
Assumptions.....	14
Limitations & Scope	14
Implications & Contributions	16
Summary	16
II. Literature Review	17
Overview.....	17
Literature Search Methods.....	17
Primary Literature Streams	18
<i>Formal Classroom Training</i>	19
<i>On-the-Job Training (OJT)</i>	20
<i>Combining Formal Classroom Training & OJT</i>	26
Theoretical Lens.....	30
<i>70-20-10 Rule</i>	30
<i>Human Capital Theory</i>	32
<i>Social Learning Theory</i>	33

Summary	34
III. Methodology	36
Overview	36
Research Design.....	36
Institutional and Air Force Approval	38
Population	38
Instrument Development.....	39
<i>Survey Design – CGO</i>	39
<i>Final Survey Questions – CGO</i>	42
<i>Survey Design – Leadership</i>	43
<i>Final Survey Questions – Leadership</i>	45
Validity and Reliability.....	45
Data Collection	48
Data Analysis Methods	49
Summary	50
IV. Results and Analysis.....	51
Overview.....	51
Participant Demographics.....	51
<i>CGO Survey Demographics</i>	51
<i>Leadership Survey Demographics</i>	54
Nonresponse Bias and Wave Analysis.....	55
Research Question (RQ) and Investigative Question (IQ) Analysis.....	57
<i>IQ A Analysis</i>	58
<i>IQ B Analysis</i>	63
<i>IQ C Analysis</i>	65
<i>IQ D Analysis</i>	67
<i>IQ E Analysis</i>	71
<i>IQ F Analysis</i>	72
<i>RQ Analysis</i>	73
Additional Findings – CGO Survey.....	75
Summary	76
V. Conclusions and Recommendations	78
Overview.....	78

Conclusions.....	78
Discussion.....	79
Recommendations.....	81
Limitations.....	82
Future Research Opportunities.....	83
Summary.....	84
Appendix A: Sponsor Endorsement Letter.....	86
Appendix B: AFIT IRB Exemption Request Approval.....	87
Appendix C: Survey Control Number (SCN) Approval Letter.....	88
Appendix D: Final CGO Survey Questions.....	91
Appendix E: Final Leadership Survey Questions.....	94
Appendix F: Final CGO Survey View in Survey Monkey®.....	96
Appendix G: Final Leadership Survey View in Survey Monkey®.....	106
Appendix H: Initial CGO Survey Questions.....	113
Appendix I: Initial Leadership Survey Questions.....	114
Appendix J: Survey Invitation Email.....	115
Appendix K: Thesis Quad Chart.....	116
References.....	117

List of Tables

Table 1: CGO Survey Participant Ranks, Duty Titles and Time in Service..... 52

Table 2: Participant Prior Enlisted and Commissioning Source Data 53

Table 3: Leadership Survey Demographic Data..... 55

Table 4: Tukey Test Results 60

List of Figures

Figure 1: Tukey Test Results	60
Figure 2: Leadership Survey Numerical Rating Scale.....	64
Figure 3: CGO Survey Preferred AMOC Timeline	66
Figure 4: Leadership Survey Preferred AMOC Timeline.....	69

MAINTENANCE OFFICER INITIAL SKILLS TRAINING TIMELINE

I. Introduction

Overview

This chapter provides a brief introduction to this thesis. This section begins by presenting the background and motivation then continues with the problem statement, purpose statement, the research and investigative questions, and research focus. Next, there is a brief description of the theoretical lens used as a background to set up this thesis topic as well as an introduction to the methodology behind this research. Finally, this chapter includes a discussion of the assumptions, scope, limitations, and the potential implications and contributions of this research.

Background & Motivation

The motivation for this thesis was to investigate the proper timeline to use both on-the-job training (OJT) and formal classroom training in a training program by utilizing the published opinions of industry experts on OJT, formal classroom training and when to schedule new logistics managers for both types of training. Whether formally adopted or not, many different organizations utilize OJT. Additionally, most industries have some formal classroom training either internally or externally that they use to train their employees. Therefore, it is important to determine the best way to schedule attendance for formal classroom training and OJT to optimize the relationship between the two as well as the end product, the trained employee. This optimized schedule of both OJT and formal classroom training will aid any organization in any industry when attempting to train a new employee to be a value added part of the organization.

This situation is also quite relevant to the Department of Defense (DoD). Most organizations within the various branches of the DoD have multiple forms of formal classroom training for all specialty codes and jobs. Additionally, most organizations within the branches of the DoD also have OJT programs that are widespread, heavily used, and often well planned. For example, aircraft maintenance (21A) Officers in the United States Air Force have two different mandatory formal training opportunity (Aircraft Maintenance Officer Course and Maintenance Officer Intermediate Course) as well as multiple optional formal classroom training opportunities, i.e. Advanced Maintenance and Munitions Officer School. In combination with these mandatory formal classroom training opportunities, 21A Officers also have mandatory OJT they must complete, referred to as the Career Field Education and Training Plan or CFETP. The majority of the CFETP defines the OJT mandatory for 21A Officers but it also lists the required formal training for 21A Officers. Therefore, the DoD can benefit from studies that investigate how to use both OJT and formal classroom training in conjunction with each other.

Two common methods of training employees are formal classroom training and on-the-job training. Examples of formal classroom training include new employee seminars or mandatory formal training classes that take place with a teacher and one or more students. On-the-job training is where trainers teach new hires as they work and they are expected to learn while on the job from other more experienced employees. Most organizations use one type or the other while quite a few organizations, including the Air Force, use both formal classroom training and OJT. Since the Air Force and the DoD often utilize both formal classroom training and OJT in their training programs, it becomes necessary to analyze how both formal classroom training and OJT programs work, especially in concert with one another. Thus this thesis

focuses on when to apply formal classroom training along with on-the-job training in new employee training programs.

As the literature review in Chapter Two presents the majority of literature discovered makes the argument for OJT versus formal classroom training, instead of when to use both OJT and formal classroom training as desired for research initially. Most every study and piece of literature found made a case for either OJT or formal classroom training. The literature was either for OJT and against classroom training or vice versa for a multitude of reasons. It appeared as though there was a lack already developed research concerning the use of both OJT and formal classroom training together and when they should be scheduled to most beneficial for the potential trainees. Therefore there was a gap discovered in the research concerning training programs and the employment of both OJT and formal classroom training in a program together. As such, to fill this gap, this thesis investigates the best time to schedule new logistics managers to attend formal class training, whether that be immediately upon entering the organization or after a period of on-the-job training. The results of this thesis will help determine how to use OJT and formal classroom training together in training programs to receive the best of both worlds and maximize the potential of all trainees.

Problem Statement

Overall this thesis investigates training programs in the general sense as well as when it is best to schedule new logistics managers for both formal classroom training and on-the-job training. Most training literature makes a case for either formal classroom training or OJT, not both. Additionally, many different industries and organizations do not have a solid training program that schedules OJT before formal classroom training because there is little research or

literature to review. For example, in Aircraft Maintenance (21A) Officer initial skills training in the United States Air Force (USAF) there is currently a lack of standardization in regards to the timeline that all new 21A Officers follow for OJT and formal classroom training.

From this problem, the researcher developed a single and central question: How might the timing of formal classroom training affect employee development? From this overarching problem it could be tailored down to fit a real world example of Aircraft Maintenance Officer Course (AMOC) for the USAF: How might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development? Researching this problem will be directly beneficial to the maintenance community, could produce a more qualified aircraft maintenance Officer from AMOC and could aid with the current budget and end strength problems faced by the United States Air Force. Additionally, this research could apply to other industry's or organization's training approach to produce a more qualified employee and cut training costs.

Purpose Statement

The purpose of this research is to explore the best time to schedule new logistic managers to attend formal classroom training, whether that be immediately upon entering the organization or after a period of on-the-job training. However, this purpose statement can be narrowed down to fill a specific example that directly affects the United States Air Force. Thus, once tailored down to the specific example of AMOC, the purpose of this survey study is to explore the best time to schedule new aircraft maintenance Officers to attend AMOC, whether that be immediately after commissioning, after in processing at a first duty station or after a period of OJT. Therefore it is now important to look at AMOC and its use as the example for this topic.

AMOC as an Example

To fully investigate this subject, this thesis will use the training of new aircraft maintenance (21A) Officers in the United States Air Force as the real-life example data for this topic area. It is important to understand the background and current scheduling practices of the Air Force sending new 21A Officers to training. Presently aircraft maintenance Officers are sent to Aircraft Maintenance Officer Course (AMOC) shortly after they commission or as soon as possible, pending class availability. Currently, the Air Force Personnel Center (AFPC) determines when new 21A Officers attend AMOC as they are the organization that performs the scheduling functions for Officer training. AFPC schedules new 21A Officers for AMOC based on a multitude of factors including the Officer's first duty location and the current class sizes or fill rates. However, AFPC aims to schedule new aircraft maintenance Officers to attend AMOC roughly 30 days after they arrive at their first duty station for administrative purposes, i.e. in processing, set up finance, and to find housing among other tasks. Although, some new 21A Officers attend AMOC as a temporary duty, or TDY, in route to their first duty station, before they even in process at their first duty station. There are also some maintenance Officers who attend the three-month TDY to AMOC after they spend a few months at their first duty assignment.

AMOC, located at Sheppard Air Force Base in Wichita Falls, Texas, is a 14-week initial training course. 21A Officers are sent to Sheppard AFB from their duty station and billeted on base during their time at AMOC. Therefore, the Air Force has to pay for airfare, lodging, per diem and possibly for a rental car on top of normal salary for each Officer that is sent TDY to AMOC. Since AMOC lasts roughly 14 weeks, the TDY to AMOC becomes quite costly, often totaling more than \$6,000 per Officer. In a class of 15, this can result in a cost of at least

\$90,000 if not more. This figure is based on a 14-week TDY and only factors in lodging with a current rate of \$60 per night for visiting officer quarters at Sheppard AFB. Therefore, this number only increases when a current per diem rate is included along with the potential costs of airline tickets and a rental car.

Currently, AFPC attempts to schedule all new aircraft maintenance Officers to attend AMOC shortly after they arrive at their first duty station. This timeline allows for new Officers to in process with their first duty station and accomplish all of their in processing, such as pay, set up before arriving at Sheppard AFB, TX as Sheppard AFB does not have the resources to handle all of these tasks for new aircraft maintenance Officers. However, due to differing circumstances, this preferred timeline is not always able to be met for some aircraft maintenance Officers. Some new 21A Officers travel directly to AMOC before arriving at their first duty location. This case is most common in 21A Officers who get assigned overseas to save costs on multiple international airline tickets. Some other new 21A Officers attend AMOC after spending anywhere from two to eight months at their first duty locations. This delay occurs when an AMOC class gets canceled, there is an influx of new 21A Officers, or another scheduling issue creates a training backlog.

Based on the different possibilities in timelines for new 21A Officers to attend AMOC it begs the question of whether or not there is a timeline that produces a potentially more qualified 21A Officer. In other words, which timeline is the most beneficial to a new 21A Officer's development? Is it more beneficial to learn on the job for a few months before attending AMOC? Is it more beneficial to attend AMOC as soon as possible so that a new 21A Officer has the max amount of knowledge at his or her disposal when they encounter real world problems? Is there some other optimal mix that produces the most qualified of new 21A Officer graduating

from AMOC? This situation is similar to the ongoing debate on learning in the classroom versus learning on the job, with the twist that eventually both will occur.

Overall, this research will most directly apply to the Air Force maintenance community. Eventually, however, this research could be useful for another career field. This research could help inform how to produce the most qualified maintenance Officers that graduate from AMOC. This research could also provide insight into how to potentially shorten the time needed for AMOC, which could cut costs and transfers resources from the school house and back out to their respective units promptly. In the current budget and manpower constrained Air Force of today the potential benefits from this research define its relevance and give credit to why this research is necessary.

Research Question

The researcher developed one overall research question to answer the problem presented in this study and accomplish the purpose of this study. The research question for this study is:

- I. How might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development?

Investigative Questions

To answer the research question the researcher developed six investigative questions (IQ). These six investigative questions each apply to specific parts of this research and the research used these investigative questions to develop the surveys for this research. The investigative questions for this research are:

- A. How does AMOC performance differ between 21A Officers who attended AMOC immediately and those who received some on-the-job training (OJT) at their first base before attending AMOC?
- B. How does the post-AMOC performance of 21A Officers at their first duty station from their Commanders' and Operations Officers' perspective relate to when they attended AMOC?
- C. When do new 21A Officers believe they should have attended AMOC to gain the most from their AMOC experience?
- D. When do 21A Commanders and Operations Officers believe new 21A Officers should attend AMOC to produce the most qualified 21A Officer with the least detriment to the unit?
- E. How do 21A Officers feel about shortening the curriculum taught at AMOC if all new 21A Officers were to receive OJT at their first duty station before attending AMOC?
- F. What, if any, curriculum could be replaced at AMOC if OJT became mandatory before attending AMOC?

Theoretical Development

This research uses three theories as a theoretical lens during the development of the surveys. The three theories for this theoretical lens are Human Capital Theory, the 70-20-10 Rule and Social Learning Theory. Human Capital Theory (HCT) relates humans and the money, time and effort put into employees to capital and suggests that the greater the human capital in an organization the larger potential for economic growth for that organization. In other words, HCT attempts to take someone's intelligence, knowledge, skills, and training to relate it to a

quantifiable form of capital similar to cash reserves or taxable firm assets (Becker, 2008).

Human Capital Theory is an extension from Adam Smith's, the 18th-century Scottish political economist, explanation of wage differentials and expounded upon by economists Gary Becker and Jacob Mincer. Smith originally defined human capital as a person's acquired and useful abilities. Then Becker and Mincer expounded upon the idea of human capital by labeling it as a means of production. (Becker, 2008)

It is tough to picture this idea, as the pieces of human capital are all intangible, but in viewing these facets as capital, it helps put emphasis on growing an organization's employees. In his article *Human Capital*, Becker (2008) says that "Education, training, and health are the most important investments in human capital." It stands to reason that training, both formal and on-the-job, are important aspects of any business as they are essential for the growth of employees or human capital. HCT provides the theoretical lens through which to examine the standardization and improvement of the initial skills training timeline for new logistics managers or in the case of the real world example, new 21A Officers.

Additionally, this study will utilize the 70-20-10 Rule developed by the Center for Creative Leadership and Social Learning Theory to add to the theoretical development of this survey study. The 70-20-10 Rule was created by Morgan McCall while working at the Center for Creative Leadership and then furthered elaborated on by Michael Lombardo and Robert Eichinger. (Lombardo & Eichinger, 1996) The 70-20-10 Rule states that to be trained and progress, personnel require three types of experiences. The three types of experiences are 70% challenging assignments or tough jobs, 20% developmental relationships and 10% coursework or reading. By taking the sum of these learning experiences, an employee becomes fully trained. (Center for Creative Leadership, n.d.) Therefore the 70-20-10 Rule provides another theoretical

lens that can be used to examine the standardization and improvement of the initial skills training timeline for new logistics managers as well as new 21A Officers.

Finally, Social Learning Theory was a theoretical lens used in the examination of the standardization and improvement of the initial skills training timeline. Social Learning Theory states that people learn from observation of models. From this idea, Social Learning Theory applies to both formal classroom training, and OJT in that students learn from models. In the case of classroom training, these models would be the teaching tools and lessons put forward by the teacher through past real life examples. (Bandura, 1971) More aptly, in OJT the models would be the trainers or mentors giving the actual hands-on instruction to the new employees. Thus, the Social Learning Theory is the third and final theory that provides a theoretical lens by which this thesis examines the standardization and improvement of the initial skills training timeline for new logistics managers as well as new 21A Officers. Chapter Two of this thesis presents Human Capital Theory, the 70-20-10 Rule and Social Learning Theory in greater detail.

Methodology

This research performs an inductive and mostly qualitative web-based survey study to best determine the optimal amount of OJT before formal classroom training to optimize the development of new logistics managers within organizations. This research is inductive as it takes specific data and details about 21A Officers in the USAF to make broad generalizations about the effects of a period of OJT before formal classroom training on the development of new logistics managers. Additionally, this research is classified as mostly qualitative because the majority of the data collected from the web-based surveys is qualitative based. Some of the research data are quantitative, but they data play a minor role in the analysis for this research.

This section will briefly describe how the data were collected and analyzed for this inductive research.

Data Collection Method

This researcher uses a survey of new 21A maintenance Officers who recently graduated from AMOC for data collection purposes. This study additionally collected data from 21A Commanders and Operations Officers for the subjective matter expert perspective. The CGO survey obtains data from new 21A Officers on many different points. These points include each Officer's rank, background, when they attended AMOC, how they performed at AMOC, their opinion on OJT, when they believe AMOC should be scheduled (immediately or after some predefined period of OJT at their first duty station), and if they would curtail AMOC curriculum based on the potential addition of an OJT period prior to AMOC. The timeline for when the new 21A Officers attended AMOC can be broken into groups of those that attended AMOC prior to their first duty station, those who spent less 1 month at their first assignment prior to AMOC, those who spent 1-3 months at their first assignment prior to AMOC, those who spent 4-6 months at their first assignment prior to AMOC and those who spent more than 6 months at their first assignment prior to AMOC. The survey of each of the Commanders and Operations Officers obtained data on each Officer's rank, background, how company grade Officers have performed for them based on different AMOC timelines, their thoughts on OJT, when AMOC should be scheduled and if they would curtail AMOC curriculum based on the potential addition of an OJT period prior to AMOC.

The survey was sent out to all members of the 21A career field via the Air Force Personnel Center. The survey invitation directed 21A Officers to answer either the Company Grade Officer (CGO) survey if they are a lieutenant or captain still at their first duty station or

the leadership survey if they are an Operations Officer or Commander. From the data collected in this survey, the researcher was able to analyze each Officer's performance at AMOC compared to when each one of the Officers attended AMOC (if they went straight to AMOC or if they had a period of OJT before attending AMOC). The data collected also allowed the researcher to determine a group consensus for the preferred timeline for AMOC in combination with OJT based on analysis from the opinions of subject matter experts and recent AMOC graduates.

Data Analysis Method

To analyze the data collected the researcher used statistical analysis, content analysis, sentiment analysis and descriptive analysis to determine the relationships and a possible correlation between the different variables, performance at AMOC and post-AMOC versus when the new 21A Officer attended AMOC. Statistical analysis can show if the differences are statistically significant or not or if there isn't a difference at all pending on when a new 21A Officer attends AMOC. While it is not usable to show causation as there is a whole host of different applicable factors it can be used to show potential correlation with the data. Specifically, the researcher tested the variance and the significant difference between the means through an analysis of variance (ANOVA) test, and the Least Squares Means Tukey HSD Test. (Hogg & Tanis, 2005) To perform the statistical analysis of the data the researcher plans to use JMP®. This program will allow for an analysis of the data in a way that is easy to use and has outputs that are easy for anyone to understand regardless of his or her familiarity with JMP®. However, statistical analysis was only applicable for the quantitative data collected. For example, the data gathered on when the new 21A Officer attended AMOC compared to how they

performed at AMOC, either through the end of course test or their overall grade at AMOC, was able to be analyzed through statistical analysis methods.

Additionally, to statistical analysis, the research also used content analysis, sentiment analysis, and descriptive analysis. First, content analysis is a method used for qualitative data. It allows the researcher to interpret and quantify separate qualitative data by looking for similar words, phrases or themes between the different data entries. (Krippendorff, 2004) This way the researcher can look at various qualitative, or text based, data entries and compare or analyze them through similar words, phrases or themes they contain to draw conclusions from the whole data set. The content analysis allowed the researcher to take the qualitative data and analyze it to compare and contrast the different data entries.

Next, the researcher utilized sentiment analysis. Sentiment analysis is a method of analysis that looks at qualitative data to determine the author's sentiment or opinion behind the data. (Liu, 2012) For example, the researcher will look to determine if the data entry has a positive, neutral or negative connotation toward the topic. This method of analysis was crucial for this thesis as many of the questions asked were opinion based. Therefore, from the data collected from the opinion based questions, the researcher was able to pull the sentiment behind each of the data entries to gain the common sentiment of the test subjects in the research pool. This common sentiment added analyzed data that can be used to draw conclusions about the topic.

Finally, the researcher used descriptive analysis to analyze the qualitative data obtained during the research. Through descriptive analysis, the researcher was able to summarize the data set collected from the research pool. (Saldana, 2016) From this data through descriptive analysis the researcher was able to analyze the themes of data entries to gain an overall theme supplied by

the data. Additionally, through the use of numerical rating scale questions the researcher was able to apply descriptive analysis to the data. Ultimately, through analyzing similar themes and numerical rating scales, the researcher was again able to transform qualitative data and questions to a quantitative type analysis.

Assumptions

The study required a few assumptions. The first assumption was that each of the recent AMOC graduates had a similar AMOC experience regarding their time physically at AMOC and that something did not differ in their educational experience. Since the data collected were from 21A Officers who all recently attended AMOC, it should aid this last assumption because they should all have had similar teachers and learned under similar curriculum. This study also incorporated the basic assumptions of survey research. The second and third listed assumptions are examples of basic assumptions of survey research. The second assumption was each one of the maintenance Officers that contributed data told the truth and supplied correct and accurate data. For data collected from the Commanders and Operations Officers developed one last assumption. The last assumption was all of the leadership are speaking in a candid, unbiased and truthful manner and that they are not basing their opinions on some personality conflict or subjective preference and instead on that actual performance of Officers previously or currently under their command.

Limitations & Scope

This research experienced a few different limitations. First, it was limited to only being able to contact the 21A Officers through the use of an electronic survey. Since the 21A Officers

are scattered all over the globe, it was not feasible to conduct face to face interviews, and it was only realistic to conduct surveys where some data could be lost based on translation or miscommunication. Second, it was limited to only those new 21A Officers who have recently graduated AMOC. While this last limitation does have benefits and is a designed feature of this research, it also limited the maximum number of responses that could be received. Third, this research did experience general limitations of survey research. For example, both response bias and social desirability influenced this research. Response bias is the tendency of respondents to answer untruthfully. (Creswell, 2014) Social desirability is when respondents answer questions based on what they think the survey or the researcher expects. (Clancy & Phillips, 1972) This research uses the anonymity of the surveys to combat potential response bias and social desirability.

This research limits the focus, or scope, to Maintenance Officers who have recently graduated from AMOC, i.e. roughly in the past four to five years at the most. Data from 21A Commanders and Operations Officers added a leadership and subject matter expert view on the development of new 21A Officers about when they attended AMOC. These dual sample frames allowed this research to obtain data from Officers who have AMOC fresh on their mind and also from Officers who have vast experience in the field.

This research investigated when each 21A Officer attended AMOC, how they performed at AMOC, and when they think 21A Officers should attend AMOC. Then from the Commanders and Operations Officers data were gathered on how company grade Officers have performed for them based on different AMOC timelines and their thoughts on OJT and when AMOC should be scheduled. This data allowed for the scope to be narrowed to a smaller and

more relevant data pool to investigate an optimal timeline for new 21A Officers to attend AMOC.

Implications & Contributions

Ultimately, this survey study adds multiple contributions to the 21A career field and general logistics training programs. The first main contribution is the closure of the previous gap in the literature in regards to a preferred timeline in which to use both OJT and formal classroom training. Additionally, the results of this research inform the 21A career field how to best schedule new 21A Officers to attend AMOC based on the proposed timeline. Third, this timeline could be translated and applied to multiple different career fields in the USAF, other branches of the DoD, or other industries in their training programs for new logistics managers. Finally, this research could lead to a reduction in the costs of AMOC. An example of follow-on research opportunities is to take this research outline and apply it to other USAF career fields such as logistics (21R) or munitions maintenance (21M).

Summary

This chapter provided an introduction and background for this survey study. Additionally, this chapter set up the thesis by providing the problem and purpose statements, the research and investigative questions and the focus along with a brief description of the theoretical lens and methodology. Finally, this chapter wrapped up with the assumptions, scope, limitations and the possible implications and contributions for this study. Chapter Two will continue with a more in-depth look at the literature review behind this thesis.

II. Literature Review

Overview

This chapter provides an in-depth look into the literature surrounding the ideas presented in this thesis. The first two primary literature streams involving formal classroom training and the literature concerning on-the-job training are each presented individually, followed by a look at the third primary literature stream on using a mix of both formal classroom training and on-the-job training. Finally, the chapter will look at the three theories applied to the theoretical lens: 70-20-10 Rule, Human Capital Theory, and Social Learning Theory.

The intent of the literature review was to find, review and assess research that analyzes the benefits and drawbacks of sending an employee to initial skills training immediately before they start work as compared to postponing training for a set period so that the new logistics managers can experience OJT prior to attending either a full or abbreviated version of initial skills training. However, a comprehensive search utilizing Google, Google Scholar, and the Defense Technical Information Center (DTIC) uncovered little literature on this topic. Thus, the researcher had to broaden the literature search to include such topics as OJT; on versus off the job training; employee training programs; continuous education; training versus experience; formal classroom training; 21A training and officer development; and workplace learning. This chapter is the results of that broader search of the available literature.

Literature Search Methods

To perform the literature for this study the researcher literature databases such as Google, Google Scholar, and DTIC to find literature related to this research and the topics listed above. However, the researcher did not perform a random search for literature. Initially, the researcher

utilized DTIC to look for recent theses conducted at the Air Force Institute of Technology or other DoD institutions as these institutions relate most to the real world example used by this research. While searching DTIC, the researcher looked for each topic listed systematically and included only theses directly related to the topics. If a topic had multiple literature pieces, then the researcher only selected the most comprehensive literature.

Next, the researcher transitioned to Google Scholar and performed a systematic search through the topics looking for academic articles directly related to the topic from civilian institutions. Then, the researcher utilized Google and again Google Scholar to look for academic and quality literature from any source related to the topics. As each topic began to gain more related literature, the literature pieces were vetted to determine which pieces were the most applicable and comprehensive. Ultimately, this research narrowed the applicable literature down to three primary literature streams. Those streams are literature that favors formal classroom training, literature that favors on-the-job training and literature that shows a mixture of formal training and OJT. However, the literature favoring a mixture of both methods typically include OJT after formal training, instead of before formal training as investigated during this research.

Primary Literature Streams

Before delving into the primary topic of determining a potential timeline for the conjunction of formal classroom training with some type of previous on-the-job training, this research must review the literature in several related areas, both direct and indirect. Through this review, this research gives a succinct yet complete view of the extant literature surrounding the main components of this study, i.e. OJT and formal classroom training. Therefore, this section will discuss in length the literature concerning the three primary literature streams, literature that

favors formal classroom training; literature that favors on-the-job training, and literature that favors a mixture of formal classroom training and OJT after formal training.

Formal Classroom Training

This research must first present the knowledge and thoughts behind the proponents of formal classroom training over OJT. Historically speaking, formal classroom training is shown to be a common and beneficial method of training. However, during an exhaustive research on the topic of formal classroom training, there appears to be only a small amount of research favoring formal classroom training over OJT as it is the “old school standard” or more antiquated training method.

Although there are sources that do argue for formal classroom training over OJT, Black and Bottenberg (1970) performed a study looked to compare technical school and OJT as methods of skill upgrading in Air Force enlisted personnel. In the study, Black and Bottenberg (1970) analyzed data from four different specialty codes and determined that in three of the four AFSCs a shift toward formal classroom training and away from OJT was favored. However, in the fourth, a change toward OJT was favored. (Black & Bottenberg, 1970) Although the findings are not definitive, the study shows that while there are proponents of formal classroom training over OJT, it would potentially be beneficial to perform both, and at the very least it will be value added to perform additional studies on this topic as this thesis attempts to do.

Next, this study further researched additional effects of formal employee training programs. Bartel (1994) found that organizations who implemented employee training programs when they were struggling saw significant increases in labor productivity in the following years. In an earlier article Bartel (1989) also discussed the positive correlation between formal training

and labor productivity in large businesses. Additionally, businesses who introduce new technology and businesses who promote internally often have higher amounts of formal training. (Bartel, 1989) According to Bartel (1989), the Air Force should have large amounts of formal training, which it does, because it meets all three of those criteria. Therefore, formal training is found to be quite beneficial especially regarding productivity. Molina and Ortega (2003) also determined higher training can have a positive impact on performance through employee satisfaction and customer loyalty, which reinforces the benefits of formal training.

From this section, it is important to note that formal classroom training has been around as a quality method of training for ages. However, as organizations attempt to cut costs, shifting from formal classroom training toward OJT is an easy first solution. This cost cutting techniques are potentially one cause for a significant portion of recent literature favoring OJT over formal classroom training. That said, there is still a good amount of proponents for formal training as formal training can still produce qualified trainees and is easy to standardize within an organization. It is then important to take from this section that clout of formal training may have faded as of late, but it can still be productive and is still a method of training to include in all training plans.

On-the-Job Training (OJT)

After reviewing the literature on formal classroom training, on-the-job training literature also needs to be analyzed and discussed. Proponents of OJT often cite reasons such as the lower cost or ease of implementation for on-the-job training as reasons for their support, as shown in this section. However, OJT has many different advantages and disadvantages. The following

section includes literature about OJT and its potential benefits either over formal classroom training or by itself.

Semb et al. (1993) attempted to outline a model which optimally performs OJT within a Navy unit and then determine how well petty officers currently conduct OJT based on their initial model. For the purpose of this literature review, it is of note that the model itself, and the performance of petty officers in conducting OJT in the Navy merely provide some background on the study. Additionally, this background information is less important than the amount of OJT performed in the Navy, the conclusions of this study, along with its recommendations.

In the Navy, as in all of the Department of Defense (DoD), OJT is a highly prevalent form of training. Of the supervisors surveyed in the study by the Navy Personnel Research and Development Center, 50% of them spent three to ten hours per week performing supervised OJT, 30% spent more than ten hours and only 20% spent two hours or less. (Semb, et al., 1993) Thus, it this literature shows that OJT is of vast importance to the Navy and the DoD.

In this Navy OJT study, the researchers presented three definite conclusions. The second and third conclusion were more applicable to the quality and performance of the OJT in the Navy. However, the first conclusion that the researchers drew is pertinent to this research. The first conclusion formed in the study is:

“OJT is an important component of the Navy training process and is expected to become even more important as the Navy increases the emphasis on shipboard training in the coming years. Apprentice training and "A" school training do not and are not intended to produce personnel capable of independently performing jobs.” (Semb, et al., 1993)

From this conclusion, it is important to note a few key points. First, the researchers in this study were once again able to note the importance of OJT to the DoD. Although, the key piece of the

first conclusion is the part about apprentice training and “A” school training (formal classroom training) not being intended to produce personnel who can perform their job or duties independently. (Semb, et al., 1993) Thus, not only do the researchers show the importance of OJT by itself but they also show how OJT prepares personnel to carry out their functions independently while formal classroom training does not.

Next, Dunham (1972) looked at the cost of OJT so to determine the optimal mix of OJT and formal classroom training. This optimal mix is extremely similar to the intent of this survey study. However, this survey study looked at performance during formal classroom training to determine if any OJT should be applied to trainees before attending formal classroom training while the fact that there will be a mix of both OJT and formal training is assumed. Although, Dunham (1972) only analyzes the cost of OJT compared to formal classroom training for use in future studies as one of five potential factors.

In the study, Dunham (1972) lists the five factors that go into determining the best mix of OJT and formal classroom training as the cost of technical school (formal classroom) training, the cost of OJT, the quality of training methods, the capacity of training methods and personnel assignment systems constraints. Additionally, Dunham (1972) lists the costs of OJT compared to formal classroom training. Dunham (1972) determines that the cost of technical school training, i.e. formal classroom training, was 112% higher than the median total cost of \$1,311 for OJT. With the use of the upper limit cost for OJT, the cost of formal classroom training would still be 82% higher than OJT. (Dunham, 1972) Dunham (1972) determines that most of the differences in costs between OJT and formal classroom training stem from equipment, maintenance, training aids, and administration costs which do not exist in OJT or are at least not easily measurable for OJT.

Thus, Dunham (1972) came to the conclusion that if the Air Force can determine more accurate cost information, along with the other four factors, the Air Force will be able to optimize the mix between OJT and formal classroom training to realize real cost savings while maintaining or potentially improving the quality of trainees produced. Dunham's (1972) study can easily be applied for this literature review and viewed as an advantage for OJT. This study easily shows the benefits of OJT, especially the potential costs benefits.

Wilson et al. (1980) clearly lay out the advantages and disadvantages for OJT. According to this study, OJT is beneficial because it is inexpensive, realistic, and can motivate those who do not thrive in the formal classroom setting. However, the researchers also note that OJT can be harmful because it is often unplanned or unstructured and since it is impossible to maximize both training and production, production often trumps training, thus decreasing the amount of time spent training. Wilson et al. (1980) also present a simple four-step method for conducting OJT.

First, a trainer must prepare by finding out where the trainee is and what they know. Second, a trainer must present the process, lessons or material by going step by step through it and repeating if necessary. Next, the trainer must apply the process by having the trainee perform what they just learned repeatedly while the trainer looks over the shoulder and corrects mistakes. Finally, the trainer allows the trainee to perform independently while periodically checking in to observe his or her progress. (Wilson, Olmstead, & Trexler, 1980) This method provides a clear and concise outline for how to accomplish OJT in a straightforward and efficient form in any organization.

However, this study also showed many disadvantages of OJT. First, the trainee is often treated as a helper or as a worker of low skill. Next, the curriculum taught in the classroom often

poorly translates to OJT. Additionally, production often trumps OJT, and occasionally the trainer lacks knowledge which trickles down and effects the trainee's abilities. Finally, OJT bases completion on a time requirement instead of on a proficiency requirement. (Wilson, Olmstead, & Trexler, 1980)

After discussing the disadvantages, this study finally moves on to the part that pertains the most to this survey study, Military OJT. Wilson et al. (1980) noted that Military OJT is often highly structured which combats many of the previously listed disadvantages often found in the civilian sector's OJT programs. Additionally while, military OJT often employs the most advanced technology, Wilson et al. (1980) note that military OJT is still affected by poor translation from the formal classroom portion to OJT, poor training materials, and failure by trainees to garner experience in all required areas similar to civilian OJT programs.

Ultimately, this study not only outlines some of the advantages and disadvantages but it also gives a brief overview of why the survey study performed by this thesis could potentially be quite beneficial to the military. By conducting a survey study to determine the amount of OJT necessary before attending formal classroom training the disadvantage of formal classroom training not translating to OJT could easily be nullified. Additionally, this study could help tailor both OJT and formal classroom training to help hone the trainee's lesson plans so that he or she can garner experience in all necessary areas.

In an additional study, O'Brien (1989) also showed the advantages of OJT. In this study, O'Brien (1989) looked at job performance and rate of advancement in different members of the United States Coast Guard to compare the different methodologies of OJT and formal training. In his study, he found that in two separate career fields, members who received OJT advanced significantly faster than those who attended formal training. (O'Brien, 1989) However, some of

O'Brien's (1989) data came back inconclusive and thus he recommended that there need to be additional studies performed on the topic area. Therefore, this study shows the importance of OJT but it also indicates that there needs to be more research in the area and that formal training may be just as beneficial. Both of these conclusions support the premise of this thesis.

In one final study, Harris, Willis and Simons (1998) analyzed OJT and the differences between OJT and off the job training, or formal training programs. In this study, Harris, Willis and Simons (1998) determine that OJT has a core competency of squeezing learning out of work, which gives OJT dual benefits, a benefit for the organization, work, and a benefit for the worker, learning. Harris, Willis, and Simons (1998) also noted that each learning environment has a valuable but different contribution which gives credit to the notion that a combination of OJT and formal training may be the best route to take when determining a training program.

Through the multiple sources in this section, the literature shows that OJT can be quite beneficial and has its fair share of proponents. OJT is quite popular in the military, and it is often extremely prevalent in the military because of its low cost and ease of implementation. However, the literature also shows that OJT has its flaws, which suggests that OJT should not be the sole source of training in any organization, especially in the DoD. Therefore, through this portion of the literature, it can be said that OJT is a valuable and beneficial resource for training, but it needs to be used in conjunction with a more formal classroom type of training as well. This point reaffirms that premise of this thesis to determine if the optimal training timeline for new logistics managers should include OJT time for trainees before attending a formal classroom setting for training.

Combining Formal Classroom Training & OJT

Since this research has analyzed both formal classroom training and on-the-job training individually, it is necessary to review the limited literature that combines both types of training and suggests a mix between the two. It is arguable that OJT is always happening in any organization through trial and error, although some organizations will afford employees fewer errors than others. That said, this portion of the literature review takes a look at the utilization of both formal classroom training and OJT in combination in an actual training plan. Thus, it is important to find what research there is that speaks to both, as well as the expert opinions and beliefs on what the optimal mix should be, as this will be extremely applicable to finding the optimal amount of OJT for trainees prior to attending formal training, or more specifically AMOC as the real world example in this survey study.

Bateman (1966) creates a model to determine the best proportion of formal and on-the-job training in military occupations, for which he used ten different Air Force specialty codes to include cook, electrician, and automotive repairmen. With this model, Bateman (1966) showed that it was important for the Air Force to use both formal classroom training and OJT to train personnel. This study does mention the lower costs of OJT. However, it makes the counterpoint that the trainees typically spend more time in OJT than in formal training which makes the costs ultimately balance out. (Bateman, 1966) All this said, this article is important to note in the literature review because it shows that an organization must utilize both formal classroom training and OJT in training personnel in the DoD and that the realization of cost reductions are possible through the addition of OJT into a training plan along with formal classroom training.

Manacapilli et al. (2007) performed a study by sending a survey to airman of the grade E-6 and above in seven different specialty codes, including some in the aircraft maintenance career

field, to determine the effectiveness of formal classroom training and OJT. Through their study, funded by the RAND Corporation, Manacapilli, et al. (2007) present a few conclusions which are directly applicable to this research. This RAND study first commented on the importance of both formal training and OJT. However, the study did note that a reduction in formal training length is possible with little impact on productivity. (Manacapilli, Bailey, Beighley, Bennett, & Bower, 2007) This premise would suggest that if an organization added a period of OJT before formal classroom training, then the formal training could be reduced in length with no productivity losses to realize actual cost reductions or savings. Additionally, this study recommended that the Air Force take a further look at OJT and formal training by performing added studies to determine the proper mix of both. (Manacapilli, Bailey, Beighley, Bennett, & Bower, 2007) This second piece of information shows the need for more research in this topic area, which the survey study in this thesis satisfies. Ultimately, this study, performed by a highly respected research organization, not only shows the need for this survey study but it also indicates that potentially adding OJT prior to formal classroom training will not decrease the productivity of training programs, which was an initial fear in performing this study, and could cut the costs associated with training.

In a different study, Quester and Marcus (1984) surveyed supervisors about the effectiveness of first term enlisted naval personnel who were either schooled in the classroom or trained on the job. From these surveys, Quester and Marcus (1984) attempted to determine which of the two produced the better personnel. However, after they had concluded their study, Quester and Marcus (1984) ultimately determined that more data would be needed if they intended to conclude which of the two methods was more optimal. Therefore, this source does

not determine a preference for which is better, but it does show the need for additional studies which again supports this research.

Misko (2008) found that combining formal, non-formal and informal learning for a workforce while adding incentives and recognition can benefit an organization in many different ways. Ultimately in this study, Misko (2008) was attempting to determine a way to accelerate training programs and not necessarily improve training programs regarding the quality of their output. However, in performing this study Misko (2008) was able to show that combining formal, non-formal and informal types of learning can not only shorten the overall required timeline for training programs, but it can also stimulate a workforce which could result in a more qualified trainee that graduates from the training. While Misko (2008) was looking to find a way to shorten training programs to solve skill shortage problems in different industries this study is relevant and applicable to this survey study as it shows that combining formal training and OJT could realize a multitude of benefits for any organization.

Finally, the real life example data used in this thesis comes from the Aircraft Maintenance Officer Course in the USAF. The data were collected to analyze the current timeline of AMOC and whether or not to include a period of OJT before the formal classroom training, i.e. AMOC. Therefore, the AMOC timeline directly applies to the main topic of this thesis, the timing of formal classroom training in conjunction with OJT. Therefore, it was important to identify past research performed on the timeline of AMOC about OJT and AMOC itself. One final piece of literature Cooper (2015) shows the need for a combination of both formal classroom training and OJT.

Cooper (2015) directly relates to both the combination of OJT and formal training as well as to the use of AMOC as a real world example for this topic. In his thesis, Cooper (2015) used

survey methodology to analyze the current training offered to and required for 21A Officers. Cooper's (2015) thesis findings proved to be quite useful to lay a baseline understanding of this research. However, Cooper's (2015) raw survey responses or data were most beneficial for this thesis effort. Multiple survey responses specifically cited or requested OJT at an operational assignment before AMOC. One specific survey response said, "When possible, I believe it is better to send new 21A Officers to an operational assignment for 3-6 months before AMOC. This timeline gives them experience with organizational structures and processes before they get to the academic/school house version and improves their ability to understand." (Cooper, 2015) This survey response almost sums up the exact purpose of this research with regards to the real world example data for this thesis, as did one or two other responses which make the desired potential data for this thesis look promising. Therefore, utilizing new 21A Officer development and the timing of AMOC will be useful for this thesis on the timing of formal classroom training in conjunction with OJT.

Ultimately, in looking at the previous literature on both formal classroom training and OJT, this section presents a few conclusions. First, there appears to be a significant need for additional studies in this area due to the limited amount of literature on the combination of OJT and formal classroom training, especially the use of OJT before formal classroom training. This fact helps validate the need for this survey study. Second, the literature shows that both formal classroom training and OJT are essential. Third, this literature displays that formal training and OJT can work well in conjunction with each other without taking away from the productivity in training end products, or personnel. Fourth, it presents that using AMOC and 21A training timelines as real world example data fits this topic quite well. Thus, it is quite beneficial to study the optimal mix of OJT before attending formal classroom training to produce more qualified

personnel and potentially cut the costs associated with training programs for any industry but especially in the Air Force and Department of Defense.

Theoretical Lens

The second important section of the literature review is to discuss and analyze the theoretical lens. In other words, the theories that were applied to this research as a part of the literature review to help frame the development of the two surveys. The theoretical lens included three separate theories. The theories include the 70-20-10 Rule, Human Capital Theory and Social Learning Theory. This section presents these three theories and discusses their use for this research.

70-20-10 Rule

The first theory applied to the theoretical lens of this study is known as the 70-20-10 Rule. This rule was developed by Morgan McCall and colleagues while working at the Center for Creative Leadership. Next, two of McCall's colleagues, Michael Lombardo and Robert Eichinger, furthered the theory through their studies in *The Career Architect Development Planner* in 1996. The 70-20-10 Rule says that for training and growth, an employee needs three types of experiences. Those experiences are 70% challenging assignments or tough jobs, 20% developmental relationships and 10% coursework or reading. All those experiences add up to develop an optimally trained employee in any industry. (Lombardo & Eichinger, 1996)

The rule is also referring to the idea that employees learn from different areas, i.e. 70% of learning comes from real life or on-the-job experiences/training, 20% comes from feedback and observing role models, and 10% of learning comes from formal courses. This interpretation

specifically favors OJT over formal classroom training but still includes both. It is important to note that this is an interpretation by Human Resource at Princeton University and that there are quite a few interpretations found in the literature that all slightly differ in their wording. (Office of Human Resources, 2015)

There are many different proponents and opponents of this rule. Obviously, the Center for Creative Leadership is a big proponent of this rule and still have a published article on their website describing the rule and how to use it to be an effective leader. Additionally, Kajewski and Madsen (2013) published an article on the 70-20-10 Rule chronically its history, different interpretations and its benefits of challenges. In this article, Kajewski and Madsen (2013) comment on the notion that the 70-20-10 Rule benefits organizations because it shows that learning comes from all opportunities and not just formal classroom training. It also benefits organizations because it adds additional supervisor involvement with their employees. (Kajewski & Madsen, 2013)

However, many people question the 70-20-10 Rule. Most do not argue the fact the learning does occur outside of the classroom, but they argue the percentages of 70, 20 and 10 listed in the rule. Jefferson and Pollack (2014), published by the Association for Talent Development, is one source that questions the percentages laid out by the rule. Jefferson and Pollack (2014) also question the data behind the 70-20-10 Rule and stress that this rule is “is a conceptual or theoretical model based on retrospective musings by executives about what made them successful and broad summary statements of the findings.” (Jefferson & Pollock, 2014) It is also important to note that the Kajewski and Madsen (2013) article, which shows the benefits of the 70-20-10 Rule also question the origin of the rule along with the supporting empirical data.

Regardless of its opponents, this theory is a useful theoretical lens to utilize for this research. It adds to the literature behind this research and helps support the idea for utilizing OJT in conjunction with formal classroom training within a training program. Therefore, this theory is the first influential theory applied as a theoretical lens.

Human Capital Theory

Human Capital Theory (HCT) is a theory that relates humans to the money, time and effort put into employees and defines it as capital within an organization. (Becker, 2008) Additionally, HCT suggests that the greater the human capital in an organization the larger potential for economic growth for that organization. (Becker, 2008) In other words, it attempts to take an employee's intelligence, knowledge, skills, and training among other attributes to relate them to a quantifiable form of capital, similar to stock or a piece of machinery.

Two important pieces of literature that help add to the background of HCT and discuss the uses and history of HCT. The first is the article by Gary Becker in the Concise Encyclopedia of Economics entitled *Human Capital*. This article is relevant because it thoroughly describes the development of HCT and describes its many applications. The most important point from this article is Becker describes two of the main uses for HCT as education and training. (Becker, 2008) The second source is the book *Lectures in Labor Economics* by Daron Acemoglu and David Autor. This source is much more encompassing and shows multiple different views and interpretations of HCT, including Becker's interpretation. This piece of literature again lists the uses of HCT including education and training. (Acemoglu & Autor, 2011) Therefore, it is easy to apply HCT to this survey study on the different methods of training, one of which is formal education.

Social Learning Theory

Social learning theory is a theory that puts forward the idea that people learn from observation of models. (Bandura, 1971) This theory can loosely be applied to formal classroom training but is much more applicable to OJT as trainees would be learning from models, i.e. trainers, and how they operate on the job instead of through a lesson plan in a class or out of a book.

For Social Learning Theory two main literature sources apply directly to this thesis topic. In the first study, Wilson et al. (1980) state that Social Learning Theory applies to a workforce or industry in two different ways. The first way is that managers can be taught to deal with various human relations issues through Social Learning Theory. The second way is that Social Learning Theory can be used to predict which employees will imitate the behavior of their supervisors. (Wilson, Olmstead, & Trexler, 1980) Based on these two applications it is easy to translate and apply Social Learning Theory to OJT and make a case for the importance of OJT.

The second source for Social Learning Theory comes from the creator of the theory, Albert Bandura and his paper *Social Learning Theory* from Stanford University. Bandura (1971) not only defines Social Learning Theory but he also again translates Social Learning Theory to learning through observation. This learning through observation is essentially on-the-job training. (Bandura, 1971) Thus, Social Learning theory can easily be applied to this survey study to make that case again for the presence of OJT in all training plans.

Summary

Overall, this literature review shows that there is a precedent for research into determining the appropriate timeline for formal classroom training in conjunction with a period OJT before the formal classroom training through the use of new 21A Officers' development and their schedule for AMOC and OJT as a real world example. It also shows that there is merit to both OJT and formal training programs and that both bring value to a training plan in any industry, especially in the DoD. Additionally, a mix of OJT and formal classroom training may be the best option as both deliver valuable but different training based on the differing environments. Finally, it displays that many previous studies requested additional research in the area of training, OJT, and formal training which again justifies the need for this survey study. Thus, based on this literature review it is appropriate to move forward with this research and to begin a survey study to better analyze an appropriate timeline for formal classroom training in conjunction with a period of OJT before the formal training.

In conclusion, the history of training programs seems to have begun with a key focus on formal classroom training programs. As organizations and industries began to shift toward cutting costs, training preferences were shifted away from a formal classroom style of training and toward OJT centric training programs. There have been some studies promoting the benefits of using both formal training and OJT in unison, but they appear to be few and far between. Therefore it was determined that there seems to be a gap in the employee training research area on how and when to use both formal classroom training and OJT in combination with each other to maximize the output, i.e. garner the best new employees possible, regardless of the industry.

This chapter provided an in-depth look at the literature review as it pertained to this survey study, from looking individually at the literature on formal classroom training and then on

OJT to literature on using both formal training and OJT. Additionally, this chapter delved into the 70-20-10 Rule, human capital theory and social learning theory to apply them as a background for this research. This chapter ultimately showed the history of literature on this subject and the apparent gap in the literature on the appropriate timeline for using OJT and formal training in conjunction with each other that this survey study hopes to fill. Chapter three will outline the methodology behind this study and the design, testing, and implementation of the surveys for data collection.

III. Methodology

Overview

This chapter outlines the research design and the steps taken to gain survey approval from the Air Force Institute of Technology and United States Air Force. The population and the instrument development, to include survey design steps and the final survey questions, are also discussed in this chapter. Finally, this chapter presents the validity and reliability of the research, data collection and the data analysis methods.

Research Design

As stated in chapter one, it is important to note that all the data obtained for this study applies to Aircraft Maintenance Officer Course, or AMOC, as the initial formal skills training for new 21A Officers in the United States Air Force. Therefore, to determine the best timeline and combination of OJT and formal training for new 21A Officers the researcher needed to find historical data on how past 21A Officers performed based on when they attended AMOC in their career. Additionally, the researcher needed to obtain qualitative data from subject matter experts in the 21A community on what the best combination is for OJT and formal training to produce the most qualified new 21A Officers. During initial research, the researcher discovered that the staff at AMOC does not keep a history of how 21A Officers performed at AMOC along with when they attended AMOC in the career. The Air Force Personnel Center (AFPC) also did not keep records of these type of data for 21A Officers.

As such, there was a need to collect primary data to conduct this research. A survey not only allowed for the new 21A Officer information to be determined but also for collection of subject matter expert opinions at the same time. Also, the researcher chose surveys as the data

collection method (vs. interviews) due to the large population size of 21A Officers and a survey allowed for a larger sample frame and sample size. Thus, the researcher decided to perform two different surveys, one for the new 21A Officers, a Company Grade Officer (CGO) Survey, and one similar type survey for the subject matter experts, i.e. the Leadership Survey. Next, the researcher determined, due to the geographical separation of the sample frames of each survey, web-based surveys was the best approach to obtain the required data. Web-based surveys allowed the researcher to reach a large sample frame in a realistic period. However, the researcher most likely lost some data due to translation errors or misinterpretation of questions. Additionally, the researcher expected survey response rate to be lower as the survey invitations were sent out to the respondents work emails, which can be ignored, disregarded or deleted. Although, the benefit of the size of the sample frame that the surveys could reach in a short period easily trumped these two negatives.

The researcher also considered using interviews to collect the required data, but surveys outweighed interviews because surveys can obtain a significant amount of data and the questions needed to collect the desired data on AMOC performance and timeline did not require the level of detail garnered through interviews. However, the researcher did keep interviews as a backup method to the surveys due to the length of the approval process for surveys within the USAF. Thus, the researcher needed to design, gain approval for and disseminate two web-based surveys to send out to the proposed sample frame.

Additionally, this research used web-based surveys as an inductive and mostly qualitative method of research. This research was inductive as this research collected specific data to make general conclusions about training programs within an organization. This research was mostly qualitative as the majority of data gathered from the web-based surveys are qualitative in nature;

however, a small portion of the data are quantitative. Therefore, this research was performed and processed as an inductive and qualitative study.

Institutional and Air Force Approval

The research sponsor for this study was the Air Combat Command Director of Logistics (ACC/A4). This research officially received the sponsorship on 06 October 2016 (Appendix A). The AFIT Exempt Determination Official granted approval for exemption from human experimentation requirements (32 CFR 219, DoDD 3216.2 and AFI 40-402) on 08 August 2016 (Appendix B). Finally, the Air Force Survey Office granted approval to disseminate the surveys to the chosen sample frames on 23 November 2016 (Appendix C).

Population

The intent of this research was to survey all second and first lieutenants who are still at their first duty location and who have graduated from AMOC for the CGO Survey while interviewing all the Commanders and Operations Officers of those lieutenants for the Leadership Survey. However, in analyzing the best way to disseminate the surveys to the sample frames, the researcher determined the originally desired method was not possible. Therefore, the researcher ultimately determined that the surveys would be sent out to the entire 21A career field and the recipients could then choose which survey to fill out based on their current rank and duty title. This change relaxed the limits for each survey's sample frame and scope as the CGO Survey now included Lieutenants through Captains and the Leadership Survey included Captains and above. Thus, the researcher disseminated the survey invitation for both surveys via an automated email from AFPC to 1,247 aircraft maintenance Officers of all ranks, and each survey invitation

recipient was able to choose one of the two surveys based on which survey better fit their credentials.

Instrument Development

This section of the chapter will discuss and describe the construction of the surveys in this research. It will start with the design of each survey along with the framing of the specific survey questions used answer each of the investigative questions as well as the research question. Next, this section presents the final survey questions for each of the two surveys. Appendix D shows the final questions on the CGO Survey and Appendix E shows the final questions on the Leadership Survey. Additionally, Appendix F shows the final CGO Survey as viewed by respondents in Survey Monkey® and Appendix G shows the final Leadership Survey as viewed by respondents in Survey Monkey®.

Survey Design – CGO

The first survey targets Second Lieutenants through Captains who have recently graduated from AMOC, in the past four to five years at the most. This research refers to this first survey as the CGO Survey. To answer the research question defined in chapter one, the CGO Survey was also responsible for collecting data to answer investigative questions A, C, E, and F. Those investigative questions are again listed below along with the research question.

- I. How might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development?

- A. How does AMOC performance differ between 21A Officers who attended AMOC immediately and those who received some on-the-job training (OJT) at their first base before attending AMOC?
- C. When do new 21A Officers believe they should have attended AMOC to gain the most from their AMOC experience?
- E. How do 21A Officers feel about shortening the curriculum taught at AMOC if all new 21A Officers were to receive OJT at their first duty station before attending AMOC?
- F. What, if any, curriculum could be replaced at AMOC if OJT became mandatory before attending AMOC?

Therefore, once these required investigative questions had been established for the CGO Survey to answer, survey questions could then be drawn up to answer each of the investigative questions. The development of the original survey for CGOs included 23 different questions ranging from background questions to subjective questions about the AMOC timeline itself. Appendix H presents this initial CGO Survey. From there the researcher developed the survey through multiple pre-tests discussed later in this chapter to ensure validity and accessibility of the survey. However, it is important to look at each required investigative question for this chapter and dive into how the survey answered the investigative questions through multiple survey questions.

The first required investigative question that the CGO Survey attempted to answer was: How does AMOC performance differ between 21A Officers who attended AMOC immediately and those who received some on-the-job training (OJT) at their first base before attending AMOC? To best answer this question, the researcher determined it was necessary to ask each of the new 21A Officers when they attended AMOC and to ask how they performed at AMOC

through their final course average and their cumulative end of course, or 21-101, test score. By comparing the respondent's grades from these two points to when they attended AMOC, it would be possible to determine on average which group of new 21A Officers performed best when consolidated by when they attended AMOC. This grouping along with whether or not they graduated as the distinguished graduate from their class could show which AMOC timeline provided the best AMOC performance on average.

The second question that the CGO Survey needed to answer was: When do new 21A Officers believe they should have attended AMOC to gain the most from their AMOC experience? This question can be answered through a question at the end of the survey asking new 21A Officers when they felt it was best to send new 21A Officers to AMOC based on their experiences and through a write-in response question justifying their timeline choice. The comments from the write-in question helped give the group consensus on when is best to attend AMOC based on the experiences of new 21A Officers who had recently graduated AMOC. This type of question would need to be analyzed through content analysis, sentiment analysis, and descriptive analysis but should yield when new 21A Officers feel it is best to attend AMOC along with justification for why. These three analysis methods, which make up the qualitative analysis method known as coding, will be further discussed in the Data Analysis Methods section of this chapter.

The third question that the CGO Survey had to answer was: How do 21A Officers feel about shortening the curriculum taught at AMOC if all new 21A Officers were to receive OJT at their first duty station before attending AMOC. While the fourth question was: What, if any, curriculum could be replaced at AMOC if OJT became mandatory before attending AMOC? Like the second question, the third and fourth questions would also need to be answered through

a subjective write in type question toward the end of the survey. These data would again allow for the experience of recent AMOC graduates to mold the group consensus on how new 21A Officers who have recently graduated AMOC feel about curtailing and possibly removing portions of the AMOC curriculum. Additionally, like the second question, these data would require analysis through content analysis, sentiment analysis, and descriptive analysis.

By answering these four investigative questions, the CGO Survey would significantly contribute to answering the research question of how might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development? Therefore, the CGO Survey started to take shape. Next in combination with the AMOC timeline questions, AMOC performance question and subjective questions already defined, the research added in informational questions and demographic questions about the Officer and their AMOC class to help build a background for each responding Officer. These additional questions also added more variables that the data could be compared against and used for distribution.

Final Survey Questions – CGO

After the question development was complete, the CGO Survey ended up with original 22 questions as previously discussed. Then, the CGO Survey was refined and improved through multiple iterations of a pre-test. These improvements led to the final survey of 31 questions for each CGO to answer. Appendix D shows the final questions on the CGO Survey. This final survey was then loaded into Survey Monkey® to be prepared and tested for the web-based survey distribution, the final CGO Survey product as viewed in Survey Monkey® by the respondents is displayed in Appendix F.

Survey Design – Leadership

After completion of the CGO Survey, the Leadership Survey required completion to garner the experience and opinions of the subject matter experts from the 21A community, or in other words, the Commanders and Operations Officers who hold a much larger amount of expertise in the career field than the CGOs. Similarly to the CGO Survey, the Leadership Survey was also responsible for a set of the investigative questions to support and answer the research question to determine the optimal timeline for AMOC and on-the-job training. The Leadership Survey was responsible for investigative questions B, D, E and F. Those investigative questions are again listed below:

- I. How might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development?
- B. How does the post-AMOC performance of 21A Officers at their first duty station from their Commanders' and Operations Officers' perspective relate to when they attended AMOC?
- D. When do 21A Commanders and Operations Officers believe new 21A Officers should attend AMOC to produce the most qualified 21A Officer with the least detriment to the unit?
- E. How do 21A Officers feel about shortening the curriculum taught at AMOC if all new 21A Officers were to receive OJT at their first duty station before attending AMOC?
- F. What, if any, curriculum could be replaced at AMOC if OJT became mandatory before attending AMOC?

The first applicable investigative question is: How does the post-AMOC performance of 21A Officers at their first duty station from their Commanders' and Operations Officers'

perspective relate to when they attended AMOC? Answering this question required a few different types of questions on the Leadership Survey. The first type of question included a numerical rating scale for ranking the Officers who had served under the survey respondents based on when they attended AMOC. These rankings would give an average score of whether new 21A Officers who attended AMOC immediately or those who had OJT before AMOC performed better at their duty stations post-AMOC. In addition to this type of question, the survey posed many subjective write-in response questions on this subject to determine which new 21A Officer performed better based on their timeline for AMOC. These write in questions would require content analysis, sentiment analysis, and descriptive analysis to determine the group consensus for answering this particular investigative question.

The second, third and fourth investigative questions answered by the Leadership Survey required two different formats of survey questions. The first format, like earlier questions, used subjective write in type questions, which were then analyzed by content analysis, sentiment analysis, and descriptive analysis to determine the group average to answer the investigative question. The second format was to ask a multiple-choice question that gave the respondents two answers and then had them explain why they chose this answer. This second format thus garnered an easy way to see group consensus through the multiple-choice answer as well as the justification answers with analysis through the use of content analysis, sentiment analysis, and descriptive analysis. The researcher used both of these methods to answer the final three investigative questions required for the Leadership Survey.

In addition to answering these four investigative questions, the Leadership Survey also needed to include background information on each Commander or Operations Officer respondent. This background information helped paint the picture on the Officer answering the

survey. This info also gave the researcher more data points for comparison. All the necessary questions ultimately added up to 16 different questions on the preliminary Leadership Survey. Appendix I shows this preliminary Leadership Survey.

Final Survey Questions – Leadership

Through multiple iterations of pre-tests and revisions, the researcher improved and expanded the first Leadership Survey from 16 questions to 20 questions. Each of these questions was then put together into the final Leadership Survey, loaded into Survey Monkey® and prepped for the web-based survey dissemination. Once loaded onto Survey Monkey®, the survey was again tested for functionality and further prepared for dissemination to the sample frame. Appendix G shows this final Leadership Survey product as viewed in Survey Monkey® by the respondents and Appendix E shows the final questions on the Leadership Survey.

Validity and Reliability

Two key facets within qualitative studies are the concepts of validity and reliability. Qualitative validity occurs when the researcher checks the accuracy of the findings and qualitative reliability occurs through a consistent approach throughout the research project(s). (Creswell, 2014) Additionally, the researcher needed to ensure the internal and external validity of this research. Internal validity helped the researcher determine if experimental manipulation is actually what resulted in the significant difference during the research, i.e. if there is a possibility of more than one independent variable affecting the results. (Kerlinger & Lee, 2000) External validity is defined as how well the data and results from this research apply to other

settings or as the results' representativeness or generalizability, i.e. how translatable the results are from this research to other settings. (Kerlinger & Lee, 2000)

The researcher utilized the extensive literature review and as well as the survey development to help ensure external validity. Also, the researcher ensured the qualitative reliability of this survey through consistent approach used with both sample frames. There were no changes to the survey during the time in which the survey was open to the respondents. This consistency helped ensure qualitative reliability as did the fact that both surveys had the same questions when possible. Additionally, the same invitation was sent to both sample frames adding to the qualitative reliability.

To ensure the internal validity and the accessibility of the surveys, the researcher performed multiple iterations of a pre-test. The researcher performed the first pre-test when creating the initial version of the survey and before it transitioned to a web-based format. For this first pre-test, the researcher surveyed six active duty Air Force Officers stationed at the Air Force Institute of Technology (AFIT). These six Officers included four AFIT students who are 21M Officers with 21A and AMOC experience, one AFIT student who is a 21A Officer, and one AFIT instructor who is a core 21A Officer. This pre-test was used to validate the initial questions and determine if the baseline for each survey was appropriate for the desired subject. As the pre-test participants are all experienced maintenance officers and fully understand the intent of this study, their feedback during the pre-test helped validate that the initial questions were appropriate for the spirit of the survey. None of the answers given during this pre-test were recorded or kept.

The second pre-test included the same six Officers stationed at AFIT and was used to check the internal accessibility of surveys when the surveys were initially loaded into the web-

based survey site while again ensuring the internal validity of this study. The researcher used Survey Monkey® for both web-based surveys in this study. The six Officers checked to make sure each survey functioned adequately and again that each question not only functioned but that they benefited the surveys as well. Once again, none of the answers given during this pre-test were recorded or kept.

A third and final pre-test was conducted just before the surveys' dissemination to the sample frames. This pre-test again included the first six Officers from the first two pre-tests and now also included 11 more Air Force Officers to answer the CGO Survey and four more Air Force Officers to answer the Leadership Survey. The Officers were chosen based on their backgrounds, rank and current duty titles. The new Officers who responded to the CGO Survey had all been to AMOC in the past five years and were asked to check the accessibility of the CGO Survey on the active duty Air Force network, to test the functionality of the CGO Survey in Survey Monkey® and to validate the questions on the CGO Survey. The four Officers chosen for the Leadership Survey are all either current 21A Commanders or had been 21A Commanders within the past two years. These four Officers were used to check the accessibility of the Leadership Survey on the active duty Air Force network, to test the functionality of the Leadership Survey and to validate the questions on the Leadership Survey. Since all Officers who responded to the surveys during this pre-test had no changes or feedback on either survey and since both surveys remain unaltered between this pre-test and the dissemination of surveys to the sample frame, the researcher kept all the answers given by the Officers on each survey as a part of the data pool. The researcher also kept these data as all Officers were given the same instructions as the survey sample frames and were instructed to answer the surveys as actual respondents if they did not have feedback on the surveys.

Data Collection

The researcher utilized web-based surveys to achieve the highest possible number of survey responses, which in turn generated more data for analysis. The surveys were created on and administered through the use of Survey Monkey® and were password protected by the primary researcher. Additionally, each survey was anonymous so that the surveys could not be linked back to any of the respondents. The survey was sent out through the AFPC automated email system to every member of the 21A community between the ranks of Second Lieutenant and Lieutenant Colonel, which added up to 1,247 Air Force Officers. Both surveys were open for the sample frame to respond from 19 December 2016 until 19 January 2017, when the researcher close the two surveys.

The initial email was sent to the sample frame on 19 December 2016 with an identical follow-up, or reminder, email sent back to the same sample frame on 9 January 2017. The intent of the reminder email was to increase the survey response rate, especially as AFPC sent the initial email around the winter holidays which is a historically popular time for members of the sample frames to take leave from work. Through Survey Monkey® the surveys only allowed each IP address to respond to each survey once which kept members of the sample frame from answering the survey a second time after receipt of the reminder email. The reminder email was the same exact email as the initial email to help ensure qualitative reliability. Appendix J shows the email invitation sent to both sample frames.

The survey response rate was 26.78% (334 combined responses), which assumes that the total sample frame was 1,247 Officers as previously discussed. Nulty (2008) defines the average online survey response rate 33% based on the data he collected. Nulty (2008) also quoted other

studies as stating the average online response rate to be 32.6%. Therefore, the response rate achieved in this study is acceptable based on this study and based on other logistics industry surveys, especially considering the short period that the surveys were open to the sample frame. (Nulty, 2008)

Once the researcher close the surveys, the researcher easily extracted all of the data from Survey Monkey® in multiple different formats. Initially, the researcher extracted the data in a single Excel® document that listed out each answer to each question sorted by the survey. Additionally, the data for each question individually were extracted to make grouping easier. Finally, the researcher extracted graphical depictions of the trends for each question and a summary all of the data for each survey. The multiple formats of raw data made multiple forms of analysis for the data possible during this study.

Data Analysis Methods

This research collected both quantitative and qualitative data and thus required two different methods for data analysis. First, for the limited amount of quantitative data, this research applied basic statistical analysis to the data. The researcher utilized an analysis of variance (ANOVA) test as well as a Tukey-Kramer HSD test to analyze this limited amount of quantitative data. (Hogg & Tanis, 2005) The researcher ran the ANOVA and Tukey tests via JMP® software.

The majority of the data for this research is qualitative data. Thus, this data required coding for analysis. Coding of the qualitative data from this research included content, sentiment and descriptive analysis. Content analysis searches for and sorts the qualitative data by similar phrases and themes. (Krippendorff, 2004) Sentiment analysis searches for and sorts the

qualitative data by the opinion of the data on the topic for each question. (Liu, 2012) Finally, descriptive analysis attempts to summarize each of the write in responses to group it with other responses. (Saldana, 2016) This coding allowed the researcher to analyze the vast amount of qualitative data pulled from both surveys developed for this research.

Summary

This chapter showed the research design in constructing and designing the surveys utilized as well as the approval for the surveys from both AFIT and the USAF. Additionally, this chapter discussed the population, instrument development, the validity and reliability of the research, data collection, and data analysis methods. Chapter four will continue with an in-depth look at how the data were analyzed as well as the data analysis results.

IV. Results and Analysis

Overview

The researcher for this study surveyed the 21A career field to gain real-world example data aimed at determining what amount of OJT before formal classroom training has the best effect on employee development. This chapter presents the results and analysis of the data that were gathered from the surveys to answer the research question along with the six investigative questions. This chapter also displays the demographics of the sample from each survey, a wave analysis for each survey, and additional findings developed from the surveys.

Participant Demographics

This survey study sent invitations for both surveys to 1,247 active duty 21A Officers in the United States Air Force. Both surveys had a combined total of 334 completed responses, 118 from the CGO Survey and 216 from the Leadership Survey. Thus, this research achieved a response rate of 26.78% which is comparable to the average response rate listed by Nulty (2008) of 33% and other survey response rates within the logistics industry. The following sections present the demographics from each of the surveys. This demographic data were used to garner a better understanding of the sample that responded to each survey. Additionally, this data helped the researcher understand and analyze the data from each survey.

CGO Survey Demographics

The CGO Survey had 118 completed responses. However two of the survey responses were discarded as the survey respondents either did not answer the questions or gave fake and inappropriate answers. Of these 116 responses, all were Company Grade Officers, but the

majority, or 55.17%, of respondents, were First Lieutenants. While Second Lieutenants accounted for 27.59% and 17.24% of respondents were Captains. Next, the top two duty titles for CGOs were Flight Commander or Flight OIC at 33.62% and Assistant AMU OIC at 25.86%. On average, the respondents had been in the Air Force 2-3 years, with 1-2 years and 4+ years as the top answers at 29.31% of the completed responses. Of the 116 respondents, 109 identified as core 21A Officers, while four did not respond to the question about their Air Force Specialty Code (AFSC), two respondents identified as Acquisitions (63A) officers, and three identified themselves as Munitions Maintenance (21M) officers. Table 1 displays the data about the participants' ranks, duty titles and time in service for the CGO survey.

Table 1: CGO Survey Participant Ranks, Duty Titles and Time in Service

Rank	Count (%)	Duty Title	Count (%)	Time in Service	Count (%)
2nd Lieutenant	32 (27.59%)	Flight Commander or Flight OIC	39 (33.62%)	Less than 6 months	2 (1.72%)
1st Lieutenant	64 (55.17%)	Assistant AMU OIC	30 (25.86%)	6 months-1 year	2 (1.72%)
Captain	20 (17.24%)	AMU OIC	19 (16.38%)	1-2 years	34 (29.31%)
		Squadron/Group/Wing Executive	16 (13.79%)	2-3 years	24 (20.69%)
		Student	4 (3.45%)	3-4 years	20 (17.24%)
		ALEET/LCBP Officer	2 (1.72%)	4+ years	34 (29.31%)
		Instructor	2 (1.72%)		
		Program Manager	1 (0.86%)		
		Depot Maintenance Officer	1 (0.86%)		
		Exchange Officer	1 (0.86%)		
		DV Coordinator	1 (0.86%)		

Of the 116 completed responses, 16 identified as officers are prior enlisted officers. Of the 16 who are prior enlisted, 13 listed their enlisted AFSC as an aircraft maintenance AFSC. The three other prior enlisted officers identified their enlisted AFSCs as a Tactical Air Control Party (TACP) Airman, a Network Integration Airman and a Satellite, Wideband and Telemetry Systems Airman. Ten of the prior enlisted officers spent more than ten years as enlisted service

members while the rest spent less than ten years. The prior enlisted officers all reached a rank between Senior Airman and a Senior Noncommissioned Officer. However, eight of the prior enlisted officers attained the rank of Technical Sergeant. Additionally, of the 116 completed responses, 56.90% obtained their commission through Reserve Officers' Training Corps (ROTC), while 27.59% commissioned from the United States Air Force Academy (USAFA) and the remaining 15.52% commissioned from Officer Training School (OTS). Table 2 displays the overall results for the prior enlisted and commissioning source data from the survey.

Table 2: Participant Prior Enlisted and Commissioning Source Data

Prior Enlisted?	Count (%)	Prior AFSC	Count	Commissioning Source	Count (%)
Yes	16 (13.79%)	2A3X	4	ROTC	66 (56.90%)
No	100 (86.21%)	2A6X	2	USAFA	32 (27.59%)
		2A5X	2	OTS	18 (15.52%)
		2W1	1		
		2A4X	1		
		2A1X	1		
		2A8X	1		
		2A2X	1		
		1C4X	1		
		3C2X	1		
		2E1X	1		

The demographic data from the CGO survey validate that all the completed responses came from Company Grade Officers who have all recently graduated from AMOC. Additionally, all of the completed responses came from officers who are at their first or second duty station and who all currently have duty titles that fit the young aircraft maintenance Officer demographic. This demographic data shows that the sample who completed the CGO survey were all 21A Officers who were early in their career and had graduated from AMOC recently

enough that it was fresh in their mind. This type of sample fit the desired demographic perfectly that the CGO survey was intended to reach.

Leadership Survey Demographics

The Leadership Survey had 216 completed responses. Of those 216 responses, 37.50% were Captains, 26.85% were Majors, 35.19% were Lieutenant Colonels and 0.46% (one response) were Colonels. Squadron Commanders completed 26.85% of the Leadership Survey responses, and Maintenance Operations Officers completed 31.48% of responses. The remaining 41.67% of the completed surveys listed their duty title as other. These other responses included duty titles like Deputy Group Commander, Branch Chief, Director of Operations and Executive or Staff Officer, among others. Of the completed responses, 53.24% listed that they had been in the Air Force for 15 or more years while every member had been in the Air Force for more than four years. Additionally, 214 of the 216 responses identified as core aircraft maintenance (21A) Officers, while one person did not answer this question and one identified as a Logistics Commander. Finally, 62.33% of completed survey responses stated that they had spent time outside of aircraft maintenance during their career. The time spent outside of aircraft maintenance included duties such as program manager, analyst, staff officers, logistics, acquisitions, instructors and joint officers among others. Table 3 presents the overall demographic data for the 216 completed Leadership survey responses.

Table 3: Leadership Survey Demographic Data

Rank	Count (%)	Duty Title	Count (%)	Time in Service	Count (%)
Captain	81 (37.5%)	Squadron Commander	58 (26.85%)	Less than 4 years	0
Major	58 (26.9)	Maintenance Operations Officer	68 (31.48%)	4-7 years	32 (14.8%)
Lt Colonel	76 (35.2%)	Other	90 (41.67%)	7-10 years	29 (13.4%)
Colonel	1 (0.5%)			10-15 years	40 (18.5%)
				15+ years	115 (53.2%)

The demographic data gathered from the Leadership Survey validate that the sample surveyed represented 21A Officers who were at the very least Captains in the USAF. Additionally, the sample for the Leadership Survey only contained 21A Officers who were on their third or later duty assignment. Finally, the sample surveyed are all currently serving or had previously served as a Commander or Operations Officer who is currently leading or has led other 21A Officers. The desired demographic for this survey includes 21A Officers who are considered subject matter experts in the 21A career field, officers who are leading other 21A Officers, and officers who have a significant amount of experience in the career field. Thus, the demographic data from the Leadership Survey confirm that the sample surveyed fits the desired demographic.

Nonresponse Bias and Wave Analysis

Rogelberg and Stanton (2007) define nonresponse bias as the bias or effect developed when the opinions of the nonrespondents differ greatly from the opinions of the respondents. In other words, it is when the survey responses do not have a true mix of responses based on the population because the majority of nonrespondents feel different than those who responded to the survey. Rogelberg and Stanton (2007) outline nine different techniques to test the validity of studies and determine the impact of nonresponse bias within those studies. One of the nine

techniques that they present is Wave Analysis. (Rogelberg & Stanton, 2007) Wave analysis is defined as comparing responses submitted after a deadline or specified date to those who submitted their responses before that date to determine if the two groups of responses differ from each other. (Rogelberg & Stanton, 2007) If they do, then there is most likely some level of bias that exists. If the waves do not differ from each other, the survey data do not suggest a level of bias; however, “given that late nonrespondents are not “pure” nonrespondents in that they obviously did complete the survey, being similar to respondents does not conclusively indicate an absence of bias.” (Rogelberg & Stanton, 2007) In other words, this is to check that the majority of surveys that come after a reminder are not negatively written based on the type of respondent that was motivated to respond after a second survey invitation.

This analysis fits this study perfectly as the distribution of the initial invitation to the sample frame in late December 2016 preceded a reminder email sent out in early January 2017. Therefore, the researcher compared the survey responses completed before the reminder email to the surveys responses completed after the reminder email. By comparing these two waves of responses, the researcher was able to determine if any form of bias was present in the data for this study. All questions from both surveys, including the demographic data and the coding analysis of the qualitative questions, were compared to see if either wave differed from each other.

In the CGO Survey, both waves followed a similar trend regarding the answers per week starting high then quickly dropping off toward the end of the wave. Additionally, both waves contained the same or similar ratios of ranks, duty titles, prior enlisted officers and commissioning sources. Next, both waves consisted of similar responses on each of the subjective questions on the CGO survey. Since there were not any questions that presented

differing trends between the two waves of collected responses the researcher determined that the CGO Survey did not suggest any level of bias however the absence of bias cannot be conclusively confirmed.

In the Leadership Survey, both waves displayed a similar trend for answers per week just as the CGO Survey did, starting high and then quickly dropping off as the wave continued. Both waves also presented similar demographic data responses and similar trends for the subjective questions on the Leadership Survey. As both waves from the Leadership Survey consisted of similar trends and responses, the researcher determined that the Leadership survey did not suggest any level of bias, but once again the absence of bias cannot be conclusively confirmed. Ultimately, since both the CGO Survey and the Leadership Survey did not suggest any levels of bias, both surveys and their results will be considered valid for nonresponse bias and its potential impact.

Research Question (RQ) and Investigative Question (IQ) Analysis

The research question answered by the researcher in this study is how might the timing of initial career field skills training (AMOC) affect new aircraft maintenance (21A) Officer development? To answer this research question, the researcher developed six investigative questions. By answering these six investigative questions, the researcher was able to answer this primary research question. This section presents the results and analysis of each of these investigative questions and then wraps up each of the six investigative questions to answer the research question.

IQ A Analysis

The first investigative question developed to help answer the research question was how does AMOC performance differ between 21A Officers who attended AMOC immediately and those who received some on-the-job training (OJT) at their first base before attending AMOC? The researcher pulled the data required to answer this investigative question solely from the CGO survey. The data necessary for this investigative question included if the CGO respondent attended AMOC prior to their first duty station or not, how much OJT they received if they went to their first duty station prior to AMOC, the respondent's final course average at AMOC, and the respondent's end of course (AFI 21-101) test score. These data allowed for the grouping of respondents into five different groups based on when they attended AMOC. Those groups included those who attended AMOC immediately, those who attended AMOC within the first month of arriving at their first duty station, after spending one to three months at their first duty station, after four to six months at their first duty station, and after more than six months at their first duty station.

Next, the researcher needed to ensure that each respondent entered their score in the correct format. The researcher performed cleaning of the data entered in the incorrect format. The most common issue that required cleaning of the data was when respondents included the percentage sign ("%") after their score. In this case, the percentage sign was just deleted which left the score the same but changed the format of the data point. However, some completed surveys gave score ranges or approximations for the two questions concerning their AMOC grade or their end of course test grade. In these cases, the scores had to be cleaned to give one number. When cleaning these scores, the researcher performed this consistently and without bias to ensure the validity of the data.

If the score was an approximation centered around one number, then that number was recorded as that respondents answer, i.e. “around 85” or “approx. 85%” would have been changed to a score of 85. If the completed survey gave a range then the score was changed to be the average or the middle number of that range, i.e. if the survey response was “90-95” then the researcher changed the response to a score of 92.5. Finally if a survey response listed that they scored greater than a given number then the score was recorded as the average of that figure and five-plus this figure, i.e. if the survey response was “above 90” then the response was changed to 92.5 or if the response was “>95” then the researcher modified the response to 97.5. While this did slightly alter the data, it made it possible to analyze all of the data. Additionally, as this change was done consistently across the board, it did not skew or alter the overall trends of the data. Finally, while there were necessary alterations, it was only required on 19 of the potential 232 (116 viable responses x2) data points, which equated to 8.19% of the data.

After formatting the data correctly, the researcher was able to perform statistical analysis on the data. For this analysis, this study compared the five groups of AMOC timelines to both the overall AMOC course scores as well as the end of course test scores. A standard Analysis of Variance test, or ANOVA, was performed along with a Tukey-Kramer Honest Significant Difference (HSD) test using JMP® software.

When comparing the AMOC timelines to the overall AMOC course grades, the ANOVA test had a P-Value of 0.0012. This P-Value means the results of the analysis were statistically significant. The Tukey-Kramer HSD test grouped the five different AMOC timelines into two statistically significant groups based on their mean AMOC Scores. The first group, group A, included less than one month, one to three months, four to six months and six plus months while the second and lower group, group B, included only those who attended AMOC immediately.

This analysis showed that those respondents who attended immediately, i.e. before arriving at their first duty location, had a statistically significant lower average score than all of the respondents who had any amount of OJT before attending AMOC. Table 4 and Figure 1 show the different groups that resulted from the Tukey test.

Table 4: Tukey Test Results

<i>Connecting Letters Report</i>			
Level			Mean
More than 6 months	A		95.390909
Less than 1 month	A		95.386957
4 to 6 months	A		95.138462
1 to 3 months	A		93.575000
Immediately		B	88.700000

*Levels not connected by same letter are significant different.

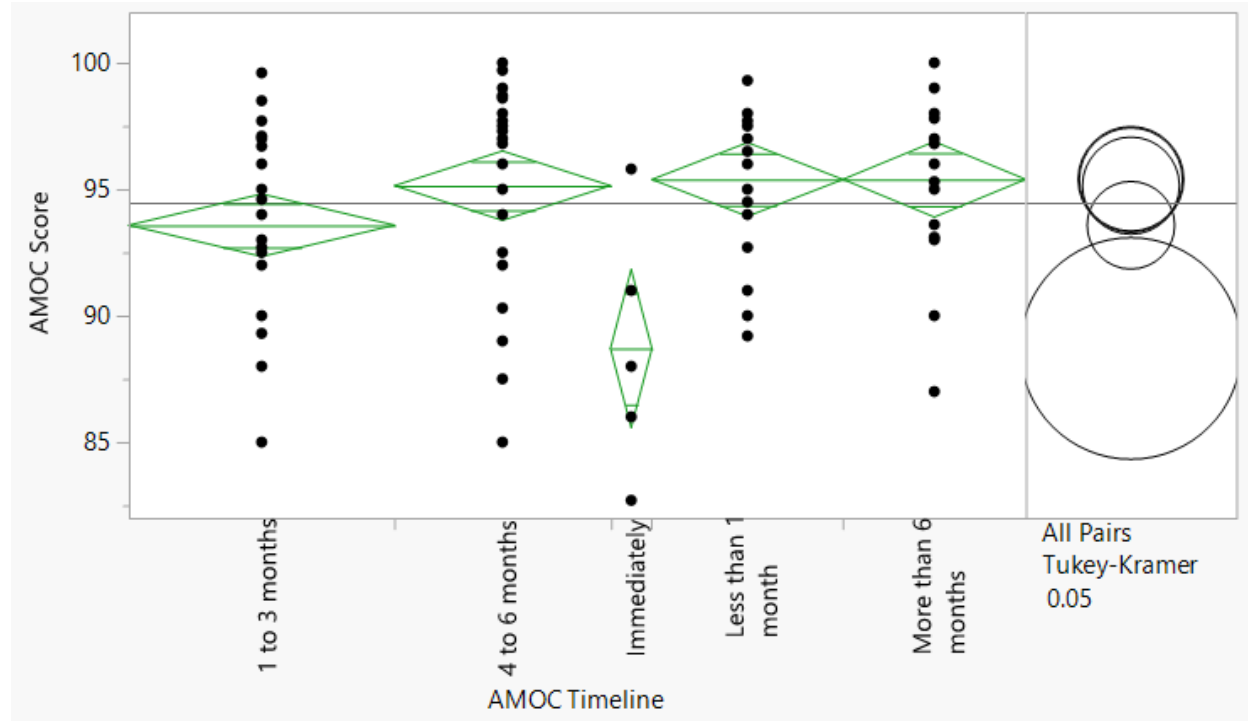


Figure 1: Tukey Test Results

When comparing the AMOC timelines to the end of course test grades, the ANOVA test had a P-Value of 0.0079 meaning the results of the JMP® analysis are statistically significant. When performed, the Tukey test grouped the timelines into two different groups based on the average of each group's end of course test scores. Group A included less than one month, one to three months, four to six months and more than six months. Group B included those who attended AMOC immediately, one to three months and four to six months. This conclusion means that one to three months and four to six months were on the border of the higher and the lower group. These results proved less conclusive but still showed that those respondents who attended AMOC immediately without any OJT time scored lower on average on the end of course test.

These results did show the importance and impact of OJT with respect to AMOC performance. However, there is a significant issue with the data. In assessing the five AMOC timeline group sizes, one to three months was the largest with 33 respondents. Four to six months had 24 respondents and both less than one month and more than six months had 22 respondents. However, the group of officers who attended AMOC immediately before their first duty station without receiving any amount of OJT contained just five respondents. According to Hogg and Tanis (2005) as well as the esteemed Dr. Tony White of the Air Force Institute of Technology, the standard rule of thumb in statistics for appropriate sample sizes when analyzing different groups states that anything higher than 25 to 30 data points is an appropriate sample size. (Hogg & Tanis, 2005)

Thus, four of the five AMOC timeline groups would either be good or close enough that they are passable according to this rule of thumb. However, with the Immediately group only having five respondents it clearly does not meet this rule. This fact is important to note because

this group was the focus of this investigative question. Due to the small sample sizes within the different groups of AMOC timelines, these conclusions found through statistical analysis are not conclusive. Since the quantitative conclusions were inconclusive, the researcher moved on to the qualitative data to answer IQ A.

The qualitative data from both surveys lined up with the quantitative data, but these data were much more conclusive. Both surveys asked the respondents about the benefits of OJT. In response to this question, 73.33% of CGO respondents and 74.61% of Leadership respondents stated that OJT added a frame of reference for new 21A Officers to use while at AMOC. This OJT before AMOC allowed new 21A Officers to relate what they were learning in class to actual real world experiences and it improved the discussion and learning that was performed at AMOC as each new 21A brought more real world knowledge to the course.

One response stated, "I went into AMOC having seen some of the topics discussed so I was not lost or confused as much during class." Another survey response stated, "The classmates with least experience had the greatest difficulty in class, and probably did not glean as much understanding." While yet another survey response stated, "If I didn't have several months of training before AMOC I would have been lost like several of my classmates."

All of these example survey responses show that OJT before AMOC was extremely beneficial to new 21A Officer performance at AMOC. With the added frame of reference gained through OJT, the new 21A Officers were able to immediately dive-in to the topics and add more to the discussion of each topic instead of having to play catch-up for the first few months at AMOC. This OJT before AMOC allowed those new 21A Officers to retain more of the AMOC curriculum and allowed them to graduate from AMOC as more qualified maintenance Officers who required less remedial training once they arrived back at their first duty location. Thus,

while the quantitative results for IQ A were inconclusive, the qualitative results showed that 21A Officers who received OJT before AMOC had a better educational experience and a higher level of performance at AMOC.

IQ B Analysis

The next investigative question posed to help answer the research question for this study was how does the post-AMOC performance of 21A Officers at their first duty station from their Commanders' and Operations Officers' perspective relate to when they attended AMOC? The researcher answered this investigative question through data from multiple different questions on the Leadership Survey. The first relevant data set used to answer this investigative question was derived from the question which rated new 21A Officers who received OJT before AMOC against those who did not receive OJT through the utilization of a numerical rating scale. The respondents rated the overall performance of Officers they are leading or had led, where the max of 10 represented those received OJT before AMOC as the top performers every time and -10 represented those who went to AMOC first as the top performers every time. For example, if a respondent felt that 60% of the time Officers who received OJT before AMOC were the top performers then that respondent would respond with a score of "6" on the numerical rating scale. Figure 2 displays the numerical rating scale used for the Leadership Survey. The results of this survey question showed that 21A Leadership felt that new officers who received OJT before AMOC performed better on average as the mean score of the data was 2.28 and the median score was 4.

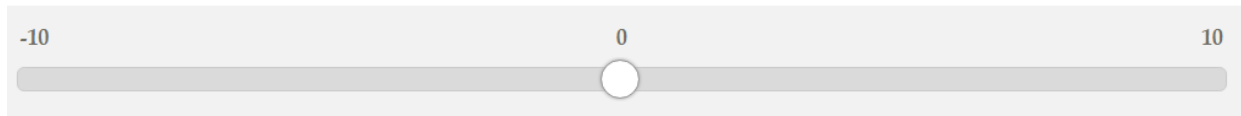


Figure 2: Leadership Survey Numerical Rating Scale

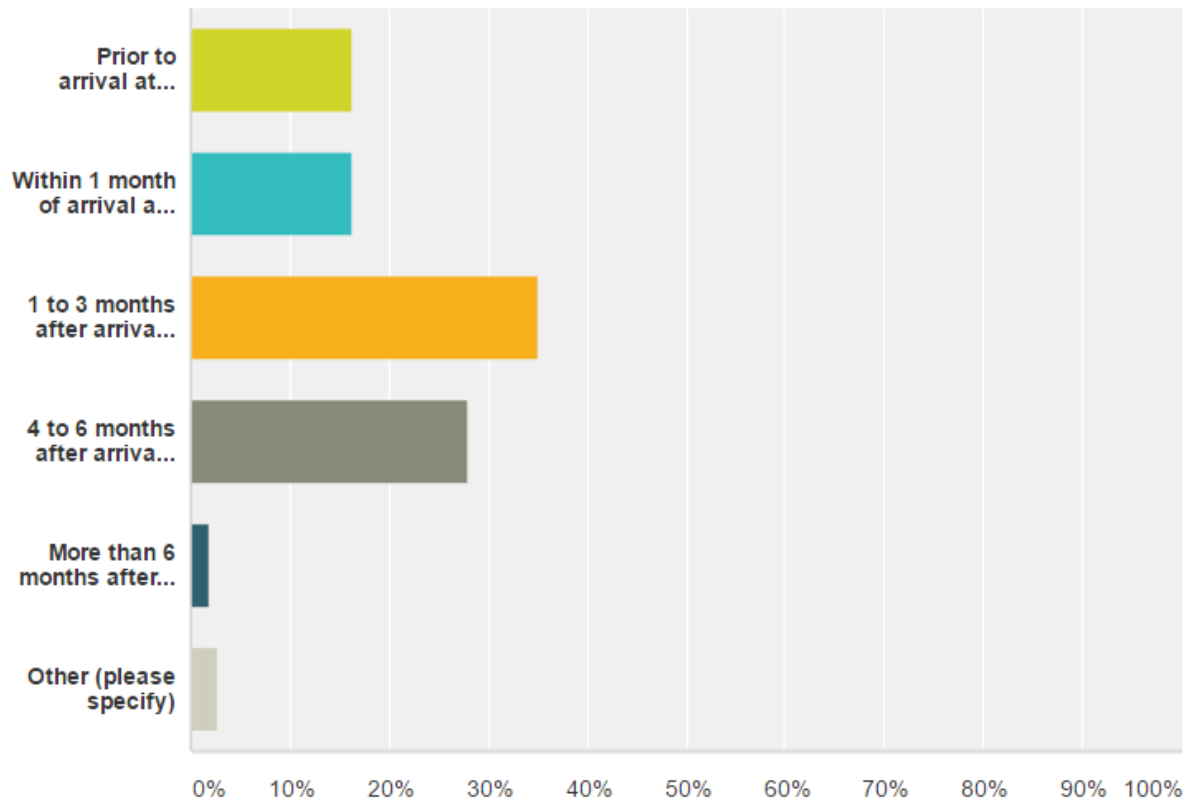
Next, the respondents were asked to comment on the performance differences between the Officers who experienced the two different training paths. After coding, the researcher discovered multiple themes within the comments. First, 45.79% specifically stated that attending OJT before AMOC produced a higher quality of officer. Additionally, 36.84% of respondents said that officers who attended AMOC immediately had lower knowledge retention after AMOC and required a greater amount of baseline learning or remedial training after AMOC. Common throughout the comments promoting OJT before AMOC included phrases such as “OJT prior to attending AMOC usually are better able to grasp basic aircraft maintenance fundamentals and apply what they learn”. Another common phrase from the survey data is “Officers with some OJT first seem to get more out of AMOC, as they can apply some context to the course material.” These comments supported the fact that Officers who receive OJT before AMOC retain more from AMOC and come back from AMOC as more qualified aircraft maintenance Officers. Although, 20.53% did say that the results of training are dependent on the individual trainee.

These two survey questions specifically related to Officer performance post-AMOC based on the AMOC (training) timeline that the Officer followed. Based on the Officers they are leading or had led, 21A Leadership felt that the new 21A Officers who have received OJT before AMOC have a higher post-AMOC performance on average. Additionally, among their comments, Leadership Officers often mentioned the idea of OJT promoting knowledge retention

during AMOC. Leadership Officers also felt that OJT allows new 21A Officers to enhance their experience at AMOC and it opens more learning opportunities during AMOC. Thus, these results showed that Commanders and Operations Officers felt that on average 21A Officers who receive OJT before AMOC perform their duties after AMOC to a higher level than those who attend AMOC immediately.

IQ C Analysis

The third investigative question for this study was when do new 21A Officers believe they should have attended AMOC to gain the most from their AMOC experience? The answer to this investigative question came from the subjective questions on the preferred AMOC Timeline from the CGO Survey. The survey asked all CGO respondents to choose the time they felt was best to send new 21A Officers to AMOC and then to justify their choice. 111 of the CGO respondents completed this question. The results of the survey question showed that 35.14% of respondents felt that between one to three months after arriving at the first duty station was the best time to send new 21A Officers to AMOC. The researcher also found that 27.93% felt that four to six months was appropriate, 1.8% felt that after more than six months was best while both before the first duty station and within the first month of arriving at the first duty each received 16.22% of the votes. Additionally, 2.7% (3 responses) responded with other, two stating that it should depend on whether the duty station location of the new 21A Officer was overseas, and the third stating that it should depend on if the new 21A Officer is a prior enlisted Officer. Figure 3 shows the data results from this question on the CGO Survey.



Answer Choices	Responses
▼ Prior to arrival at first duty location (1)	16.22% 18
▼ Within 1 month of arrival at first duty location (2)	16.22% 18
▼ 1 to 3 months after arrival at first duty location (3)	35.14% 39
▼ 4 to 6 months after arrival at first duty location (4)	27.93% 31
▼ More than 6 months after arrival at first duty location (5)	1.80% 2
▼ Other (please specify) (6) Responses	2.70% 3
Total	111

Figure 3: CGO Survey Preferred AMOC Timeline

These results show that the majority (63.07%) felt that somewhere between one to six months of OJT before AMOC would be most beneficial. From here, the comments become necessary to see the justifications for these timeline choices. In the comments, multiple common

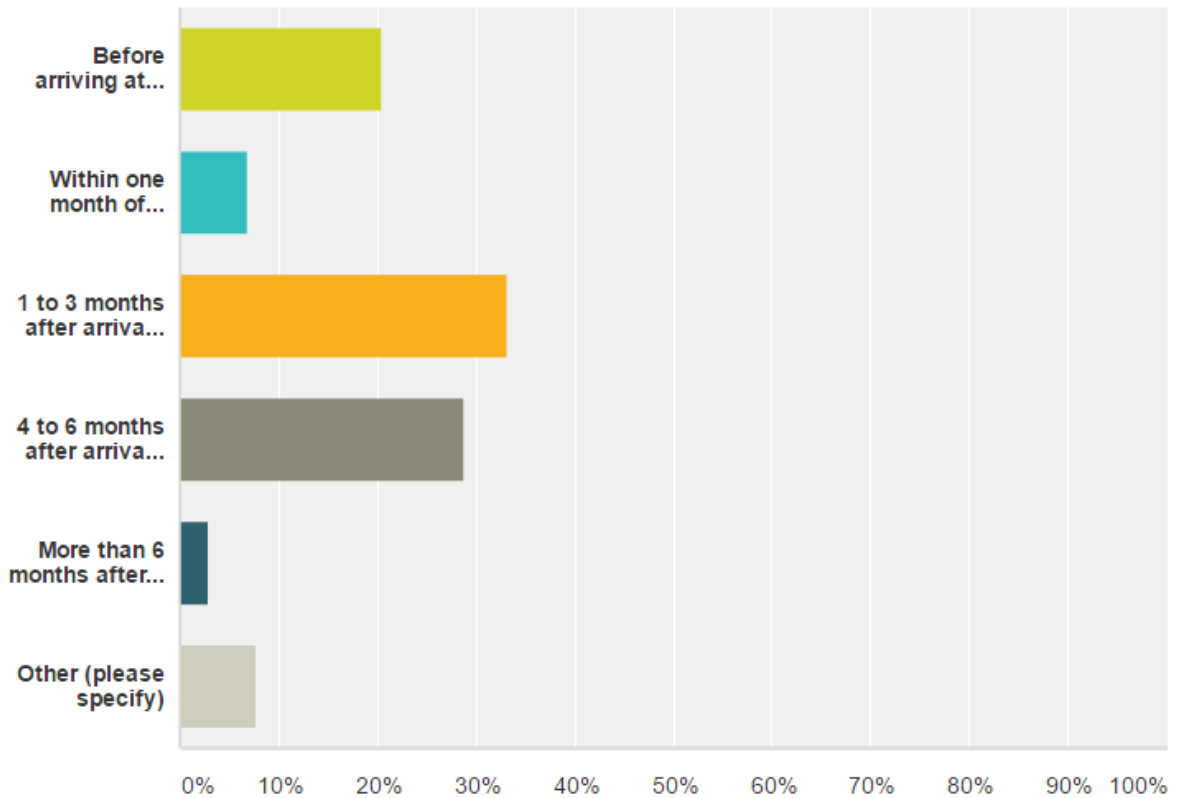
themes appear during coding (content, sentiment and descriptive analysis). The first and most prominent theme is that 73.33% of responses felt that OJT was necessary for new 21A Officers because it allowed them to learn the basics and gain a frame of reference for AMOC, as previously discussed. This theme was common throughout both surveys, but ultimately the respondents felt that learning the basics before AMOC during OJT and gaining a frame of reference for AMOC allowed the new 21A Officers to retain more knowledge gained at AMOC and ultimately graduate from AMOC as more qualified aircraft maintenance Officers.

Additionally, 9.52% of responses commented that while OJT is important, it is key to not keep an Officer at their first base performing OJT for too long before AMOC. An extended period of OJT before AMOC can lead to bad habits or the new 21A Officer could become stagnate in their training, i.e. “training stagnation”. Therefore, new 21A Officers feel it would be best for them to attend AMOC after a period of OJT to gain the most from their AMOC experience but not too long of an OJT period to avoid training stagnation. Based on the survey results and analysis this OJT period should be roughly one to three months minimum but no more than six months to benefit the new 21A Officer while avoiding training stagnation.

IQ D Analysis

The fourth investigative question was when do 21A Commanders and Operations Officers believe new 21A Officers should attend AMOC to produce the most qualified 21A Officer with the least detriment to the unit? The Leadership Survey solely provided the data to answer this investigative question. Thus, it was important to look at the data from the questions specifically asking the Commanders and Operations Officers their preferred training timeline for AMOC and potential OJT as well as their comments on the justification for their answer.

Of the Commanders and Operations Officers surveyed, 33.17% felt that one to three months was the appropriate period for OJT before AMOC while 28.78% felt that four to six months would be the best period for OJT before AMOC. Although, 20.49% felt that new 21A Officers should attend AMOC before their first duty station and 6.83% felt they should attend within the first month. Finally, 2.93% felt that new 21A Officers should spend more than six months learning through OJT before AMOC. The additional 7.8% (16 respondents) marked their response as other. Seven of those 16 felt that between three and four months would be appropriate and marked other because that option was not available. The additional nine officers marked other due to the difference of new officers stationed overseas, new officers being prior enlisted, or because they wanted to state a different OJT period that was not a potential option. Figure 4 shows the results from this survey question.



Answer Choices	Responses
Before arriving at first duty station (1)	20.49% 42
Within one month of arriving at first duty station (2)	6.83% 14
1 to 3 months after arrival at first duty station (3)	33.17% 68
4 to 6 months after arrival at first duty station (4)	28.78% 59
More than 6 months after arrival at first duty station (5)	2.93% 6
Other (please specify) (6)	7.80% 16
Total	205

Figure 4: Leadership Survey Preferred AMOC Timeline

After coding the justification comments for their choices, the researcher found three distinct themes among the Commanders' and Operations Officers' answers. First and foremost, 74.61% of leadership Officers felt that new 21A Officers develop a frame of reference or context for AMOC while learning the basics of aircraft maintenance during OJT before AMOC. This

frame of reference idea was similar to the CGO survey comments and a common theme throughout all comments on both surveys. Leadership Officers felt that this added frame of reference or context helps the new 21A Officers retain more from AMOC, increase the value to the discussion at AMOC and bring more relevant questions to AMOC. The leadership Officers also felt that those who learned the basics and gained context before AMOC came back as more qualified and prepared aircraft maintenance Officers. Additionally, one key point that was noted multiple times throughout the comments was that a young maintenance Officer's main job is to learn about aircraft maintenance. Thus, the Commanders and Operations Officers felt to best accomplish this job and set up that new Officer for a successful career the new 21A Officer should spend the most time possible learning. A key aspect of this learning process according to aircraft maintenance leadership is OJT before AMOC. Additionally, only 15.03% specifically commented that formal classroom training (AMOC) should be before hands-on training (OJT) and 5.70% felt that learning is individually dependent.

Based on the data gathered from these two survey questions it is clear that the subject matter experts and most experienced 21A Officers, i.e. the Commanders and Operations Officers, feel that new 21A Officers should attend AMOC somewhere in the one to three month range after arriving at their first duty station. If this one to three-month range is not achievable, then the four to six-month range would be the second-best option. The leadership survey respondents overwhelmingly felt that an added on-the-job training period before AMOC would produce a more qualified aircraft maintenance Officer and would add a frame of reference for the new 21A Officers to add to the retention of AMOC curriculum post-AMOC.

IQ E Analysis

The fifth investigative question for this thesis was how do 21A Officers feel about shortening the curriculum taught at AMOC if all new 21A Officers were to receive OJT at their first duty station before attending AMOC? This investigative question required data from both surveys to determine the best answer. Both surveys had a question specifically asking the respondents if they felt that the curtailment of the AMOC course length is necessary with the addition of a period of OJT before AMOC. The researcher determined that 63.96% of CGO Survey respondents were against the curtailment of AMOC, and 81.28% of Leadership Survey respondents were against the curtailment of AMOC.

When asked to justify their choices both the CGO and Leadership Survey presented similar themes once the researcher performed coding. Of the CGO respondents, 42.45% felt the length was adequate for the required curriculum while 10.38% felt the length should stay the same but with a different curriculum and 4.72% felt the length should be longer with added curriculum. Additionally, 13.21% of the CGO respondents specifically noted that it would be difficult to shorten the length of AMOC as OJT before AMOC is tough to standardize from base to base and unit to unit. From the Leadership Survey, 72.49% of Commanders and Operations Officers felt that the current length of AMOC was adequate and 28.04% felt that shortening the length would be ill advised due to OJT not being standardized across the USAF.

Based on the results from both surveys the researcher determined that both samples feel that there should not be a curtailment of the length of AMOC even with the addition of a period of OJT before AMOC. The justification comments presented similar reasons and themes for not curtailing AMOC including OJT not being standardized across the USAF and the large amounts

of curriculum at AMOC. Therefore, even with the addition of a period of OJT, regardless of length, the survey results promote the current course duration of AMOC.

IQ F Analysis

The sixth and final investigative question posed to answer the research question for this study was what, if any, curriculum could be replaced at AMOC if OJT became mandatory before attending AMOC? To answer this question, the analysis required data from both surveys. Even though the respondents of both surveys were overwhelmingly against the curtailment of the length of AMOC, it is still important to look at the thoughts on the curriculum offered at AMOC.

In a separate question, both surveys asked the respondents which sections of AMOC to replace with a period of OJT before AMOC. More than 80% of CGO respondents felt a certain section of AMOC curriculum should be curtailed or eliminated with the addition of OJT and roughly 12% of leadership listed a specific section of the curriculum as well. However, the researcher did not find a consensus among respondents on both surveys on which specific section to eliminate.

After coding the justifications for which portions of the curriculum to cut, a few different themes appeared in both surveys. The researcher found that 32.18% of CGO respondents argued for the dismissal of the basic portions of AMOC with the addition of OJT, and 13.79% specifically mentioned changing or replacing other portions of the curriculum taught at AMOC. Similarly, 15.09% of Leadership Survey respondents were for the removal of the basic portions of AMOC with the addition of an OJT period before AMOC and 9.43% specifically commented on changing or replacing some portions of AMOC.

While the respondents overwhelmingly felt that the current length of AMOC was adequate, the respondents' views, or perceptions, differed on the applicability of the current curriculum taught at AMOC with the addition of a period of OJT before AMOC. The majority of CGO respondents, who most recently went through AMOC, chose certain sections that they felt would best be changed or removed. However, there was a lack of consensus on which section to cut. Instead, the results suggested that AMOC should reevaluate the curriculum with the addition of a period of on-the-job training before AMOC. Thus, while the majority of respondents were against the curtailment of AMOC, and many felt it should be lengthened instead of shortened, a significant portion of respondents felt that the current curriculum taught of AMOC requires reevaluation.

RQ Analysis

The researcher answered the research question through the answers to the six investigative questions posed through this thesis. Overwhelmingly throughout both surveys, the majority of respondents felt that OJT was extremely beneficial to both the new 21A Officer and the unit. From the surveys, 90.27% of CGOs and 90.64% of Commanders and Operations Officers felt that OJT helps a new 21A Officer before AMOC. From the coding performed on the comments from this question on both surveys, 54.13% of CGOs and 74.33% of leaders felt that OJT adds a frame of reference or context of the new officer at AMOC while 33.94% of CGOs specifically listed that OJT helps the new officers learn the basics of aircraft maintenance prior to and while at AMOC.

When looking at the impact on the unit, 49.11% of CGOs felt new 21A Officers were beneficial to the unit during OJT while 50.89% felt they were not, but in their comments 54.63%

did specifically state that while they may not be helpful to the unit, the new 21A Officers are learning which is the main part of their job at that point in their career. However, 71.90% of leaders felt that new officers were beneficial to the unit during OJT which adds weight to the comments listed by the CGOs. Similarly, 70.30% of Leadership Survey respondents specifically cited the learning the basics and adding a frame of reference was helpful for the unit in the long term and helpful to the new officer in the short term. Additionally, 41.58% of leaders felt that the new officers were beneficial to a unit during OJT as they were learning and bringing a different perspective to the unit. Finally, 15.35% of leaders did comment that while they answered that new officers are not beneficial during OJT, they are learning which is what they are supposed to be doing.

Therefore, based on the above analysis from the survey data as well as the answers to the six investigative questions the researcher derived the answer to the research question. While the quantitative data for the first investigative question was inconclusive due to a small sample size, the qualitative data from the first investigative question and the five remaining investigative questions proved to be key to answering the research question through the use of coding. Ultimately, if there is an addition of a predefined period of on-the-job training before attending initial career field skills training (AMOC) for new aircraft maintenance (21A) Officers, those new Officers would see an improvement in their development as 21A Officers. Based on the survey results the Officers would be better prepared and more qualified once they graduate AMOC, and they would achieve a higher level of retention of the AMOC curriculum. Therefore, adding a period of OJT before AMOC for new 21A Officers would improve their 21A Officer development in the short term and long term. Finally, both surveys showed that the optimal

timeline for this added period of OJT before AMOC is a minimum of one to three months but no more than four to six months.

Additional Findings – CGO Survey

The CGO Survey also presented a few additional findings from the data. First, the CGO Survey asked the respondents if they were prior enlisted, as previously discussed during the participant demographics section. Since the data were available, the researcher analyzed the data to see if there was a statistical difference between the scores of prior enlisted and non-prior enlisted officers. During the ANOVA test evaluating the overall AMOC course grade of prior enlisted officers against those who were not, the average for the prior enlisted group was higher, however with a P-Value of 0.3531 the results were not statistically significant. Additionally, since the prior enlisted group only had a sample size of 16 respondents, it did not pass the rule of thumb for sample sizes to be statistically viable. (Hogg & Tanis, 2005) However, the researcher did notice that outside of three outliers within the group of prior enlisted officers they did all score on the higher end of the scale.

The next additional finding derived came from coding the comments the CGO respondents gave to the final question asking for additional comments. Within the additional comments, multiple respondents mentioned that they had been discussing this topic for a while showing that this is a relevant topic to the 21A career field. Additionally, 7.35% of respondents again specified the need for AMOC to be lengthened to add specifics about certain tracks of aircraft maintenance. This conclusion reiterates the need for reevaluating the curriculum at AMOC.

One final additional finding from the CGO Survey concerned the performance of the distinguished graduates (DG) from AMOC. The CGO Survey asked each of the respondents if they graduated as the DG from AMOC. 16 of the respondents marked that they did graduate as the DG of their class. Of those 16 respondents, six attended AMOC within the one month of being at their first duty station, one attended AMOC after one to three months of OJT, six attended AMOC after four to six months of OJT and three attended AMOC after more than six months of OJT. This sample size was too small to make any certain inferences. However, it is noteworthy that all of the DGs had at least some amount of OJT before AMOC and 10 of the 16 DGs had a significant portion of OJT, i.e. more than one month. Finally, it is of note that both surveys suggested that the prime time to attend AMOC was somewhere between one to three months and four to six months after arriving at the new 21A Officer's first duty station. Seven of the 16 DGs attended AMOC under those two timelines.

Summary

In conclusion, both the CGO and the Leadership Survey results supported the addition of an OJT period before AMOC to promote aircraft maintenance Officer development. Both surveys often referenced the fact that OJT adds a frame of reference and context for the new 21A Officers while they attend AMOC. This added frame of reference and context allows them to apply what they are learning in the classroom to real life examples which aid in the learning process. Additionally, the added context allows the new 21A Officers to bring real world questions to the subject matter experts at AMOC, and it stimulates discussion within the classrooms at AMOC benefitting the entire AMOC class.

While the surveys do not support the curtailment of AMOC with the addition of an OJT period before AMOC, they do both indicate that there should be a reevaluation of the current curriculum of AMOC. Therefore, to ultimately answer the research question, adding a predefined period of OJT before attending AMOC will positively affect new 21A Officer development. Both young 21A Officers who have recently graduated AMOC and the experienced leadership within the aircraft maintenance community recommended this addition. These AMOC specific surveys, data, and conclusions easily apply to a general OJT and formal classroom training focus. Chapter 5 will discuss this generalized focus.

V. Conclusions and Recommendations

Overview

This chapter presents the conclusions found during this study as well as the recommendations derived from the findings of this thesis. Additionally, the limitations experienced during this study are listed and explained. Finally, this chapter presents potential future research opportunities following this study.

Conclusions

The purpose of this survey study was to explore the best time to schedule new logistics managers to attend formal classroom training, whether that be immediately upon entering the organization or after a period of on-the-job-training. To best accomplish this purpose the researcher applied the real world example of aircraft maintenance Officers attending Aircraft Maintenance Officers Course (AMOC). The researcher collected data on AMOC performance of recent graduates, recent graduate and leadership opinions on the proper timing of AMOC, and the value of OJT through the use of two web-based surveys. This data was then analyzed to determine what effect a period of OJT before AMOC had on 21A Officer development to apply those conclusions to a general logistics training program scope.

From the surveys, the researcher reached a few different conclusions specifically relating to the development of 21A Officers in the United States Air Force. First, the researcher found that on average 21A Officers who attended AMOC after a period of OJT scored higher at AMOC than those who went straight to AMOC. While the researcher could not conclusively prove this finding through quantitative data due to a small sample size, the research could prove this conclusion through the qualitative data from both surveys. Next, the researcher concluded that

21A Leadership feels that the post-AMOC performance of 21A Officers who attended AMOC without any OJT is lower on average than those who received OJT before attending AMOC. The researcher also concluded that both recent AMOC graduates as well as experienced 21A leadership feel that the optimal time for new 21A Officers to attend AMOC is roughly one to three months at a minimum after arriving at their first duty station but no longer than four to six months to avoid training stagnation. Both samples felt that this added OJT period before AMOC gives the new Officers context or a frame of reference for aircraft maintenance which adds to the educational experience at AMOC and increases the Officers' retention of AMOC curriculum.

Finally, both samples overwhelmingly felt that there should not be a curtailment of AMOC curriculum. However, the samples, especially the CGO respondents, felt there is a need for a reevaluation of the AMOC curriculum. These findings ultimately led to the conclusion that the addition of an OJT period for roughly one to three months, but no more than four to six months, before AMOC attendance would greatly benefit the development of new 21A Officers in the USAF. While these conclusions are specific to the 21A community within the USAF, they are also applicable to a general logistics training focus regarding OJT and formal classroom training for the overall purpose of this study. This premise will be discussed in the recommendations section of this chapter.

Discussion

It is important to compare the conclusions of this research back to the key literature concepts and the theories within the theoretical lens. First, in looking at key literature concepts, these results get the best of both worlds by taking the advantages of both methods for training. This research recommends added OJT before formal training which allows organizations to reap

the dual benefits of OJT, but it still includes the beneficial and easy-to-standardize formal classroom training. Therefore, this added OJT before formal training could result in a more qualified output from formal training.

The results of this research can also easily be viewed through the stated theoretical lens. The results are in line with and applicable to the 70-20-10 Rule in that they show the importance of OJT by adding more OJT before AMOC, but they still include that important formal training piece. In review, 70-20-10 Rule states that employee growth comes from 70% challenging jobs, 20% relationships and 10% coursework or formal training. Therefore, these results are applicable to the 70-20-10 Rule in that they support the addition of more OJT and show the importance of OJT, but they still include the formal training piece. The combination of these two pieces helps ensure the optimal growth strategy for new logistics managers, and for new 21A Officers.

Next, the results line up with Human Capital Theory in that putting more into the human capital, i.e. more training for 21A Officer before AMOC, will ultimately be beneficial to the organization, i.e. the USAF and the 21A community. HCT relates the attributes of human employees to capital within an organization which is directly applicable to education and training in that the more money an organization puts into education and training the better off it is for that company's bottom line. Therefore, the results of this research apply to this theory as the results show that added training, i.e. OJT before AMOC, is beneficial for the 21A community and to the USAF. Ultimately, this added OJT before AMOC can be beneficial to the USAF's bottom line as it produces more qualified 21A Officers.

Finally, these results echo the importance and benefits of OJT which is outlined by Social Learning Theory. Social Learning Theory shows not only how OJT trains new employees or

logistics managers but Social Learning Theory also stresses the importance of OJT. Thus, similar to HCT, these results apply to Social Learning Theory as the results show the importance of OJT and its benefits before formal classroom training to the trainee and to the unit. Therefore, the results of this research apply to the Social Learning Theory and the two other theories utilized for the theoretical lens for this research which adds to the validity of these results.

Recommendations

When looking at a general logistics training program, organizations should look to make a few different changes based on these results. First and foremost, logistics training program managers should look to include a period of OJT before any formal classroom training for new logistics managers. This plan will benefit the development of new logistics managers and increase retention of the formal classroom training material. Additionally, based on these results, training program managers should schedule OJT based on organizational needs but attempt to schedule OJT for one to three months at a minimum but no longer than four to six months before sending new logistics managers to formal training. This timeline will ensure that new logistics managers fully benefit from the maximum amount of training, will allow for formal classroom scheduling flexibility and it will ensure new logistics managers do not start to form bad habits or stagnate in their training. Finally, formal classroom training programs should not be shortened with the addition of OJT, especially if organizations are geographically separated, but logistics training programs should reevaluate the current curriculum of formal training programs to ensure their validity. With these measures applied, logistics organizations and leadership should expect to garner a more qualified output, or logistics manager, from their training programs.

Limitations

This survey study experienced a few limitations for a variety of different reasons. The first limitation is that the research could realistically only collect data through the use of a web-based survey. The population of 21A Officers is geographically located all across the world which meant that the survey sample frame was located around the world as well. This geographic separation made talking to each subject individually and in person extremely unrealistic. Additionally, since this study attempted to reach as many of the 1,247 21A Officers in the sample frame as possible it also meant that an interview over the telephone was also not realistic for time purposes. This constraint left the study with a web-based survey which added additional limitations.

A web-based survey brings nonresponse bias into account. However, this study attempted to combat this limitation as much as possible by performing a wave analysis of the data. Next, as this study was limited to web-based surveys some of the questions on the survey were not completely understood and lost in translation for the respondent as evidenced by some of the response to particular questions. Though the majority of the respondents answered the question as intended, some of the completed survey responses either didn't answer the intended question, or they specifically answered that they did not understand the question. Additionally, as this survey was limited to an anonymous web-based survey, it required the researcher to assume that every answer given by the respondents was correct and accurate. This assumption is necessary as it is impossible to check the validity of each data point with the surveys being anonymous. This assumption may limit the accuracy of the data and conclusions.

Another key limitation of this survey study was that limited scope. As this study limited the scope of respondents to recent AMOC graduates as well as 21A Commanders and Operations

Officers it limited the already small sample frame. This limitation contributed to the small sample size issues experienced multiple times during this research. Next, this survey was limited to the specific real world example for the data. While this limitation was a choice made by the researcher to gather data that could be analyzed, it potentially means that the conclusions and recommendations may not apply to every organization that utilizes training programs for their new employees.

Finally, as discussed in chapter one, this research experienced general limitations of survey research. These general limitations include response bias and social desirability. Response bias is the tendency of respondents to answer untruthfully. (Creswell, 2014) Social desirability is when respondents answer questions based on what they think is expected from the survey or the researcher. (Clancy & Phillips, 1972) This research uses the anonymity of the surveys to combat potential response bias and social desirability.

Future Research Opportunities

This survey study presents multiple future research opportunities. These opportunities including expanding the scope to other career fields within the USAF, i.e. the munitions maintenance (21M) or logistics (21R) career fields. Additionally, this study could be extended to look at the enlisted side of the 21A career field. This study looked solely at the training and development of 21A Officers, but a future study could look to see if these recommendations apply to an enlisted aircraft maintainer's development. A future study could also extend this research topic to other branches of the military, i.e. the United States Army or Navy, or a civilian organization, i.e. a restaurant or supermarket chain.

Another opportunity for future research is to determine the specific amount of on-the-job training that produces the most qualified 21A Officer or logistic manager. In other words, this research recommends between one and six months of OJT, so what amount between one and six months produces the most qualified trainee, i.e. possibly three months or four months. Finally, to branch off from this research, a potential future research opportunity is looking into the formal classroom training knowledge retention of trainees based on the amount of exposure they have had to the material before the formal classroom training. This final research opportunity would expound upon the effect OJT has on formal classroom training retention, and it would make this research topic more applicable to organizations regardless of the industry.

Summary

Through this study, the researcher addressed the potential benefits of applying a period of OJT before formal classroom training within a logistics training program. The researcher also attempted to fill a gap in the literature by adding to the current literature on different training methods for new logistics managers within a given logistics organization. To accomplish this purpose, the researcher conducted two web-based surveys of recent formal classroom training graduates as well as leadership within the aircraft maintenance community in the United States Air Force. From the quantitative data, the researcher was not able to conclusively state that 21A Officers who received OJT before formal classroom training performed better based on their scores. However, through the the recent graduates and the experienced leadership qualitative data the researcher was able to show that a period of OJT for at least one to three months, but no more than four to six months, prior to formal classroom training was not only a benefit to the new logistics manager but also to the organization before, during and after formal training.

Additionally, the researcher determined that with the addition of an OJT period before formal classroom training, a logistics organization should not curtail formal classroom training length but instead should reevaluate the curriculum taught in formal training. This research is valuable to any logistics organization with a training program for new logistics managers and will hopefully spark future studies in the area of employee development, training and growth through the use of a period of OJT before formal classroom training.

Appendix A: Sponsor Endorsement Letter



**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC**

6 Oct 16

MEMORANDUM FOR AFIT/SCP
HQ AFPC/MAPP

FROM: ACC/A4

SUBJECT: Aircraft Maintenance Officer Course (AMOC) Timeline for New Aircraft Maintenance (21A) Officers Survey

1. Currently in 21A initial skills training there is a lack of standardization in regards to the timeline that new 21A officers follow. We have requested the help of the Air Force Institute of Technology (AFIT) in conducting research to explore an optimal timeline for new aircraft maintenance (21A) officers to attend aircraft maintenance officer course (AMOC). The results of this study will enable the 21A community to schedule new 21A officers to attend AMOC at the optimal time in order to produce the highest quality aircraft maintenance officers and to potentially lower the costs of training future 21A officers.
2. Additionally this results will help determine if there is benefit to on-the-job training (OJT) for maintenance officers prior to attending initial skills training and if training cost savings can be realized by shortening AMOC and adding on-the-job training for new 21A officers prior to attending AMOC.
3. As part of this research, AFIT will need to administer a web-based survey to collect data from active duty Air Force 21A officers, both new 21A officers who have recently graduated from AMOC and from their commanders and operations officers. As the Director of Maintenance and Logistics from Air Combat Command, I see the long-term value of the research results outweighing the cost of administering the survey and request that AFPC/MAPP approve the AFIT survey.
4. If you have any questions about this request, please contact Maj Benjamin Hazen (principal investigator) – Phone 785-3636, ext. 4337; E-mail – benjamin.hazen@afit.edu.


CURTIS R. HAFER, Colonel, USAF
HQ ACC/A4M

Appendix B: AFIT IRB Exemption Request Approval



DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OHIO

8 August 2016

MEMORANDUM FOR MAJOR BENJAMIN T. HAZEN

FROM: Jeffrey A. Ogden, Ph.D.
AFIT Exemption Determination Official
2950 Hobson Way
Wright-Patterson AFB, OH 45433-7765

SUBJECT: Approval for exemption request from human experimentation requirements (32 CFR 219, DoDD 3216.2 and AFI 40-402) for the distribution of 21A Officer Initial Training Timeline Study

Your request was based on the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2) Research activities that involve the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

1. Your study qualifies for this exemption because you are not collecting sensitive data, which could reasonably damage the subjects' financial standing, employability, or reputation. Further, the demographic data you are collecting, if any, and the way that you plan to report it cannot realistically be expected to map a given response to a specific subject.
2. This determination pertains only to the Federal, Department of Defense, and Air Force regulations that govern the use of human subjects in research. Further, if a subject's future response reasonably places them at risk of criminal or civil liability or is damaging to their financial standing, employability, or reputation, you are required to file an adverse event report with this office immediately.

Jeffrey A. Ogden, Ph.D.
IRB Exempt Determination Official

Appendix C: Survey Control Number (SCN) Approval Letter



23 Nov 2016

MEMORANDUM FOR ACC/A4
ATTENTION: BRIG GEN CARL A BUHLER

FROM: AFPC/DSYS
550 C Street West, Suite STE 152
Randolph AFB TX 78150-4451

SUBJECT: Survey Approval – Aircraft Maintenance Officer Course (AMOC) Survey.

1. The survey is approved for use with the following population(s):

Population:	Number(s):
Air Force Officers	200
Air Force Active-Duty Enlisted	0
Air Force Civilians	0
Air Force Retirees and/or AF Family Members	0
Total Number to be Surveyed	200

The dates for survey administration are 11/24/2016 through 12/31/2016; the Survey Control Number (SCN) for this effort is AF17-021AFIT.

Please ensure compliance with the following guidance, as applicable, while administering your survey.

a. Invitations to participate in the survey must include:

- (1) Survey title (as shown in the subject line of this memo).
- (2) AF Survey Control Number (SCN).
- (3) Statement that completion of the survey is voluntary.
- (4) Link to the list of Air Force approved surveys: <https://www.my.af.mil/gcss-af/USAF/ep/browse.do?programId=t0ECF2BB847D139300147D55307A100E2&channelPageId=sE3494DD04562FCC901456BE0545C017A>.
- (5) Government contact name or office, with official contact information (e.g., e-mail address, telephone number, etc.), to provide a point of contact for questions about the survey.
- (6) Identifying information of the survey's sponsor, to inform survey recipients under whose authority the survey is being conducted.
- (7) All AF attitude and opinion surveys must include the following statement on the questionnaire: "We cannot provide confidentiality to a participant regarding comments involving criminal activity/behavior, or statements that pose a threat to yourself or others. Do NOT discuss or comment on classified or operationally sensitive information."

- b. This approval is exclusive to the Air Force community and does not constitute authority for administration to individuals from other federal agencies, sister services, etc. Surveys that include individuals from outside the Air Force community must be coordinated through the DOD/WHS/ESCD Information Management Division (commercial phone 703-696-5284).
- c. The organization conducting this survey must contact the Civilian Personnel Office; Civilian Personnel Element, Manpower & Personnel Flight; for labor union notification prior to releasing this survey if any participants are civilian employees of a bargaining unit. If this survey involves bargaining unit civilians at more than one base, the organization conducting this survey must notify HQ AFPC/DPIECC, Air Force Program Management and Evaluation.
- d. The organization conducting this survey must insure that if this survey requires any changes, request must be submitted to the Survey Office for review and approval prior to implementation in accordance with AFI 38-501.
- e. If this survey requires an IRB, the PI must submit all proposed survey changes to the Survey and IRB Office for review and approval (minor changes do not require a change of SCN number) prior to implementation in accordance with AFI 38-501.
- f. AFI 33-115, governs Web Management and Internet usage of websites hosted in the commercial environment (i.e., ".com", ".org", etc.). The organization conducting this survey is responsible for insuring compliance with web management and usage requirements. Questions should be directed to SAF/A6 (usaf.pentagon.saf-cio-a6.mbx.a3cs-a6cs-strategy-and-policy@mail.mil).
- g. For information regarding digital certification of e-mails, refer to AFI 33-119, *Air Force Messaging*. The reference for PK enabling (PKE) information is <https://afpki.lackland.af.mil/html/pkenabling.cfm>. For information pertaining to ".mil" accounts, the reference is https://afpki.lackland.af.mil/html/help_desk.cfm. Information for systems that are not ".mil" can be found at <http://iase.disa.mil/pki/eca/>. For information on External Certificate Authority or to contact a representative, the reference is http://iase.disa.mil/pki/eca/contact_us.html.
- h. The organization conducting this survey must ensure its Operations Security (OPSEC) manager reviews this survey prior to administration. References for the OPSEC Program include: DOD Directive 5205.02, *DOD Operations Security Program*; Joint Publication 3-13.3, *Operations Security*; AFPD 10-7, *Air Force Information Operations*; and AFI 10-701, *Operations Security (OPSEC)*.
- i. The public may request survey results under provisions of the Freedom of Information Act (FOIA). Results released outside the Air Force require coordination with Air Force Public Affairs prior to dissemination.
- j. Data collected under this survey may be subject to the Privacy Act of 1974. Please ensure compliance with this act as set forth in Title 5 United States Code (USC), Sec 552a; Title 10 USC, Sec 55 and 8013; Executive Order 9397; and Air Force Instruction 33-332, *Privacy Act Program*.

2. If you have any questions, please call the Air Force Survey Office at DSN 665-2776 or send an e-mail to afpc.dsys.af.surveyoffice@us.af.mil.

//Signed//
RENEE TEALER
Management Analyst
Air Force Survey Office

Appendix D: Final CGO Survey Questions

The final questions for the CGO Survey are listed below with the answer choices in the parentheses following the questions. Example: Question? [Answer 1; Answer 2; Answer 3]

1. What is your rank? [2nd Lt (O-1); 1st Lt (O-2); Captain (O-3)]
2. What is your duty title? [Flight commander or Flight OIC; Assistant AMU OIC; AMU OIC; Squadron/Group/Wing Executive; Other (please specify)]
3. How long have you been in the Air Force? [Less than 6 months; 6 months to 1 year; 1-2 years; 2-3 years; 3-4 years; 4+ years]
4. What is your core AFSC? [Write-in response]
5. Are you prior enlisted? [Yes; No]
6. If you are prior enlisted, what was your AFSC while enlisted? If not, please respond with N/A. [Write-in Response]
7. If you are prior enlisted, how many years were you enlisted? [1-3 years; 4-6 years; 7-9 years; 10 or more years; N/A]
8. Additionally if you are prior enlisted, what rank did you reach while enlisted? [Airman Basic (E-1); Airman (E-2); A1C (E-3); SrA (E-4); SSgt (E-5); TSgt (E-6); SNCO (MSgt+/E-7+); N/A]
9. What was your commissioning source? [USAFA; ROTC; OTS]
10. What date did you commission into the United States Air Force (MM/YYYY)? [Write-in response]
11. What date did you start AMOC (MM/YYYY)? [Write-in response]
12. Did you attend AMOC before arriving at your first duty location? [Yes; No]
13. If you went to your first duty station prior to going TDY to AMOC, how long were you at your first duty station? [Less than 1 month; 1 to 3 months; 4 to 6 months; More than 6 months; N/A]
14. How many students were in your AMOC class? [Less than 10 students; 10-15 students; 15-20 students; more than 20 students]
15. How many international students were there in your AMOC class? [There were no international students; 1-2 international students; 3-5 international students; More than 5 international students]

16. What was your final course average grade at AMOC (%)? [Write-in response]
17. What did you score on the end of course test at AMOC (%), also known as the AFI 21-101 test? [Write-in response]
18. How many distinguished graduates did you have in your class? [My class did not have a distinguished graduate; 1 distinguished graduate; 2 distinguished graduates; More than 2 distinguished graduates]
19. Did you graduate as the distinguished graduate for your class? [Yes; No]
20. Do you believe that On-the-Job Training (OJT) helps or hurts a new 21A officer prior to attending AMOC? [OJT Helps; OJT Hurts]
21. Why do you feel OJT helps or hurts a new 21A officer prior to attending AMOC? [Write-in response]
22. On average, do you feel that a new 21A officer who has NOT attended AMOC is or is not helpful for a unit? [Is Helpful; Is NOT Helpful]
23. Why do you feel a new 21A officer who has not attended AMOC is or is not helpful for a unit? [Write-in response]
24. When do you feel is the best time to send new 21A officers to AMOC? [Prior to arrival at first duty location; Within 1 month of arrival at first duty location; 1 to 3 months after arrival at first duty location; 4 to 6 months after arrival at first duty location; More than 6 months after arrival at first duty location; Other (please specify)]
25. Why do you feel this is the best time for new 21A officers to attend AMOC? [Write-in response]
26. On a scale of 1 to 10, with 10 being the best, how do you feel that your performance ranks compared to other 21A CGOs that you work with? [Sliding scale of 1-10 given to choose answer]
27. Do you feel that if new 21A officers received OJT prior to AMOC, the course length of AMOC should be shortened? [Yes; No]
28. Why do you feel that AMOC should or should not be shortened? [Write-in response]
29. If you believe that AMOC could be shortened with OJT, which sections of AMOC do you believe could be replaced or shortened by OJT? [Block I – Orientation, Maintenance Terms, Practices, and Inspections; Block II – Logistics and Resources; Block III – Aircraft Systems I; Block IV – Aircraft Systems II; Block V – Munitions; Block VI – Flightline Operation; Block VII - Scheduling, Forms and Simulator; I do not believe AMOC should be shortened; Other (please specify)] **MULTIPLE ANSWERS COULD BE CHOSEN**

30. Why do you feel that the curriculum you chose could be removed or shortened with the addition of OJT? [Write-in response]

31. Do you have any additional comments about the timing of AMOC? [Write-in response]

Appendix E: Final Leadership Survey Questions

The final questions for the Leadership Survey are listed below with the answer choices in the parentheses following the questions. Example: Question? [Answer 1; Answer 2; Answer 3]

1. What is your rank? [Captain (O-3); Major (O-4); Lt Colonel (O-5); Colonel (O-6); General Officer (O-7+)]
2. What is your duty title? [Squadron Commander; Maintenance Operations Officer (MXS); Maintenance Operations Officer (AMXS); Other (please specify)]
3. How long have you been in the Air Force? {Less than four years; 4-7 years; 7-10 years; 10-15 years; 15 or more years}
4. What is your core AFSC (i.e. 21A)? [Write-in response]
5. Have you spent any time outside of maintenance? [Yes; No]
6. If so, in what AFSC or job? If not, please respond with N/A [Write-in response]
7. Have you had any new 21A officers receive On-the-Job Training (OJT) prior to attending AMOC? [Yes; No]
8. Do you feel that new 21A officers benefit the unit while receiving OJT prior to AMOC? [Yes; No]
9. Why do you believe that a new 21A officer is or is not beneficial while receiving OJT prior to AMOC? {Write-in response}
10. On a scale of -10 to 10 rate the post AMOC performance of new 21A officers who have served under you, where -10 ranks officers who attended AMOC immediately as the best performers and 10 ranks officers who received OJT prior to AMOC as the best performers. For example, if you feel that officers who attended AMOC immediately are better 60% of the time then respond with -6, or if you feel that officers who received OJT prior to AMOC are always the best performers then respond with 10. [Slider scale of -10 to 10 given for respondents to answer}
11. Consider the 21A officers who have served under you who either attended AMOC immediately or who received OJT prior to AMOC, what performance differences did you notice between them? [Write-in response]
12. Do you believe that On-the-Job Training (OJT) helps or hurts a new 21A officer prior to AMOC? [OJT Helps; OJT Hurts]
13. Why do you feel OJT helps or hurts a new 21A officer prior to attending AMOC? [Write-in response]

14. When do you feel is the best time to send new 21A officers to AMOC? [Before arriving at first duty station; Within one month of arriving at first duty station; 1 to 3 months after arrival at first duty station; 4 to 6 months after arrival at first duty station; More than 6 months after arrival at first duty station; Other (please specify)]

15. Why do you feel this is the best time for new 21A officers to attend AMOC? [Write-in response]

16. Do you feel that if new 21A officers received OJT prior to AMOC, the course length of AMOC could be shortened? [Yes; No]

17. Why do you feel that AMOC should or should not be shortened? [Write-in response]

18. If you believe that AMOC could be shortened with OJT, which sections of AMOC do you believe could be replaced by OJT? [Block I – Orientation, Maintenance Terms, Practices, and Inspections; Block II – Logistics and Resources; Block III – Aircraft Systems I; Block IV – Aircraft Systems II; Block V – Munitions; Block VI – Flightline Operation; Block VII - Scheduling, Forms and Simulator; I do not believe AMOC should be shortened; Other (please specify)] ****MULTIPLE ANSWERS COULD BE CHOSEN****

19. Why do you feel that the curriculum you chose could be removed or shortened with the addition of OJT? [Write-in response]

20. Do you have any additional comments about the timing of AMOC? [Write-in response]

Appendix F: Final CGO Survey View in Survey Monkey®

AMOC Survey CGO

CONSENT TO PARTICIPATE IN SURVEY

Aircraft Maintenance Officer Course (AMOC) Survey

You have been asked to participate in a research study conducted by researchers from the Air Force Institute of Technology (AFIT), Graduate School of Engineering and Management, Department of Operational Sciences. The AF Survey Control Number (SCN) for this effort is AF17-021AFIT. This survey is being sponsored by ACC/A4. The purpose of this study is to establish an optimal timeline for new aircraft maintenance (21A) officers to attend Aircraft Maintenance Officer Course, or AMOC. The results of this study will enable the Air Force Personnel Center and the 21A community to schedule new 21A officers to attend Aircraft Maintenance Officer Course at the optimal time in order to produce the highest quality aircraft maintenance officers. You were selected as a possible participant in this study because of your AFSC and current duty title. Please read the information below and do not participate in this survey if you do not feel comfortable with any of this information or the survey questions at any time.

- Completion of this survey is voluntary.
- You will not be compensated for participating in this survey.
- Your answers and information will be kept confidential and will not be linked to your name so please be honest and as accurate as possible.
- All survey responses will be stored in a secure work space until 1 year after that date. The responses will then be destroyed.
- We cannot provide confidentiality to a participant regarding comments involving criminal activity/behavior, or statements that pose a threat to yourself or others. Do NOT discuss or comment on classified or operationally sensitive information.

If you have any questions or concerns please contact Capt Vincent at aaron.vincent@afit.edu or Maj Hazen at benjamin.hazen@afit.edu or 937-255-3636 x4337.

If you understand the above information and procedures and have no questions or concerns please select the Next button. By selecting the Next button you are consenting to take this survey and agreeing that you understand the above information and procedures.

If you do not consent to taking this survey now or at any time during this survey please exit the survey.

Additionally the following is a link to the list of Air Force approved surveys: <https://www.my.af.mil/gcssaf/USAF/ep/browse.do?programId=0ECF2BB847D139300147D55307A100E2&channelPageId=3E3494DD04562FCC901456BE0545C017A>.

Thank you for participating in this survey. Your feedback is important.

Background Information

This information will be kept confidential and will not be linked to your name.

1. What is your rank?

- 2nd Lt (O-1)
- 1st Lt (O-2)
- Captain (O-3)

2. What is your duty title?

- Flight commander or Flight OIC
- Assistant AMU OIC
- AMU OIC
- Squadron/Group/Wing Executive
- Other (please specify)

3. How long have you been in the Air Force?

- Less than 6 months
- 6 months to 1 year
- 1-2 years
- 2-3 years
- 3-4 years
- 4+ years

4. What is your core AFSC?

AMOC Survey CGO

Prior Enlisted Info

If you are prior enlisted please answer questions 6-8.

If you are not prior enlisted please answer questions 6-8 with N/A.

This information will be kept confidential and will not be linked to your name.

5. Are you prior enlisted?

- Yes
- No

6. If you are prior enlisted, what was your AFSC while enlisted? If not, please respond with N/A.

7. If you are prior enlisted, how many years were you enlisted?

- 1-3 years
- 4-6 years
- 7-9 years
- 10 or more years
- N/A

8. Additionally if you are prior enlisted, what rank did you reach while enlisted?

- Airman Basic (E-1)
- Airman (E-2)
- A1C (E-3)
- SrA (E-4)
- SSgt (E-5)
- TSgt (E-6)
- SNCO (MSgt+/E-7+)
- N/A

AMOC Survey CGO

Commissioning Information

This information will be kept confidential and will not be linked to your name.

9. What was your commissioning source?

- USAFA
- ROTC
- OTS

10. What date did you commission into the United States Air Force (MM/YYYY)?

AMOC Survey CGO

AMOC Information

This information will be kept confidential and will not be linked to your name.

11. What date did you start AMOC (MM/YYYY)?

12. Did you attend AMOC before arriving at your first duty location?

- Yes
- No

13. If you went to your first duty station prior to going TDY to AMOC, how long were you at your first duty station?

- Less than 1 month
- 1 to 3 months
- 4 to 6 months
- More than 6 months
- N/A

14. How many students were in your AMOC class?

- Less than 10 students
- 10-15 students
- 15-20 students
- more than 20 students

15. How many international students were there in your AMOC class?

- There were no international students
- 1-2 international students
- 3-5 international students
- More than 5 international students

If you do not know your scores they are on your training report from AMOC.

This information will be kept confidential and will not be linked to your name.

16. What was your final course average grade at AMOC (%)?

17. What did you score on the end of course test at AMOC (%), also know as the AFI 21-101 test?

18. How many distinguished graduates did you have in your class?

- My class did not have a distinguished graduate
- 1 distinguished graduate
- 2 distinguished graduate
- More than 2 distinguished graduate

19. Did you graduate as the distinguished graduate for your class?

- Yes
- No

AMOC Survey CGO

Wrap Up Questions

This information will be kept confidential and will not be linked to your name.

Answer these questions based on your experiences, knowledge and beliefs.

OJT = On-the-Job Training

20. Do you believe that On-the-Job Training (OJT) helps or hurts a new 21A officer prior to attending AMOC?

- OJT Helps
- OJT Hurts

21. Why do you feel OJT helps or hurts a new 21A officer prior to attending AMOC?

22. On average, do you feel that a new 21A officer who has NOT attended AMOC is or is not helpful for a unit?

- Is Helpful
- Is NOT Helpful

23. Why do you feel a new 21A officer who has not attended AMOC is or is not helpful for a unit?

24. When do you feel is the best time to send new 21A officers to AMOC?

- Prior to arrival at first duty location
- Within 1 month of arrival at first duty location
- 1 to 3 months after arrival at first duty location
- 4 to 6 months after arrival at first duty location
- More than 6 months after arrival at first duty location
- Other (please specify)

25. Why do you feel this is the best time for new 21A officers to attend AMOC?

26. On a scale of 1 to 10, with 10 being the best, how do you feel that your performance ranks compared to other 21A CGOs that you work with?



AMOC Survey CGO

Wrap Up Questions

This information will be kept confidential and will not be linked to your name.

Answer these questions based on your experiences, knowledge and beliefs.

OJT = On-the-Job Training

27. Do you feel that if new 21A officers received OJT prior to AMOC, the course length of AMOC should be shortened?

- Yes
 No

28. Why do you feel that AMOC should or should not be shortened?

29. If you believe that AMOC could be shortened with OJT, which sections of AMOC do you believe could be replaced or shortened by OJT?

- Block I – Orientation, Maintenance Terms, Practices, and Inspections
 Block II – Logistics and Resources
 Block III – Aircraft Systems I
 Block IV – Aircraft Systems II
 Block V - Munitions
 Block VI – Flightline Operation
 Block VII - Scheduling, Forms and Simulator
 I do not believe AMOC should be shortened
 Other (please specify)

30. Why do you feel that the curriculum you chose could be removed or shortened with the addition of OJT?

31. Do you have any additional comments about the timing of AMOC?

AMOC Survey CGO

Survey Complete

Thank you for participating in this survey. Your feedback is important.

Appendix G: Final Leadership Survey View in Survey Monkey®

AMOC Survey Leadership

CONSENT TO PARTICIPATE IN SURVEY

Aircraft Maintenance Officer Course (AMOC) Survey

You have been asked to participate in a research study conducted by researchers from the Air Force Institute of Technology (AFIT), Graduate School of Engineering and Management, Department of Operational Sciences. The AF Survey Control Number (SCN) for this effort is AF17-021AFIT. This survey is being sponsored by ACC/A4. The purpose of this study is to establish an optimal timeline for new aircraft maintenance (21A) officers to attend Aircraft Maintenance Officer Course, or AMOC. The results of this study will enable the Air Force Personnel Center and the 21A community to schedule new 21A officers to attend Aircraft Maintenance Officer Course at the optimal time in order to produce the highest quality aircraft maintenance officers. You were selected as a possible participant in this study because of your AFSC and current duty title. Please read the information below and do not participate in this survey if you do not feel comfortable with any of this information or the survey questions at any time.

- Completion of this survey is voluntary.
- You will not be compensated for participating in this survey.
- Your answers and information will be kept confidential and will not be linked to your name so please be honest and as accurate as possible.
- All survey responses will be stored in a secure work space until 1 year after that date. The responses will then be destroyed.
- We cannot provide confidentiality to a participant regarding comments involving criminal activity/behavior, or statements that pose a threat to yourself or others. Do NOT discuss or comment on classified or operationally sensitive information.

If you have any questions or concerns please contact Capt Vincent at aaron.vincent@afit.edu or Maj Hazen at benjamin.hazen@afit.edu or 937-255-3636 x4337.

If you understand the above information and procedures and have no questions or concerns please select the Next button. By selecting the Next button you are consenting to take this survey and agreeing that you understand the above information and procedures.

If you do not consent to taking this survey now or at any time during this survey please exit the survey.

Additionally the following is a link to the list of Air Force approved surveys: <https://www.my.af.mil/gcssaf/USAF/ep/browse.do?programId=t0ECF2BB847D139300147D55307A100E2&channelPageId=sE3494DD04562FCC901456BE0545C017A>.

Thank you for participating in this survey. Your feedback is important.

AMOC Survey Leadership

Background Information

This information will be kept confidential and will not be linked to your name.

1. What is your rank?

- Captain (O-3)
- Major (O-4)
- Lt Colonel (O-5)
- Colonel (O-6)
- General Officer (O-7+)

2. What is your duty title?

- Squadron Commander
- Maintenance Operations Officer (MXS)
- Maintenance Operations Officer (AMXS)
- Other (please specify)

3. How long have you been in the Air Force?

- Less than four years
- 4-7 years
- 7-10 years
- 10-15 years
- 15 or more years

AMOC Survey Leadership

AFSC Information

This information will be kept confidential and will not be linked to your name.

4. What is your core AFSC (i.e. 21A)?

5. Have you spent any time outside of maintenance?

Yes

No

6. If so, in what AFSC or job? If not, please respond with N/A.

AMOC Survey Leadership

Commander Perspective On AMOC Graduates

This information will be kept confidential and will not be linked to your name.

Answer these questions based on your experiences, knowledge and beliefs.

OJT = On-the-Job Training

7. Have you had any new 21A officers receive On-the-Job Training (OJT) prior to attending AMOC?

Yes

No

8. Do you feel that new 21A officers benefit the unit while receiving OJT prior to AMOC?

Yes

No

9. Why do you believe that a new 21A officer is or is not beneficial while receiving OJT prior to AMOC?

10. On a scale of -10 to 10 rate the post AMOC performance of new 21A officers who have served under you, where -10 ranks officers who attended AMOC immediately as the best performers and 10 ranks officers who received OJT prior to AMOC as the best performers.

For example, if you feel that officers who attended AMOC immediately are better 60% of the time then respond with -6, or if you feel that officers who received OJT prior to AMOC are always the best performers then respond with 10.

-10 0 10

11. Consider the 21A officers who have served under you who either attended AMOC immediately or who received OJT prior to AMOC, what performance differences did you notice between them?

AMOC Survey Leadership

Wrap Up Questions

This information will be kept confidential and will not be linked to your name.

Answer these questions based on your experiences, knowledge and beliefs.

OJT = On-the-Job Training

12. Do you believe that On-the-Job Training (OJT) helps or hurts a new 21A officer prior to AMOC?

- OJT Helps
- OJT Hurts

13. Why do you feel OJT helps or hurts a new 21A officer prior to attending AMOC?

14. When do you feel is the best time to send new 21A officers to AMOC?

- Before arriving at first duty station
- Within one month of arriving at first duty station
- 1 to 3 months after arrival at first duty station
- 4 to 6 months after arrival at first duty station
- More than 6 months after arrival at first duty station
- Other (please specify)

15. Why do you feel this is the best time for new 21A officers to attend AMOC?

AMOC Survey Leadership

Wrap Up Questions

This information will be kept confidential and will not be linked to your name.

Answer these questions based on your experiences, knowledge and beliefs.

OJT = On-the-Job Training

16. Do you feel that if new 21A officers received OJT prior to AMOC, the course length of AMOC could be shortened?

Yes

No

17. Why do you feel that AMOC should or should not be shortened?

18. If you believe that AMOC could be shortened with OJT, which sections of AMOC do you believe could be replaced by OJT?

Block I – Orientation, Maintenance Terms, Practices, and Inspections

Block II – Logistics and Resources

Block III – Aircraft Systems I

Block IV – Aircraft Systems II

Block V - Munitions

Block VI – Flightline Operation

Block VII - Scheduling, Forms and Simulator

I do not believe AMOC should be shortened

Other (please specify)

19. Why do you feel that the curriculum you chose could be removed or shortened with the addition of OJT?

20. Do you have any additional comments about the timing of AMOC?

AMOC Survey Leadership

Survey Complete

Thank you for participating in this survey. Your feedback is important.

Appendix H: Initial CGO Survey Questions

Officer Info

- What is your rank?
- What is your duty title?
- How long have you been in the Air Force?
- Are you a core 21A officer? If not, what is your core AFSC?
- Are you prior enlisted? If so what was your AFSC while enlisted and how long were you enlisted?
- What was your commissioning source?

When did the officer attend AMOC

- What date did you commission into the United States Air Force?
- What date did you start AMOC?
- Did you attend AMOC before arriving at your first duty location?
- Did you go to your first duty station prior to attending AMOC?
- If you went to your first duty station prior to going TDY to AMOC were you at your first duty station for less than 1 month, 1 to 3 months, 4 to 6 months or greater than 6 months?

Class make up

- How many students were in your AMOC class?
- How many international students were there in your AMOC class?
- Were all of the students in the same situation in terms of when they attended AMOC, i.e. did you all attend after spending 4-6 months at your first duty station or was there a mix?
- How many prior enlisted students were in your class?

AMOC Performance

- What was your final course average grade at AMOC?
- What did you score on the end of course test at AMOC?
- Did you graduate as the distinguished graduate for your class?
- Did your class have a distinguished graduate?

Thoughts on when AMOC should be held

- When do you feel is the best time to send new 21A officers to AMOC?
- Do you believe that OJT helps or hurts a new 21A officer prior to AMOC? If it helps how long should the new 21A receive OJT prior to AMOC?
- Do you believe it is more beneficial for a new 21A officer to receive OJT prior to AMOC to better prepare for AMOC or for a new 21A officer to attend AMOC ASAP so that they return to the unit earlier as a trained 21A officer?
- Do you feel that a new 21A officer should be considered a “wasted resource” since they have not received formal maintenance officer training yet?

Appendix I: Initial Leadership Survey Questions

Commander Info

- What is your rank?
- What is your duty title?
- How long have you been in the Air Force?
- Are you a core 21A officer? If not, what is your core AFSC?
- Have you spent any time outside of maintenance? If so in what job?
- Are you prior enlisted? If so what was your AFSC while enlisted and how long were you enlisted?
- What was your commissioning source?

Prior/Post AMOC performance

- Have you had any new 21A officers receive OJT prior to attending AMOC?
- Do you feel that new 21A officers benefit the unit while receiving OJT prior to AMOC?
- Do you feel that 21A officers who receive OJT prior to AMOC or those that immediately attend AMOC perform better?
- Did you attend AMOC (or formal maintenance officer training) immediately after commissioning, or within a short time of arriving at your first duty station or did you learn through OJT prior to attending AMOC?
- Did you graduate as the distinguished graduate for your AMOC class?

Thoughts on when AMOC should be held

- When do you feel is the best time to send new 21A officers to AMOC?
- Do you believe that OJT helps or hurts a new 21A officer prior to AMOC? If it helps how long should the new 21A receive OJT prior to AMOC?
- Do you believe it is more beneficial for a new 21A officer to receive OJT prior to AMOC to better prepare for AMOC or for a new 21A officer to attend AMOC ASAP so that they return to the unit earlier as a trained 21A officer?
- Do you feel that a new 21A officer should be considered a “wasted resource” since they have not received formal maintenance officer training yet?

Appendix J: Survey Invitation Email

This e-mail was sent from the myPers auto-notification system, please do not reply to this message.



Sir or Ma'am,

You have been asked to participate in the Air Force Maintenance Officer Course (AMOC) Survey created by researchers from the Air Force Institute of Technology (AFIT). The purpose of this survey is to establish an optimal timeline for new aircraft maintenance (21A) officers to attend Aircraft Maintenance Officer Course, or AMOC. The AF Survey Control Number (SCN) for this effort is AF17-021AFIT. This survey is being sponsored by ACC/A4. Please read the information below and participate in this survey only if you feel comfortable with this information and with the survey questions:

- Completion of this survey is voluntary
- Your answers and information will be kept confidential and will not be linked to your name so please be honest and as accurate as possible
- We cannot provide confidentiality to a participant regarding comments involving criminal activity/behavior, or statements that pose a threat to yourself or others. Do NOT discuss or comment on classified or operationally sensitive information. If you have any questions or concerns please contact [Capt Aaron Vincent](#), or [Major Benjamin Hazen](#), or call 937-255-3636 x4337.

If you understand the above information with no questions or concerns please follow the link below to complete the applicable survey.

ALL 2nd and 1st LTs PLEASE FILL OUT THIS SURVEY:

https://www.surveymonkey.com/r/AMOC_Survey_CGO

ALL Commanders and Maintenance Operations Officers (MOOs) PLEASE FILL OUT THIS SURVEY:

https://www.surveymonkey.com/r/AMOC_Survey_Leadership

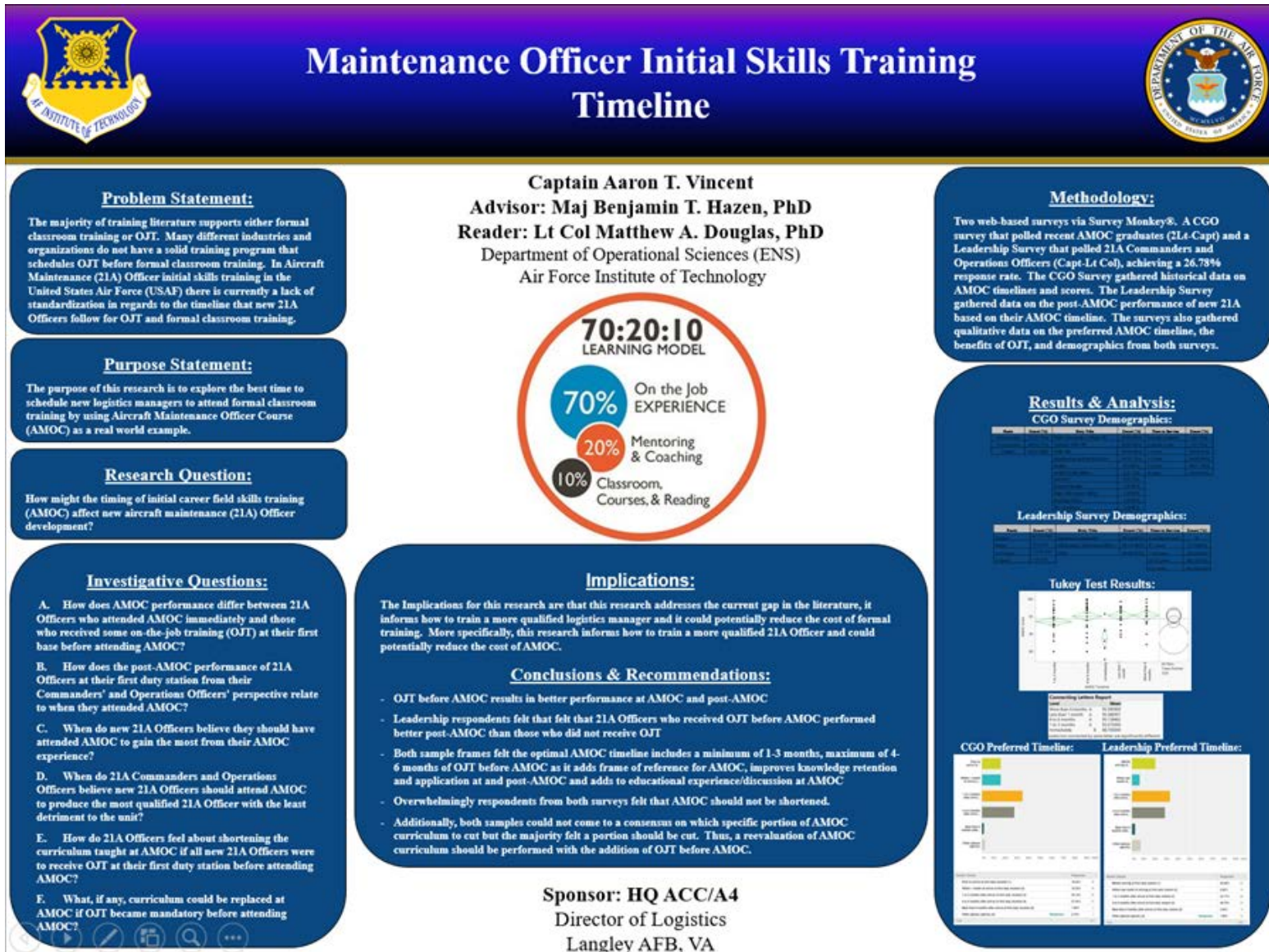
Thank you for participating in this survey.

The following is a link to the list of Air Force approved surveys:

<https://www.my.af.mil/gcss-af/USAF/ep/browse.do?programId=t0ECF2BB847D139300147D55307A100E2&channelPageId=sE3494DD04562FCC901456BE0545C017A>

Capt Aaron Vincent, AFIT/ENS

Appendix K: Thesis Quad Chart



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14. ABSTRACT There is a current gap in training literature with regards to the benefits of on-the-job training (OJT) prior to formal training. Therefore, the purpose of this research is to explore the best time to schedule new logistics managers to attend formal classroom training by using Aircraft Maintenance Officer Course (AMOC) as a real world example. Two surveys were created, a survey of new aircraft maintenance (21A) Officers and a survey of 21A leadership, to collect the primary data for this research. Through the data this research proposes a timeline for the addition of OJT prior to AMOC in order to inform how to train the most qualified 21A Officer.					
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