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THESIS

A SURVEY ON TRAINING AND EDUCATION REQUIREMENTS OF MARINE CORPS AVIATION LOGISTICS OFFICERS IN PREPARATION FOR SEA BASING

by

Roger M. Mishoe

September 2004

Thesis Advisor: Robert Koyak
Second Reader: Susan Dooley

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We describe the results of a statistical survey that we conducted of the four military occupational specialties that comprise the Marine aviation logistics community: supply, maintenance, avionics, and ordnance. Our survey, which reached nearly 44 percent of aviation logistics officers, asked respondents to rate the importance of different types of training to help prepare them for Sea Basing. We find that Marine aviation logistics officers highly rate training in acquisition, advanced specialty training, and joint training. Officers rate the importance of training in these areas differently depending on the specialty of the officer. In addition, many officers regard training in supply-chain management as important to making a successful transition to a Sea Base.

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Roger M. Mishoe
Captain, United States Marine Corps
B.S. Mechanical Engineering, Southern University and A&M College, 1999

Submitted in partial fulfillment of the
requirements for the degree of

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NAVAL POSTGRADUATE SCHOOL
September 2004

Author: Roger M. Mishoe

Approved by: Robert Koyak
Thesis Advisor

Susan Dooley
Second Reader

James N. Eagle
Chairman, Department of Operations Research

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TABLE OF CONTENTS

I. INTRODUCTION 1
A. TRANSFORMATION AND THE TRIAD OF CAPABILITIES 3
1. Sea Strike 4
2. Sea Shield 4
3. Sea Basing 4
B. RESEARCH FOCUS 6
1. Aviation Supply 7
2. Aviation Maintenance 7
3. Avionics 7
4. Ordnance 8
C. ORGANIZATION OF THESIS 8

II. MARINE CORPS AVIATION AND SEA BASING 9
A. SEA BASING BACKGROUND 9
B. LOGISTICS AND SEA BASED LOGISTICS 10
1. Sea-based Logistics 10
2. Impact on Marine Corps Aviation Logistics 11
C. TRAINING & EDUCATION 12

III. METHODOLOGY 15
A. SURVEY DESIGN 15
B. RESPONDENTS 17
C. DATA CAPTURE 18

IV. ANALYSIS 19
A. DATA 19
B. ASSUMPTIONS 19
C. THE SUPPLY COMMUNITY SURVEY 20
1. Supply Study Question 1: Tours in Acquisition 21
2. Supply Study Question 2: Supply Chain Management Training to Support Sea Basing 24
3. Supply Study Question 3: Importance of Acquisition Training for Career Advancement ..27
4. Supply Study Question 4: Navy Logistics Onboard Ship 29
5. Supply Study Question 5: Inter-service versus Joint Service Training 30
6. Supply Study Question 6: Additional Training .32
a. Supply: Limited Duty Officer Structure ..33
b. Supply: Transportation 34
c. Supply: Logistics Planning 35
d. Supply: Joint Services Logistics 35
D. THE MAINTENANCE COMMUNITY SURVEY 35

1. Maintenance Study Question 1: MOS School Focus 37
2. Maintenance Study Question 2: Joint versus Inter-service Logistics Training 39
3. Maintenance Study Question 3: Acquisition Tours 40
4. Maintenance Study Question 4: T-AVB Training for Sea Basing 42
5. Maintenance Study Question 5: Force Deployment Planning 43
6. Maintenance Study Question 6: Primary Acquisition Career Track 44
7. Maintenance Study Question 7: Additional Training 46
a. Maintenance: Sea Basing 47
b. Maintenance: Logistics Planning 47
c. Maintenance: OJT before MOS School 48
d. Maintenance: T-AVB Training 49
e. Maintenance: Operations Planning 49
F. THE AVIONICS COMMUNITY SURVEY 49
1. Avionics Study Question 1: Comparisons of Additional, Advanced, and Specific Training ..50
2. Avionics Study Question 2: Benefit of the Supply Officer’s Short Course 53
3. Avionics Study Question 3: Challenges in A Sea-Based Environment 54
a. Avionics: Parts Resupply and Availability 55
b. Avionics: Supply Chain Management 55
c. Avionics: Reach-back, System Integration, and IMA 56
d. Avionics: COMSEC 57
4. Avionics: Possible Advanced Avionics Officer’s Course 58
E. THE ORDNANCE COMMUNITY SURVEY 58
1. Ordnance Study Question 1: Specific Training Preferences 59
2. Ordnance Study Question 2: Supply versus Joint Maintenance and Supply 62
3. Ordnance Study Question 3: Ordnance Advanced Training Course 63
4. Ordnance Study Question 4: Acquisition Training 64
5. Ordnance Study Question 5: Additional Training 65
G. COMPARISON OF SURVEY RESPONSES ACROSS MARINE CORPS AVIATION OFFICER COMMUNITIES 66

1. Community Comparisons: Study Question 1: Acquisition Training 66
2. Community Comparisons Study Question 2: Advance Training Preference 69
3. Community Comparisons Study Question 3: Joint Training across All Communities 71

V. CONCLUSIONS AND RECOMMENDATIONS 75
A. CONCLUSIONS 75
B. FUTURE AREAS OF RESEARCH 77
C. SURVEY DATA AND REFERENCES 78

APPENDIX 79
A. MAIN PAGE QUESTIONS 79
B. AVIATION SUPPLY SURVEY QUESTIONS 80
C. AVIATION MAINTENANCE SURVEY QUESTIONS 82
D. AVIATION AVIONICS SURVEY QUESTIONS 84
E. AVIATION ORDNANCE SURVEY QUESTIONS 85

LIST OF REFERENCES 87

INITIAL DISTRIBUTION LIST 89

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LIST OF FIGURES

Figure 1. Triad of Sea Power 21 Capabilities (from SECNAV, 2002) 5
Figure 2. Marine Corps Supply Officers and Acquisition Tours 23
Figure 3. Multiple Comparison Procedure for Supply Specific Supply Chain Management Training 26
Figure 4. Effect of Acquisition Billets on MOS Credibility and Promotion Opportunities 28
Figure 5. Preference for Navy Logistics Training Onboard Ship 30
Figure 6. Supply Officer's preference for more inter-service or joint training 31
Figure 7. Four Most Frequently Mentioned Areas for Additional Training 33
Figure 8. Results of the Multiple Comparison Procedure 39
Figure 9. Maintenance Officer's Preference for Acquisition Billets 41
Figure 10. Force Deployment Planning at the Marine Aviation Logistics Squadron 44
Figure 11. Marine Maintenance Officer's Responses on the Establishment of a Primary Acquisitions Track 45
Figure 12. Marine Corps Maintenance Preferred Additional Training for Sea Basing 47
Figure 13. Marine Corps Avionics Officers' Preferences for Advance, Additional, and Specific Training ...51
Figure 14. Multiple Comparison Results For Avionics Training 52
Figure 15. Marine Corps Avionics Officer's Preferred Additional Training 54
Figure 16. Marine Corps Ordnance Specific Training Preferences 61
Figure 17. Multiple Comparisons Results for Ordnance-Specific Training 62
Figure 18. Results of the Multiple Comparisons Procedure for Strength of Preference of Acquisition Training 69
Figure 19. Results of the Multiple Comparisons Procedure for Strength of Preference for Advanced Training 71

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LIST OF TABLES

Table 1. Aviation Commodity Classes and Marine Corps Officer Rank Structure 6
Table 2. Number of Survey Respondents with Corresponding Personnel End Strength Per Commodity Class 17
Table 3. Strengths of Responses of Supply Officers to Study Question Two 26
Table 4. Multiple Comparisons Procedure for Supply Chain Management Specific Training 27
Table 5. Preferences of Marine Corps Maintenance Officers for MOS School Focus 38
Table 6. Multiple Comparisons for MOS School Focus ...39
Table 7. Preferences of Avionics Officers for Different Training 52
Table 8. Numerical Results of Multiple Comparisons for Avionics Training 53
Table 9. Preferences of Ordnance Officers for Specific Training 61
Table 10. Numerical Results of Multiple Comparisons for Ordnance Training 62
Table 11. Preferences for Acquisition Training Across Maintenance, Supply, and Ordnance Communities. 68
Table 12. Numerical Results of Multiple Comparisons Test for Strength of Preference of Acquisition Training 69
Table 13. Preference for Advanced Training across Supply, Avionics, and Ordnance Communities ...70
Table 14. Means Rank Sums for Advanced Training Across Avionics, Supply, and Ordnance Communities 71
Table 15. Preference for Joint Training across All Marine Aviation Logistics Communities 72
Table 16. Results of Multiple Comparisons Procedure for Significance among Communities 73
Table 17. Means Rank Sums for Joint Training Across Marine Aviation Logistics Communities 73
Table 18. Training Preferences by Marine Aviation Logistics Specialty 75

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EXECUTIVE SUMMARY

The term “Naval Transformation” describes the combined efforts of the Naval services to integrate new and existing technologies with more efficient business practices to improve warfighting capabilities around the world. One key initiative of Naval Transformation is Sea Basing. The objective of Sea Basing is to project power from the sea directly to military objectives using a network of specialized transportation and weapons systems. An integral component of Sea Basing is sea-based logistics.

In a sea-based environment, Marine Corps aviation logistics officers are required to support Marine forces from greater distances than in the past, and without the land-based infrastructure upon which they traditionally have depended. Successful transition to Sea Basing will come to rely on the experience and training of aviation logisticians. We describe the training needs of these officers as they transition to Sea Basing, as reported by the officers themselves.

To support our research we developed and administered a computerized statistical survey that targeted the four specialties of Marine aviation logistics officers (Supply, Maintenance, Avionics, and Ordnance) to determine their training needs. Forty four percent of aviation logistics officers responded to the survey.

In addition to asking questions appropriate to each Military Occupational Specialty (MOS), we also asked questions that are of common interest to every specialty. Using the survey responses, we determine which community of

officers express a preference for certain kinds of training. Three training areas common to nearly every community in which the questions were asked are acquisition, advanced, and joint training.

We use statistical rank-based tests to determine if there are detectable differences among specialties for the types of training considered. Where detectable differences are found, we then conduct follow-up multiple comparisons to determine which specialties prefer a given type of training more than other specialties.

The table below presents the sample percentages of the surveyed specialties that responded favorably to the indicated training questions. A favorable response is denoted by the two highest categories on an ordinal preference scale upon which respondents were asked to rate the type of training in question.

		Percentage of respondents that gave favorable ratings to the indicated type of training		
		Type Training		
Specialty	**Survey Size**	**Acquisition**	**Advanced**	**Joint**
Supply	132	56	76	83
Maintenance	113	46	N/A	54
Avionics	93	N/A	59	76
Ordnance	42	78	95	70

Training Preferences by Marine Aviation Logistics Specialty

N/A indicates that a related survey question was not asked of the targeted specialty.

Based on the survey responses, ordnance officers prefer acquisition and advanced specialty training more than those in other specialties. Supply, maintenance, and avionics officers prefer joint training more than any other types of training.

Based on the text responses given by the survey respondents, we find that training in supply-chain management is regarded as important by officers across all aviation logistics specialties. These officers note that future sea-based capabilities will require more extended logistics reach than similar operations conducted from land. Training in transportation and material movement are also mentioned as important to supporting the sea base.

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LIST OF ACRONYMS

ALOC	Advanced Logistics Officer’s Course
AOOCP	Aviation Ordnance Officer Career Progression
ASE	Automated Software Engineering
ATE	Automated Test Equipment
AVCAL	Aviation Consolidated Allowance List
CASS	Consolidated Automated Support Systems
CLF	Combat Logistics Force
COMSEC	Communications Security
COTS	Commercial-Off-The-Shelf
EKMS	Electronic Key Management System
ESG	Expeditionary Strike Group
FISP	Fly-In Support Package
FLIR	Forward Looking Infrared Radar
IMA	Intermediate Maintenance Activity
IMRL	Individual Material Readiness List
JASMMM	Joint Aviation Supply and Maintenance Material Management
JOPES	Joint Operation Planning and Execution System
KEYMAT	Keying Material
LDO	Limited Duty Officer
MALSP II	Marine Aviation Logistics Support Program II
MEF	Marine Expeditionary Force
MOS	Military Occupational Specialty

MPF(F)	Marine Preposition Force (Future)
MPS	Maritime Preposition Ship
OEM	Original Equipment Manufacturer
OJT	On-the-job-training
OMA	Organizational Maintenance Activity
PBL	Performance Based Logistics
PEB	Pre-expended Bin
PME	Professional Military Education
RESP	Remote Expeditionary Support Package
RFI	Ready-For-Issue
RIFLe	Relevant Information For Leadership
TAVB	Aviation Logistics Support Ship
TLOC	Tactical Logistics Officer’s Course
TOC	Theory of Constraints
TPFDD	Time Phased Force Deployment Data
WO	Warrant Officer
WRA	Weapons Replaceable Assembly

I. INTRODUCTION

This thesis identifies training and education requirements of Marine Corps aviation logistics officers, contingent on core sea-basing principles and concepts. Although this thesis is tailored towards aviation logistics, its applicability extends across the broad spectrum of Marine Corps logistics.

The success of military operations depends on many factors. Of these, logistics continues to be a force multiplier (Commandant of the Marine Corp (CMC), 1997). While logistics has not been shown to be the sole factor in winning wars, shortfalls therein have been directly attributed to losing many (CMC, 1997). An example of this is the analysis of the German defeat in World War II. Goralski and Freeburg (1987) describe how, from the beginning of the war until the end, inadequate transportation infrastructure, combined with fuel and oil shortages, plagued nearly every German offensive operation. Consequently, senior German officers were forced to build campaigns around deficiencies of equipment, supplies, and sometimes manpower. The penalty of scarcity was defeat.

The transportation of people, material, and equipment to support military operations evolved considerably during the decade of the 1990s. The process of transporting people and material to a designated place and at a designated time depends on the availability of well trained and educated logistics officers, dedicated to the mission of meeting the time-sensitive demands of maneuver commanders on the battlefield. In this thesis we examine

the type of training that these aviation logisticians will require to support unit commanders in any engagement.

Due to advances in technology and in future warfighting capabilities of America's adversaries, the U.S. Navy has undertaken a series of changes designed to expand its capabilities across the full spectrum of warfare (Secretary of the Navy (SECNAV), 2002). The phrase "Naval Transformation" refers to the course of action developed to implement these changes. The Secretary of the Navy (2002) outlines the objectives of this transformation. Sea Power 21 (SECNAV, 2002) has been adopted as the strategy to drive this transformation.

Sea Power 21 rests on the following triad of capabilities:

- Sea Strike – Projecting precise and persistent offensive power;
- Sea Shield – Projecting global defensive assurance;
- Sea Basing – Using the sea as maneuver space to supply and pre-position crisis response forces.

Each leg of the triad contributes to the transformation process and each has its individual capabilities that support Sea Power 21. Sea Basing represents the foundation for Sea Strike and Sea Shield. Sea basing doctrine requires that Marine forces be reorganized and structured to always be in a state of readiness (SECNAV, 2002). As such, Marine transformation is a subset of Naval transformation.

The Marine Corps transformation process considers the individual Marine to be its most important resource, and is founded on four interdependent principles:

- Agile organizations: Adapting institutions to maximize the potential of both Marines and their units;
- Operational changes: Concepts designed to tactically and strategically project power across the littorals;
- Innovations in technology: Taking advantage of innovations in technology to acquire weapons systems to support joint theatre level warfare;
- Business and acquisition processes: Rapid development of new capabilities while generating the most efficient use of the nation's resources (SECNAV, 2002).

As the Marine Corps strives to support Naval transformation, it is increasingly important that its logistics officers be properly trained to support the required changes.

A. TRANSFORMATION AND THE TRIAD OF CAPABILITIES

The purpose of Naval transformation is to support joint initiatives not only across the armed services, but also with allied and coalition forces around the globe. The Navy and Marine Corps, through enhanced naval capabilities, seek to produce and exploit a dispersed battle space within which sustainable naval, air, ground, and space elements form a unified force that can project offensive power and defensive capability (SECNAV, 2002). Attainment of this posture is contingent on the development

of the three capabilities (Sea Shield, Sea Strike, and Sea Basing), which are discussed separately below.

1. Sea Strike

The purpose of Sea Strike is to project precise and persistent naval power in joint campaigns across the globe (SECNAV, 2002). This capability is to be achieved by combining information gathering along with effective and efficient management processes to deliver precision firepower in theatres of operations.

2. Sea Shield

The purpose of Sea Shield is to project global defensive assurance (SECNAV, 2002). This capability is to be achieved by integrating homeland defense with forward deployed naval forces and intelligence and law enforcement agencies to intercept threats before they materialize. Critical to the success of Sea Shield is information gathering and networked intelligence to help protect not only home shore lines but also forces at sea and abroad.

3. Sea Basing

Sea basing represents a shift from current amphibious doctrine of landing on a beachhead, securing it, and then assaulting inland objectives (SECNAV, 2002). The objective of sea basing is to project power from the sea directly to military objectives using a network of specialized transportation and weapons systems. Sea basing does not require forces to establish footholds on land, thereby eliminating the need for operational pauses as forces and supplies are combined for strikes against inland enemy objectives (Lowe, 2004). ForceNet is the communications infrastructure that provides the framework for integrating people, sensors, command and control, platforms, and

weapons systems that bind the triad of capabilities (SECNAV, 2002).

Figure 1 depicts the triad of capabilities of the transformation process, which is also the foundation of Sea Power 21. Sea Trial, Sea Warrior, and Sea Enterprise are the three supporting processes of the triad designed to encourage continuous innovations (SECNAV, 2002). Sea Trial's designated purpose is to integrate new concepts and technology to support future warfighting capabilities. Sea Warrior provides training to Marines and sailors on changes to warfighting functions brought about by Sea Power 21. The role of Sea Enterprise is to design programs and practices to assess Navy organizations, target areas for improvement, prioritize investments, and to fund them accordingly (SECNAV, 2002).

Figure 1. Triad of Sea Power 21 Capabilities (from SECNAV, 2002)

The three legs of Sea Power 21, together with the three supporting concepts of Sea Trial, Sea Warrior, and Sea Enterprise. ForceNet is the communication framework for combining the triad.

B. RESEARCH FOCUS

The transformation represented by Sea Power 21 extends to Marine Corps aviation logistics, which must accommodate new technology and adapt to new deployment strategies. The purpose of this thesis is to identify the kinds of training that are needed to support this transformation.

The Marine Corps aviation logistics community is organized by four commodity classes:

- Aviation Supply,
- Aircraft Maintenance,
- Avionics, and
- Aviation Ordnance.

The aviation supply and aircraft maintenance classes have unrestricted Military Occupational Specialties (MOS), which prepare future commanders for the Marine Aviation Logistics Squadrons (MALS) and Wing and Marine Forces (MARFOR) aviation logistics department heads. The restricted MOSs, Limited Duty Officer (LDO) and Warrant Officers are the technical experts for the commodity class. Table 1 shows the commodity classes and the types of officers that belong to each class.

	Unrestricted	LDO	Warrant Officer
Supply	X		X
Maintenance	X	X	X
Avionics		X	X
Ordnance		X	X

Table 1. Aviation Commodity Classes and Marine Corps Officer Rank Structure

A brief summary of the activities of each MOS is provided below.

1. Aviation Supply

Aviation supply officers are responsible for planning, directing, and controlling the performance and execution of aviation supply functions (Commandant of the Marine Corps (CMC), 2004). The restricted aviation supply operations officer MOS was dissolved in 1998. As those Warrant Officers became eligible for retirement and left the Marine Corps, much of the depth and breadth of knowledge and experience of the supply community was lost as well. As such, this loss of structure requires that supply officers be trained more thoroughly in daily supply functions.

2. Aviation Maintenance

Aviation maintenance officers supervise and coordinate aircraft maintenance and repair activities. The LDO and Warrant Officers are also responsible for technical aircraft maintenance and aeronautical repairs. The unrestricted officer’s career path can lead to command of a MALS. The restricted maintenance officer’s career path focuses on the technical, procedural, planning and managerial details associated with organizational and intermediate level maintenance in support of shore-based, sea-based, and expeditionary operations (CMC, 2004).

3. Avionics

Avionics officers are responsible for the handling, processing, and repair of avionics and avionics support equipment (CMC, 2004). Avionics officers provide services of a more technical nature, which requires that they be trained on future airframes and capabilities.

4. Ordnance

Ordnance officers manage all aviation ordnance functions. Their duties range in scope from the storage and handling of ammunition to the repair of aviation armament handling and testing equipment (CMC, 2004). These are restricted warrant officers and LDOs who have demonstrated aviation ordnance qualification throughout their careers.

C. ORGANIZATION OF THESIS

As part of the thesis research, we conducted a survey of more than 350 Marine Corps logistics officers to identify areas for further training in order to prepare them for the transformation envisioned by the Sea Basing initiative. The thesis reports our findings from this survey.

The remainder of this thesis is organized as follows. Chapter II provides additional background information on sea basing, sea based logistics, and on the training of logistics officers. Chapter III describes the design and administration of the survey, and Chapter IV presents the results of analyses conducted with the survey data. Conclusions and recommendations for further research are presented in Chapter V.

II. MARINE CORPS AVIATION AND SEA BASING

A. SEA BASING BACKGROUND

Marine Corps aviation has seen continued growth in complexity of its aircraft, operational war fighting plans, service and joint logistical environments, and technical architecture of the aviation logistics MOSs. However, only nominal maturation has occurred in the process of preparing aviation logistics officers to manage the changing environment.

The Naval services has been developing the sea basing concept to reduce or eliminate the logistical footprint on shore once a response force has been activated. The objective of sea basing is to pre-position and support a Marine Expeditionary Brigade (MEB) capable of assaulting an objective more than 200 miles inland from a fleet of ships and specialized sea-based platforms (Lowe, 2004). Beddoes (1997) explored the possibility of the sea base supporting three different warfighting scenarios with 628, 546, and 117 Marine Corps personnel respectively. He observed that the given available combat service-support assets did not support a traditional ground force mix of the 628 or 546 Marines at distances envisioned by sea basing doctrine, but supported the smallest team with 117 Marine personnel.

Although Sea Basing is presented as part of the larger transformation process, the concept is not new. From the island-hopping campaigns of World War II to the ship-staged aerial assaults by Marines in Afghanistan in 2001, sea-based operations have long been a key element of military operations (Lowe, 2004). Not only must logistics officers understand their respective functions in a sea-based

environment, they must also be flexible enough to support military operations during crises.

B. LOGISTICS AND SEA BASED LOGISTICS

The Commandant of the Marine Corps observed that "Logistics transforms manpower, natural resources, and industrial capacity into units, weapons, equipment, and supplies" (CMC 1997, p. 4). Sea-based logistics requires that Marine forces have light configurations, mobility, and no support base established ashore. The term "sea-based logistics" began to appear frequently in Marine Corps publications in 1997 with the publications of Operational Maneuver from the Sea (OMFTS) (CMC, 1997) and Ship to Objective Maneuver (STOM) (CMC, 1997). Both publications present models of how the Marine Corps intends to fight in future engagements.

1. Sea-based Logistics

In 1998, Lieutenant General J.E. Rhodes (Commanding General, MCCDC) and Rear Admiral G.S. Holder (Commander, NDC) described how the U.S. Navy intends to integrate its military operations, logistics, and warfighting capabilities under sea basing (Rhodes and Holder, 1998). The doctrine that they describe provides guidance on how sea-based logistics would influence OMFTS, and it recognizes five fundamental changes that Naval forces would have to undergo in order to operate in a sea-based environment:

- Primacy of the sea base: Using the sea as unopposed maneuver space to be able to strike inland military objectives from over-the-horizon through the use of forces pre-positioned in theatre.

- Reduced demand: Refining the operational and logistics posture to increase efficiency and place lighter forces ashore.
- In-stride sustainment: The coupling of sea-based ship to objective distribution through the use of network-based automated logistics support systems.
- Adaptive response and joint operations: Integrating joint theatre logistics to accomplish expanded missions.
- Force closure and reconstitution at sea: Successfully building and restoring combat power.

2. Impact on Marine Corps Aviation Logistics

Sea-based logistics changes the manner in which military units are resupplied. Traditionally, Marine Corps aviation logisticians depended on a network of land-based runways, repair facilities, and well-trained officers to move parts and other requisitioned items from the continental United States (CONUS) to theatres outside the continental United States (OCONUS). The advent of sea basing and sea-based logistics presents new challenges to Marine aviation logistics officers because requisitioned items move directly from the sea base to the supported unit.

In a report from Operation Iraqi Freedom (OIF) Klein and Morales (2004) addressed logistics support from a sea base. They identified automated material handling systems, such as the future selective offloading capability, as a possible way to locate, identify, and deliver sea-based

supplies and equipment rapidly ashore. Marine aviation logistics officers will need training on automated material handling systems as well as improved supply chain processes to ensure that the maneuver units are supported.

C. TRAINING & EDUCATION

Most of the literature on the training of aviation logisticians addresses the methods of educating officers in general terms. In addressing the duties of aviation supply and maintenance officers in an Air Command Element, Knapp (2001) emphasizes the importance of aviation logistics support. Knapp observes that there is no effective substitute for training and experience, and that on-the-job training and Professional Military Education (PME) are not adequate substitutes for this training.

CMC (1997) addresses education in terms of warfighting capabilities and relationships:

> Likewise, the professional education of the logistician cannot focus merely on the techniques and procedures of the logistics system; it must begin with the study of the larger art of war (Logistics, p. 107).

Unless logisticians understand the design of campaigns and the character of the supported force, supply channels will not be able to meet the needs of the Naval forces that operate in a sea-based environment.

Also important to this training effort is education through training exercises. Aviation logistics officers must be trained in their areas of expertise and their knowledge must be tested under difficult circumstances. Training that integrates supported forces and a logistics unit is essential. Scripted training leads to a false

sense of security and could be detrimental in stressful combat environments (MCDP-4, 1997).

As the Naval services continue to evolve, sea basing has emerged as a major factor in how military forces are trained, organized, and supplied in hostile environments. The Marine Corps is committed to support Naval Transformation by providing the necessary education and training to its aviation officers.

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III. METHODOLOGY

The objective of our research is to describe the training and education requirements of Marine Corps aviation logistics officers in a sea-based environment as Naval Transformation evolves. To meet this objective, we administered a computerized survey to the four specialties of aviation logistics officers (Supply, Maintenance, Avionics, and Ordnance) to determine their training needs. This chapter describes the design and methodology of the survey. In Chapter IV we present the results of the survey.

The survey was made available to Marine Corps aviation logistics officers by means of an external link to the U.S. Naval Postgraduate School's website. Respondents were asked to complete the survey within a two-week period during the spring of 2004. Approximately 44 percent of all officers in the targeted communities submitted usable survey responses.

A. SURVEY DESIGN

In February 2004 we interviewed aviation logistics officers located at the Third Marine Aircraft Wing in Miramar, CA to learn about their perceived educational and training needs in a sea-based environment. These interviews assisted in the development of a set of preliminary survey questions. After a review of the preliminary survey questions by the thesis sponsor, the final survey was composed and entered into Microsoft® FrontPage (version 2002) to make it electronically available to the survey respondents. The survey was placed on a website operated by the Naval Postgraduate School.

Officers were then able to complete the survey by navigating to the website and activating the survey.

The survey was administered in four sections, one for each commodity class that was targeted (Supply, Maintenance, Avionics, and Ordnance). The first page of the survey elicited descriptive information from the respondents: their rank, MOS, length of time in MOS school, and length of time in the military. After completing the first page respondents were directed to the second phase of the survey, in which they were asked a set of survey questions tailored to their respective communities. Most of the questions in the second phase elicited disagreement or agreement from the respondents using a five-point Likert scale, with 1 indicating strong disagreement, and 5 indicating strong agreement.

The supply officers' survey comprised 25 questions, two of which required text responses. The questions focused on issues related to acquisition, supply chain management processes, advanced training courses, and management training.

The maintenance officers' survey comprised 21 questions, three of which required text responses. The questions focused on issues related to joint training, MOS school, and acquisition.

The avionics officers' survey comprised 13 questions, three of which required text responses. The questions focused on issues related to avionics-specific technical training, advanced training, and additional training as it relates to sea basing.

The ordnance officers' survey comprised 12 questions, two of which required responses. The questions focused on issues related to ordnance specific training, advanced training, and additional training.

B. RESPONDENTS

The respondents for this survey were the unrestricted and restricted component officers of aviation supply, maintenance, avionics, and ordnance. The following table shows the numbers of active duty officers in each community as of September 13, 2004 and the numbers that responded to the survey:

Aviation Logistics Community	Number of Officers	Number of Respondents	Percent of Community Responding
Supply	243	132	54
Maintenance	393	113	29
Avionics	134	93	69
Ordnance	96	42	42
TOTAL	**866**	**380**	**44**

Table 2. Number of Survey Respondents with Corresponding Personnel End Strength Per Commodity Class

Numbers of Marine Corps active duty officers are provided by the Aviation Logistics Support Section, Headquarters United States Marine Corps, Washington, D.C. Number of officers per community is the number of Marine Corps active duty officers as of 09/13/2004.

As shown in Table 2, more than two-thirds of the avionics community completed the survey, compared to less than one-third of the maintenance community. Whether or not an officer chose to complete the survey was a voluntary decision. Different patterns of deployment across these

communities may have affected their access to the internet or their available time to complete the survey in different ways. Nonetheless, these response rates are not unusual for surveys in which participation is voluntary.

C. DATA CAPTURE

Respondents completed the survey by accessing it via the Internet, and then submitted their results by clicking an icon on the survey web page. The survey data were collected at an external website linked to the U.S. Naval Postgraduate School's main web address. Unfortunately, some data were lost or rendered unusable in this process. Of the 380 responses received only 73 had information from the first phase of the survey captured in the data base. And, none of the first-phase responses that were captured were linkable to the second-phase responses.

Because of this technical failure in data capture, it is not possible to analyze the second-phase results together with those from the first phase. However, this loss does not prevent important inferences from being made about the training needs of Marine Corps aviation logistics officers in their respective commodity classes. In the following chapter we analyze the responses to questions from the second phase of the survey to address these issues.

IV. ANALYSIS

A. DATA

After final data collection, the data were transferred to an Excel spreadsheet and examined for errors. We found that the data set contained multiple entries of some of the survey responses. In order to identify repeated records, we compared survey responses of successive records, in particular the text responses for which identical responses were not likely to be coincidental. We also compared the time stamps and computer host (IP) addresses of successive records. Records that came from the same IP address, were time-stamped less than one minute apart, and had identical survey responses were regarded as duplicates. Duplicate records were flagged by augmenting the data set with an additional field.

B. ASSUMPTIONS

The objective of the survey is to characterize the state of opinion with regard to training among aviation officers with specializations relevant to sea-basing. A basic assumption that underlies our analysis is that officers who responded to our survey are typical of officers within their respective communities. As is typical of most surveys, ours did not constitute exhaustive samples of the four Marine Corps aviation communities that were targeted. Overall, 44 percent of the targeted communities responded to the survey. We adopt an assumption that the respondents can be treated as if they were randomly sampled from essentially infinite populations. The latter is appropriate because the officers who constitute the communities of interest to this

research are changeable, so that even an exhaustive survey would not have targeted a fixed, stable population for a significant period of time. In addition, treating the populations as infinite in size leads to more conservative inferences because the variability of random sampling from finite populations is smaller than it is from infinite populations.

Many of the survey questions elicit preferences on a five-point Likert scale, with one indicating strong disagreement and five indicating strong agreement. At times it is convenient for us to combine response values of one and two into a “weak preference” category, and four and five into a “strong preference” category.

C. THE SUPPLY COMMUNITY SURVEY

At the time that the survey was administered there were approximately 243 Marine Corps aviation supply officers, of whom 132 (54 percent) submitted usable survey responses. Our analysis of their responses is guided by the following six study questions:

1. Does the option of replacing or eliminating a department head tour affect a supply officer’s decision to accept a tour in acquisition?
2. Which types of supply chain management training are most preferred by supply officers in preparation for sea basing?
3. Do supply officers believe that acquisition training is important for career progression or promotion opportunities?

4. Do supply officers indicate a strong preference to learn the Navy's logistics process onboard ship to successfully transition into a sea base?

5. Is there a preference for more inter-service or joint service training as supply officers prepare for sea basing?

6. What training in addition to those areas mentioned in the survey do supply officers prefer as sea basing continues to evolve?

The six study questions above are motivated both by the high levels of responses of the survey on the Likert scale as well as the supply officer's text responses provided in questions 23 and 24. We will present an analysis for each of the study questions in separate subsections below.

1. Supply Study Question 1: Tours in Acquisition

The purpose of the first study question is to ascertain the degree of willingness in the supply officer community to accept billets in acquisition if the tour either counted as or replaced a department head tour; or if the acquisition billet prevented the supply officer from qualifying for a department head tour. The following two questions from the supply community survey address this issue:

Q20: I will accept a tour in acquisition if it could replace an eventual department head tour.

Q21: I will accept a tour in acquisition even if it prevents me from getting a department head tour.

Both questions are answered on a five-point Likert scale, with an option to answer "not applicable". The latter are not used in the analysis of this study question.

Of the 132 supply officers that responded to the survey, 99 gave non-missing responses to both Q20 and Q21. Our analysis therefore is limited to these 99 survey responses.

Being prevented from getting a department head tour is widely understood to place an officer at a disadvantage for career advancement. Therefore, one would expect that responses to Q21 are lower than they are to Q20.

Supply officers indicate a clear lack of preference for a tour in acquisition if accepting such a tour would prevent them from becoming department heads. Of the 99 respondents 56 answered either one or two (low preference) to Q21 whereas only 30 answered either four or five (high preference). Allowing a tour in acquisition to count as a department head tour increases preference for a tour in acquisition, although more respondents continued to give it a low preference rating (42) than a high preference rating (38). Figure 2 shows the preference distributions based on responses to Q20 and Q21.

The degree of improved preference obtained by comparing Q20 and Q21 may be disappointing, in the sense that more officers continue to express a lack of preference for a tour in acquisition than a preference in favor of a tour. The improvement in preference is, however, statistically significant. We demonstrate this using the Sign Test based on the differences in responses to Q20 and Q21. Of the 99 differences 69 have values of zero (Q20 equal to Q21), 5 have negative values (Q20 less than Q21), and 25 have positive values (Q20 greater than Q21). For the Sign Test, only the 30 non-zero responses are used. We test the null hypothesis that the median difference is equal to zero versus the alternative hypothesis that the

median difference is greater than zero. The p-value for the Sign Test is the same as the probability that a binomial random variable with $n = 30$ and $p = .5$ is less than or equal to 5. This probability is less than 0.0002, which suggests that the null hypothesis is strongly rejected.

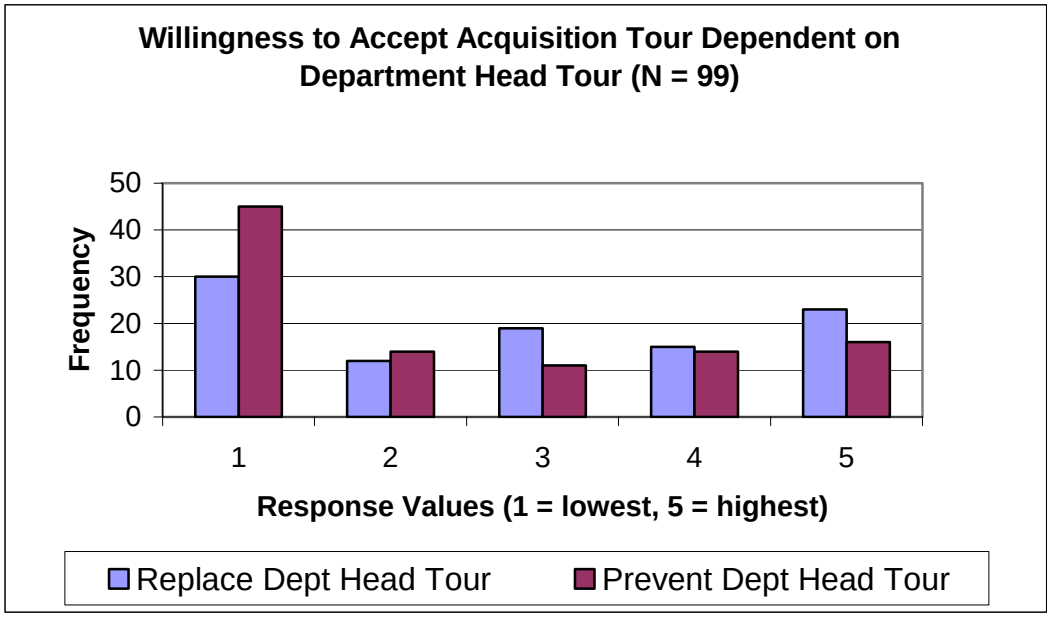

Figure 2. Marine Corps Supply Officers and Acquisition Tours

Supply officers' stated willingness to accept a tour in acquisition if the tour would serve in place of a department head tour, or to accept an acquisition tour if it meant that they were no longer considered for department head tour.

The results of the Sign Test indicate that supply officers are more willing to accept tours in acquisition billets if the tour would count as a department head tour vice being disqualified for a department head tour completely.

2. Supply Study Question 2: Supply Chain Management Training to Support Sea Basing

The second study question considers whether supply officers indicate differing preferences for various kinds of training related to supply chain management to help them prepare for sea basing. The following eight survey questions are analyzed to address this issue:

Q2: Supply officers should be trained on transportation and material movement.

Q4: Supply officers should have basic understanding of Defense Logistics Agency's and Naval Inventory Control Point's functions and procedures.

Q5: Supply officers should have basic knowledge of wholesale supply system.

Q7: Marines will need to learn to operate forward with T-AVBs in the future sea based environment.

Q13: Supply officers could use more management training as it relates to supply.

Q14: Enterprise Resource Planning is an upcoming concept within the supply community and supply officers should be trained and evaluated in its procedural applications.

Q15: Some areas where supply could use further training are: Supply replenishment, Shelf-Life Programs, ERP, procurement acquisition, TPFDD, JOPES, Reception Staging Onward & Integration.

Q19: A logistic officer will need to be well versed in acquisition training, procedures, and guidelines for the coming implementation of sea basing.

We use Friedman's Test for several related samples to determine if respondents indicate differing strengths of preference for the eight types of training mentioned in the study questions. Friedman's Test is an extension of the Sign Test that is used when comparing more than one treatment on a set of subjects (Conover, 1999). The null hypothesis is that treatments (questions related to training) on blocks (respondents) have the same distribution. The alternative hypothesis is that there is at least one pair of treatment for which one tends to have larger responses than the other. If the null hypothesis is rejected, then the issue becomes which treatments can be regarded as having higher responses than others. This issue is addressed using a follow-up multiple comparison procedure based on Friedman's Test, as explained in Conover (1999).

Of the 132 aviation supply officers who responded to the survey, 117 gave usable responses to each of the eight questions that are addressed in this analysis. The following table summarizes their responses to these questions.

Survey Question	Frequencies		
	Low Preference	High Preference	Neither
Q19	26	54	37
Q14	11	72	34
Q15	6	91	20
Q13	9	94	14
Q2	8	98	11
Q7	3	97	17
Q5	4	107	6
Q4	3	110	4

Table 3. Strengths of Responses of Supply Officers to Study Question Two

It is clear from Table 3 that supply officers indicate strong preferences for each of the training options presented in the eight survey questions. Friedman's Test, however, suggests that differences in preference between the questions is highly statistically significant. The test yields a chi-square value of 197.8 on seven degrees of freedom, which represents a p-value that is much less than .0001. The null hypothesis is therefore rejected.

Multiple comparisons based on Friedman's test produce the result indicated in Figure 3 and Table 4 presents these results in numerical form.

Q19 Q14 Q15 Q13 Q2 Q7 Q5 Q4

Figure 3. Multiple Comparison Procedure for Supply Specific Supply Chain Management Training

The lines over the Qs represent differences between questions that are not significant at the simultaneous five percent level.

	Q19	Q14	Q15	Q13	Q2	Q7	Q5	Q4
Rank Sums	332.0	414.0	507.5	511.5	577.0	579.5	630.0	660.5
Interval Width = **50.36028**								

Table 4. Multiple Comparisons Procedure for Supply Chain Management Specific Training

Ranks sums in increasing order. Any two rank sums greater than the interval width apart may be regarded as unequal. The questions rank least preferred (left) to most preferred (right).

Figure 3 and Table 4 indicate that Q19 and Q14 each had significantly lower preferences than the other questions, followed by Q15 and Q13 as a group, followed by Q2 and Q7 as a group, followed by Q5 and Q4 as the group with the highest preferences. Based on the survey responses, the most desired training is in the areas of wholesale supply (Q5) and DLA and NAVICP processes (Q4).

3. Supply Study Question 3: Importance of Acquisition Training for Career Advancement

The third study question focuses on the attitudes of aviation supply officers with regard to obtaining acquisition training and experience. The following two survey questions are analyzed to address this issue:

Q17: An acquisition tour could only strengthen my MOS credibility.

Q22: I believe that tours outside my MOS, such as acquisition, hamper my opportunity to be promoted with my peers.

Of the 132 supply officers who responded to the survey 106 gave usable responses to both of the survey questions.

Figure 4 shows bar graphs that summarize responses to these questions. For Q17 61 respondents indicated agreement (response values of four or five) and 21 indicated disagreement (response values of one or two). For Q22 25 respondents indicated agreement and 52 indicated disagreement.

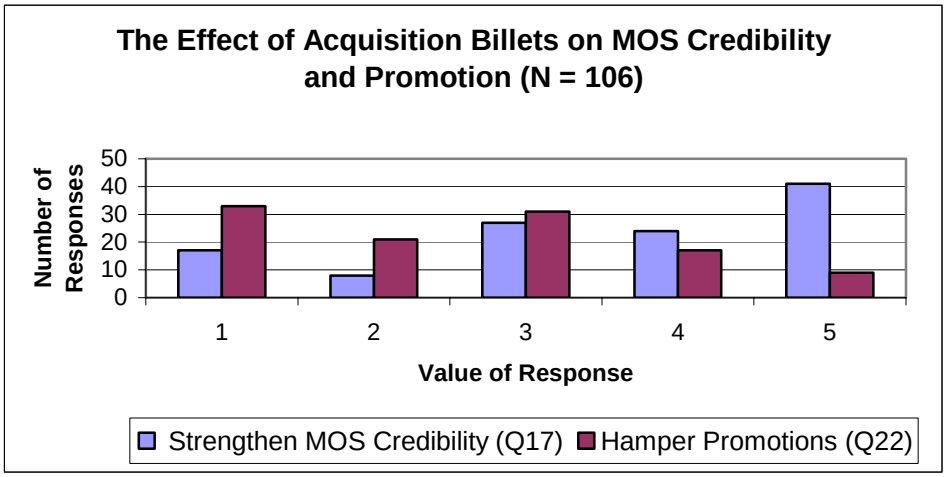

Figure 4. Effect of Acquisition Billets on MOS Credibility and Promotion Opportunities

We compare responses to Q17 and Q22 using the Sign Test on the differences (Q17 minus Q22). The differences yield 19 zeros, 65 values greater than zero and 22 values less than zero. The null hypothesis that the median of the differences is equal to zero is rejected in favor of the alternative that the median is greater than zero (p-value smaller than .0001). Based on the survey responses, supply officers believe that acquisition billets strengthen MOS credibility more than acquisition billets hamper promotion opportunities. Approximately 49 percent of all respondents responded that acquisition billets do not hamper promotion

opportunities. A 95 percent confidence interval based on this sample percentage is given by (40, 58).

4. Supply Study Question 4: Navy Logistics Onboard Ship

The fourth study question focuses on supply officers' preference for receiving training in Navy logistics while onboard ship. The following question will be used to address this issue:

Q1. Knowing more about Navy logistics onboard ship would facilitate more efficient operations in a sea-based environment.

Of the 132 supply officers who responded to the survey, 128 gave usable responses. Figure 5 provides a bar graph of the distribution of responses to Q1. For Q1, 101 officers indicated agreement (response values 4 or 5) and 13 indicated disagreement (response values 1 or 2). Seventy nine percent of respondents (101 out of 128) are in agreement and a 95 percent confidence interval based on this sample percentage is given by (71, 85). It is clear that supply officers consider learning Navy logistics onboard ship as important to understanding the flow of logistics in a sea-based environment.

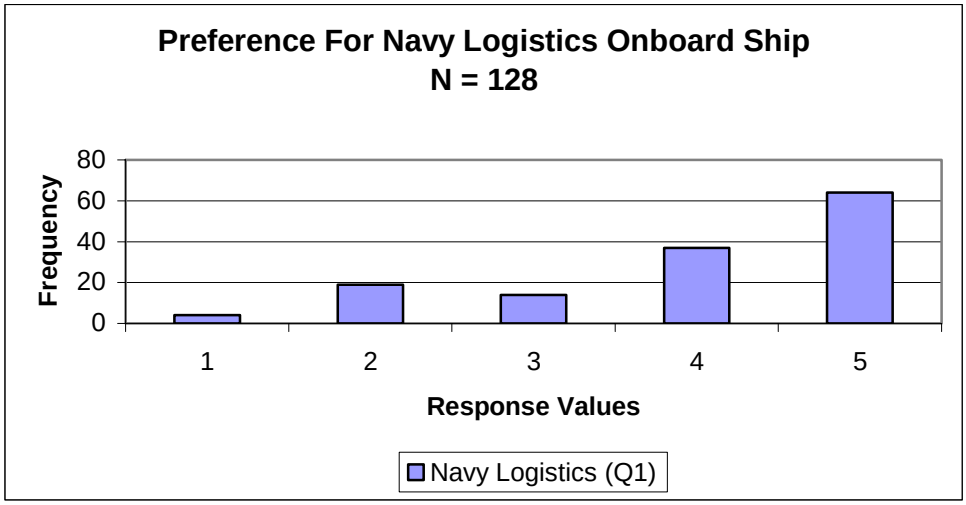

Figure 5. Preference for Navy Logistics Training Onboard Ship

5. Supply Study Question 5: Inter-service versus Joint Service Training

The fifth study question considers whether supply officers indicate differing preferences for attending inter-service or joint service short courses to help them prepare for sea basing. The following questions will be used to address this issue:

Q11: All supply officers should attend other commodity logistics officers' short courses.

Q12: All supply officers should attend other services logistics officers' short courses.

Of the 132 supply officers who responded to the survey, 127 gave usable responses to both of the survey questions. Figure 6 shows bar graphs that summarize responses to these questions. For Q11 92 respondents indicated agreement (response values of four or five) and 11 indicated disagreement (response values of one or two). For Q12 66 respondents indicated agreement and 20 indicated disagreement.

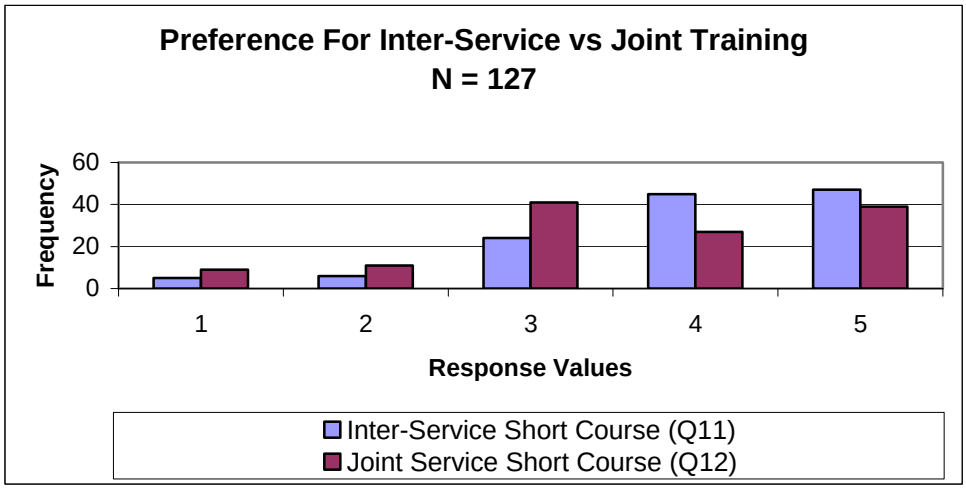

Figure 6. Supply Officer's preference for more inter-service or joint training

Supply officers indicate whether they prefer attending other commodity officer's short courses or other armed services short courses.

We compare responses to Q11 and Q12 using the Sign Test on the differences (Q11 minus Q12). The differences yield 80 zeros, 37 values greater than zero and 10 values less than zero. The null hypothesis that the median of the differences is equal to zero is rejected in favor of the alternative that the median is greater than zero (p-value smaller than .0001). Based on the survey responses, supply officers prefer attending other commodity logistics officer's short courses vice attending other armed services short courses. Approximately 73 percent of supply officers preferred to attend other commodity logistics officer's short courses. A corresponding 95 percent confidence level for this sample percentage is (65, 80). Approximately 52 percent of supply officers considered attending other

services' short courses as important as they transition into the sea base. A 95 percent confidence interval based on the sample percentage is (43, 60).

6. Supply Study Question 6: Additional Training

Study question six elicits the responses of supply officers for any additional training not specifically mentioned in the survey. The following questions provide the opportunity for supply officers to write, in text form, their responses and those responses are used to addresses this issue:

Q24: Please use this space to list additional training and education that you feel are needed as it relates to sea basing.

Q25: Please list any additional comments here.

Of the 132 supply officers who responded to the survey, 33 gave usable responses to Q24 and 44 gave usable responses to Q25. Approximately 25 percent of the supply officers answered Q24 and approximately 33 percent of supply officers answered Q25.

Figure 7 presents a bar graph of the four most frequently mentioned training areas in text responses to Q24 and Q25. These training areas were identified after manually tabulating the responses. One text response to Q24, for example, could indicate multiple training areas, and each of these would be included in the tabulations.

One of the most frequently mentioned suggestions for training concerned the Limited Duty Officer (LDO) rank structure, which is not a specific training area. The LDO rank structure was rendered obsolescent in the supply community in 1998. The LDO used to provide technical

guidance and leadership to both the Warrant Officers and junior unrestricted officers in the supply community. Plausibly, respondents who indicated "LDO" to Q24 or Q25 expressed a desire to restore this rank structure in order to enhance training and readiness.

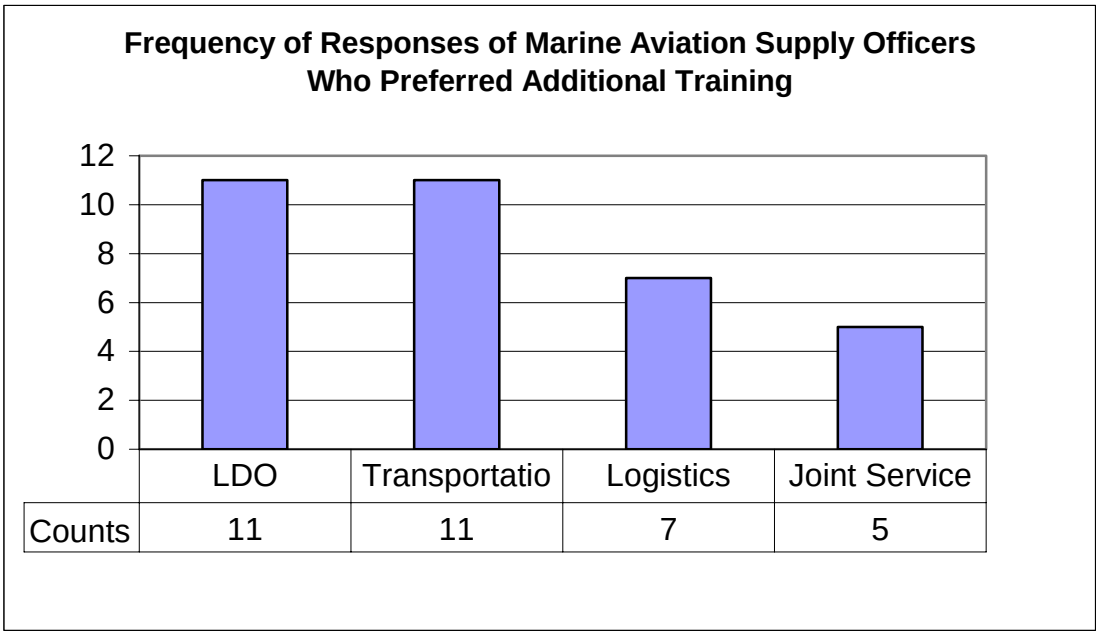

Figure 7. Four Most Frequently Mentioned Areas for Additional Training

Supply officers' preferences for additional training are Limited Duty Officer structure, transportation, logistics planning, and joint service logistics (JSL).

We discuss each of the five training areas in separate subsections below.

a. Supply: Limited Duty Officer Structure

Warrant Officers and LDOs are considered subject matter experts in any MOS. Table 1 in Chapter I shows the structure of unrestricted and restricted officers across the four commodity classes. LDOs used to be an integral part of the supply architecture but they were phased out in 1998. This is particularly important because every

commodity class has senior representation for their unrestricted officers except supply.

Supply officers respond significantly about the supply LDO because of the LDO's training value and experience that they provide to not only restricted officers but also to their junior unrestricted counterparts. Officers in other commodity classes also noted this loss of expertise in the supply community. One Marine avionics officer wrote,

> ...ask aviation supply officers...once they lost the LDO supply officer knowledge base, you had a vacuum of seasoned, [F]leet experienced leaders, able to train and educate the young emerging unrestricted officers. This is not to take away from the unrestricted ASO's [sic], but they lost "tools" from their toolboxes in the squadron and MALS. Once lost, structure is impossible to regain.

Other supply officers indicated similar concerns and recommended that the LDO structure be restored. The following comment is representative:

> Aviation Supply needs to reestablish the LDO program because the level of knowledge is slowly diminishing in the major and Captain ranks. Division officers need to have someone to go to and that would be well seasoned LDO Captain with experience in each division.

b. Supply: Transportation

Of the 56 respondents who answered either Q24 or Q25, 11 (20 percent) respondents expressed concerns over current transportation systems and networks. Currently Marine Corps aviation relies on commercial shippers to support deployment sites. Under Sea Basing the transportation of material will undergo substantial changes, and may be less reliant on commercial shippers.

Respondents recommended that training be provided on transportation so that they can coordinate this effort.

c. Supply: Logistics Planning

Of the 56 supply officers who responded to either Q24 or Q25, 7 respondents (13 percent) indicated logistics planning as important as they transition to a sea-based environment. Few supply officers believe that as the intermediate level maintenance support diminishes, officers will have to be trained more on support issues such as maintenance, personnel, transportation, material movement, and test and support equipment. Also, the few supply officers that mentioned logistics planning as critical, also mentioned that the future Sea Basing concept will require more stand-alone expeditionary logistics. They also indicate that training in logistics planning could lessen the burden of support left by the IMA scale down.

d. Supply: Joint Services Logistics

Of supply officers that responded to either Q24 or Q25, five supply officers (11 percent) identified joint service logistics as being critical to sea basing. Respondents indicated that since they will be operating in a joint environment, it is necessary that they understand how the other armed services carry out their logistics functions. Respondents expressed that they anticipate working with the Army and Air Force in much greater capacities in the future.

D. THE MAINTENANCE COMMUNITY SURVEY

At the time that the survey was administered there were approximately 393 Marine Corps aviation maintenance officers (restricted and unrestricted), of whom 113 (29 percent) submitted usable survey responses. Our analysis is motivated by maintenance-specific training issues such

as parts management and supply connectivity. Also, we explore the effect of acquisition on a maintenance officer's preference to receive this type of training. The following study questions guide our analysis:

1. Which recommended changes in MOS school structure are regarded as most important by maintenance officers?
2. Do maintenance officers prefer joint logistics training with the Air Force to other inter-service joint logistics training as they transition into a sea base?
3. Does the option of eliminating or accepting acquisition billets in lieu of department head tours affect a supply officer's decision to accept a tour in acquisition?
4. Do maintenance officers indicate a need for T-AVB specific training as Sea Basing doctrine evolves?
5. Which groups of officers (restricted or unrestricted) prefer training on force deployment planning and execution?
6. How do maintenance officers respond to the establishment of the primary acquisition career track?
7. What additional training do maintenance officers indicate as being necessary for operating in a sea-based environment?

We will present an analysis for each of the study questions in separate subsections below.

1. Maintenance Study Question 1: MOS School Focus

The first study question considers which areas of focus for MOS school are regarded as most important to help maintenance officers prepare for sea basing. The following three survey questions are analyzed to address this issue:

Q3: My MOS school should focus more on Marine Corps squadrons with a heavy maintenance perspective.

Q4: My MOS school would be better utilized if the first half of training was limited to officers new to the MOS.

Q5: Aviation Maintenance Officers need more MOS instructors that are proficient in management processes.

We use Friedman's Test for several related samples to determine if respondents indicate different strengths of preference for the three types of MOS school focus mentioned in the survey questions. The null hypothesis is that treatments (questions related to MOS school focus) on blocks (respondents) have the same distribution. The alternative hypothesis is that there is at least one pair of treatment for which one tends to have larger responses than the other. If the null hypothesis is rejected, then the issue becomes which treatments can be regarded as having higher responses than others. This issue is addressed using a follow-up multiple comparison procedure based on Friedman's Test as previously discussed in the second study question of the supply officer's community above.

Of the 113 maintenance officers that took the survey, 99 gave usable responses to each of the three questions of this analysis. Table 5 summarizes their responses to these questions.

Survey Question	Frequencies		
	Low Preference	High Preference	Neither
Q4	32	47	20
Q5	23	53	23
Q3	20	64	15

Table 5. Preferences of Marine Corps Maintenance Officers for MOS School Focus

Fifty five percent of maintenance officers that responded to the survey recommended having instructors more proficient in management processes. A 95 percent confidence interval for this percentage is (46, 64). Forty seven percent indicated that the first half of school should be limited to those officers new to the MOS, with a 95 percent confidence interval of (38, 57).

It is clear from Table 5 that supply officers indicate strong preferences for each of the training options presented in the three survey questions. Friedman's Test, however, suggests that differences in preference between the questions is statistically significant. The test yields a chi-square value of 10.3162 on two degrees of freedom, which represents a p-value of .0058. The null hypothesis is therefore rejected.

Because the null hypothesis above is rejected, we next apply a multiple comparisons procedure to identify which treatments differ significantly from others. The results of the multiple comparison based on Friedman's Test is depicted in Figure 8. Table 6 reports these results in numerical form.

Q4 Q5 Q3

Figure 8. Results of the Multiple Comparison Procedure

	Q4	Q5	Q3
Rank Sums	180.0	195.5	218.5
Interval Width = 23.2785			

Table 6. Multiple Comparisons for MOS School Focus

Rank sum differences greater than the interval width apart are significant at the five percent level.

This result suggests that Q4 had significantly lower preferences than Q3. No other differences were detected as significant. Based on the survey responses, the most desired MOS school focus is on Marine Corps squadrons with a heavy maintenance perspective (Q3).

2. Maintenance Study Question 2: Joint versus Inter-service Logistics Training

The second study question addresses the attitudes of maintenance officers with regard to either receiving joint training with other armed services or inter-service training. The following two questions address this issue:

Q6: There should be joint logistics classes taught with the Naval services and the Air Force to ease the transition to the sea base.

Q7: All maintenance officers should attend the Joint Aviation Supply and Maintenance Material Management Course (JASMMM).

Of the 113 maintenance officers that responded to the survey, 107 gave usable responses to both survey questions.

For Q6 58 respondents indicated agreement (response values of four or five) and 21 indicated disagreement (response values of one or two). For Q7 87 respondents indicated agreement and 10 indicated disagreement.

We compare responses to Q6 and Q7 using the Sign Test on the differences (Q6 minus Q7). The differences yield 37 zeros, 11 values greater than zero and 59 values less than zero. The Sign Test uses only the 70 non-zero values in the analysis. The null hypothesis that the median of the differences is equal to zero is rejected in favor of the alternative that the median is less than zero (p-value smaller than .0001). Based on the survey responses, maintenance officers prefer attending JASMMM vice attending classes taught with the Naval services and the Air Force. Maintenance officers strongly indicated their preference to attend JASMMM to help understand other aviation logistics communities' functions and responsibilities particularly in a sea based environment.

3. Maintenance Study Question 3: Acquisition Tours

The purpose of the third study question is to ascertain the degree of willingness in the maintenance officer community to accept billets in acquisition if the tour either counted as or replaced a department head tour; or if the tour did not disqualify an officer for a future department head tour. The following two questions from the maintenance community survey address this issue:

Q12: I would be willing to accept a tour in acquisition if it could replace a department head tour.

Q13: I would accept a tour in acquisition with the provision that I still be considered for a department head tour.

Of the 113 maintenance officers that responded to the survey, 91 gave usable responses to both survey questions. For Q12 30 respondents indicated agreement (response values of four or five) and 43 indicated disagreement (response values of one or two). For Q7 44 respondents indicated agreement and 29 indicated disagreement.

Being prevented from getting a department head tour is widely understood to place an officer at a disadvantage for career advancement. However, the two survey questions used in this analysis address whether the respondent would accept a tour in acquisition if it either counted as a department head tour or if the respondent remained eligible to receive a department head tour.

Figure 9 summarizes the responses to Q12 and Q13. It is clear that the survey respondents do not show a clear preference for acquisition tours.

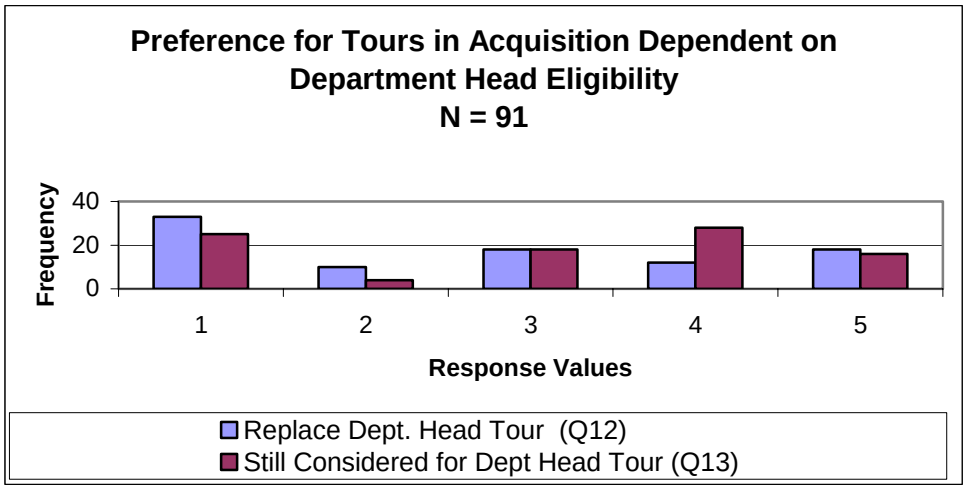

Figure 9. Maintenance Officer's Preference for Acquisition Billets

Although there is no clear preference for acquisition tours indicated in responses to either question, the

results of the Sign Test indicate that the difference in responses is statistically significant. Applying the Sign Test (Q12 minus Q13) yields 53 zeros, 10 values greater than zero and 28 values less than zero. The null hypothesis that the median of the differences is equal to zero is rejected in favor of the alternative that the median is less than zero (p-value smaller than .0002). Based on the survey responses, maintenance officers more greatly prefer accepting tours in acquisition with the provision that it replace a department head tour than if they merely remained eligible for a department head tour.

4. Maintenance Study Question 4: T-AVB Training for Sea Basing

The fourth study question focuses on maintenance officers' preference for receiving training on the aviation logistics support ship (T-AVB) as the transition continues to sea-based warfare. The following survey question is used to address this issue:

Q8. Maintenance officers should receive training on basic deployment operations with the T-AVB due to the increasing realization of sea basing.

Of the 113 maintenance officers who responded to the survey, 110 gave usable responses to the survey question. For Q8, 78 officers indicated agreement (response values 4 or 5) and 11 indicated disagreement (response values 1 or 2). There is evidence that maintenance officers consider training on the T-AVB to be important.

Of the 110 maintenance officers that responded to Q8 71 percent stated agreement with the need to T-AVB training. A 95 percent confidence interval based on this sample percentage is (62, 79).

5. Maintenance Study Question 5: Force Deployment Planning

This purpose of this study question is designed to ascertain whether restricted or unrestricted maintenance officers should be familiar with Force Deployment Planning at the Marine Aviation Logistics Squadron (MALS). The following survey questions address this issue:

Q15: Unrestricted Maintenance Officers need to be familiar with Force Deployment Planning and Execution (e.g., MAGTF II/LOG AIS, MDSS II, JOPES, TPFDD, GUDL, MDL) at the MALS level.

Q16: Restricted Maintenance Officers need to be familiar with Force Deployment Planning and Execution (e.g., MAGTF II/LOG AIS, MDSS II, JOPES, TPFDD, GUDL, MDL) at the MALS level.

Of the 113 maintenance officers that responded to the survey, 106 provided usable responses to both survey questions. For Q15, 94 officers indicated agreement (response values 4 or 5) and 6 indicated disagreement (response values 1 or 2). For Q16, 78 officers indicated agreement (response values 4 or 5) and 7 indicated disagreement (response values 1 or 2). Figure 10 shows the distributions of the responses for both of the survey questions.

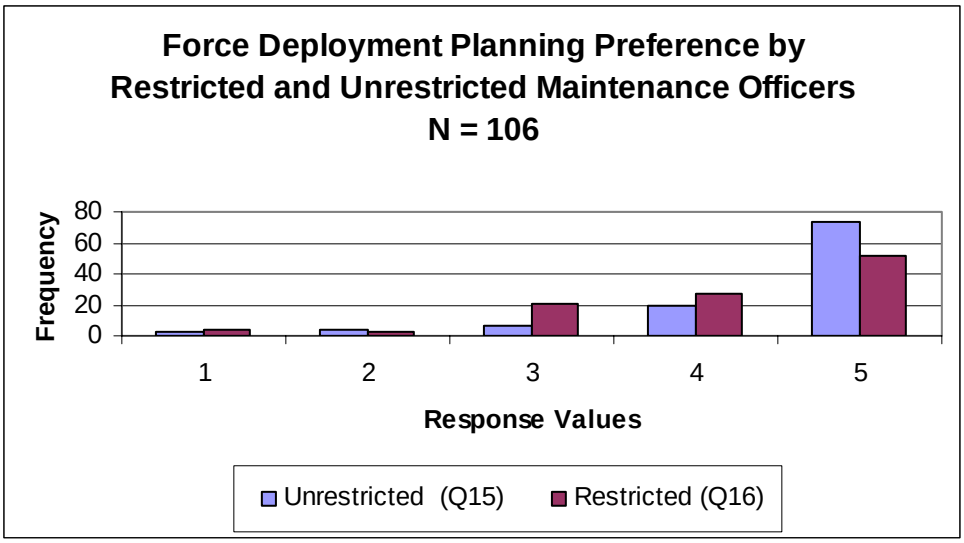

Figure 10. Force Deployment Planning at the Marine Aviation Logistics Squadron

Although Figure 10 does not exhibit an obvious difference in the distribution of responses between unrestricted and restricted officers, the Sign Test indicates that the difference (Q15 minus Q16) is statistically significant. The differences yield 67 zeros, 33 values greater than zero and 6 values less than zero. The null hypothesis that the median of the differences is equal to zero is rejected in favor of the alternative that the median is greater than zero (p-value smaller than .0001). Based on the survey responses maintenance officers indicate that unrestricted officers has a greater need to become familiar with force-deployment planning at the MALS level in preparation for sea basing than restricted officers.

6. Maintenance Study Question 6: Primary Acquisition Career Track

This study question considers the attitudes of maintenance officers toward the establishment of a primary

acquisition career track. The following survey question addresses this issue:

Q19: Flag Officers recently approved the establishment of a primary acquisition career track. What impact does that have on the 6002 MOS?

Figure 11 summarizes the distribution of responses for this survey question.

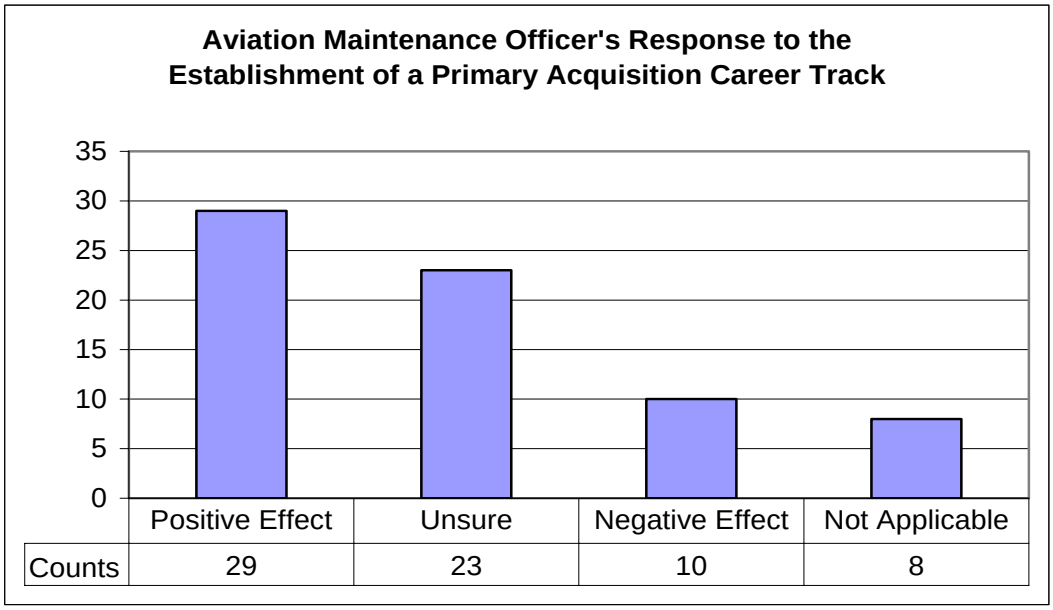

Figure 11. Marine Maintenance Officer's Responses on the Establishment of a Primary Acquisitions Track

Based on a total of 70 survey responses.

Of the 39 respondents who assigned either positive or negative value to establishment of a primary acquisition track, 29 (74 percent) assigned positive value and 10 (26 percent) assigned negative value. Using the Sign Test under the null hypothesis that the percentages are equal

versus the alternative that the percentage in favor is greater than the percentage not in favor, the p-value is equal to .0017. There is a statistically stronger indication in favor of a primary acquisition track than opposed to it.

7. Maintenance Study Question 7: Additional Training

This study question considers maintenance officer's preference for additional training that was not previously mentioned in the survey. Maintenance officers were provided an opportunity to type in a text box, their suggestions for additional training that would benefit the community. The following survey questions address this issue:

Q20: Please use this space to list additional training and education that you feel are needed as it relates to sea basing.

Q21: Please list any additional comments here.

Of the 113 maintenance officers who responded to the survey, 63 (56 percent) gave usable responses to either Q20 or Q21. Figure 12 presents the results of the five most frequently occurring responses.

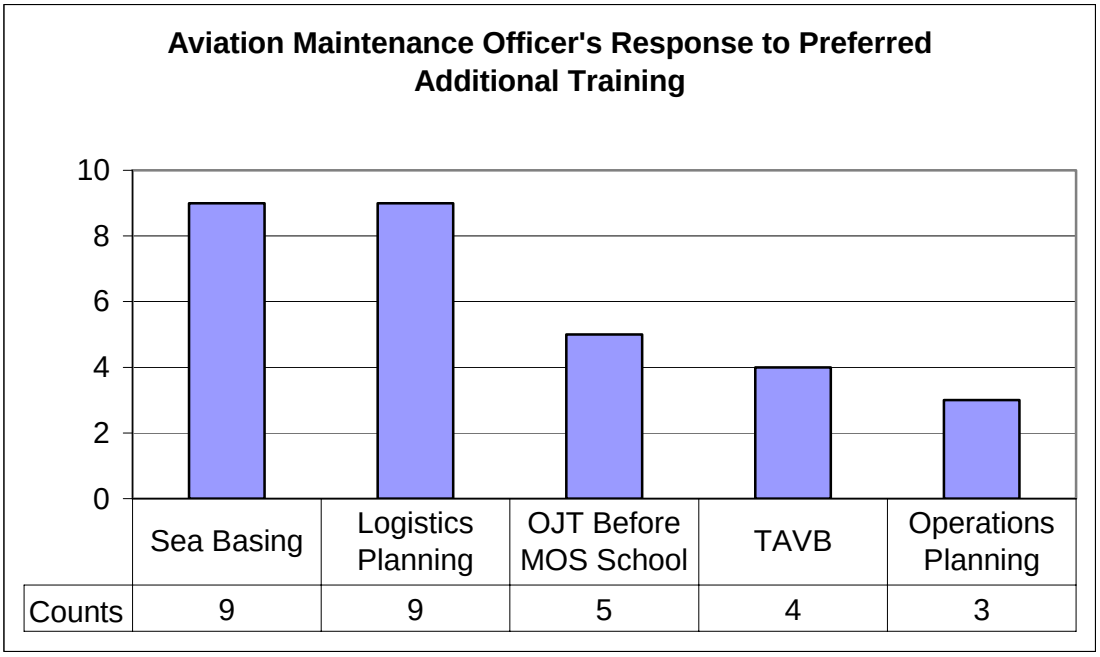

Figure 12. Marine Corps Maintenance Preferred Additional Training for Sea Basing

a. Maintenance: Sea Basing

Of the 56 percent of maintenance officers who answered Q20 or Q21, 14 percent (9 out of 63) expressed understanding the principles of sea basing as important. Respondents indicate that they are not completely clear on what sea basing is or what it entails. One Marine maintenance officer wrote, "...not familiar with Sea Basing, so more training must be required!" (Pg 7 of Appendix B) Respondents believe that since this is the future of Naval warfare, more resources must be devoted to ensuring not only maintenance but also logistics officers are educated fully on Sea Basing's capabilities.

b. Maintenance: Logistics Planning

Logistics planning encompasses many areas in the maintenance community. Maintenance officers have identified specific areas that pertain to logistics

planning as important to understanding how sea basing influences their duties and functions. Those areas are listed below:

- Sea Basing
- Theory of Constraints (TOC)
- Relevant Information for Leadership (RIFLe)
- Maritime Prepositioned Force (Future) MPF(F)
- Tactical Logistics Officer’s Course (TLOC)
- Advanced Logistics Officers Course (ALOC)
- Individual Material Readiness List (IMRL)
- Joint Aviation Supply & Maintenance Management Material Course (JASMMM)

Individual Material Readiness Lists (IMRL) serves as the allowances and inventory for Navy and Marine Corps repairable items. It is essentially a planning tool for the types and quantities of spare parts that aircrafts require while deployed onboard ship.

c. Maintenance: OJT before MOS School

Several maintenance officers (5 out of 63) identify having OJT before MOS school as important. These maintenance officers believe that although MOS school provides a solid foundation of knowledge for new maintenance officers, the knowledge is essentially lost because newly graduated officers leave MOS school and report to their permanent duty station only to fill jobs left vacant by other maintenance officers. Often times these billets are in no way related to performing the duties of a maintenance officer in an actual maintenance

billet. The belief is that OJT before MOS school over some specified period of time would benefit the new maintenance officer whenever he or she arrives at the new unit.

d. Maintenance: T-AVB Training

T-AVBs are aviation logistics support ships that are currently operated by Military Sea Lift Command (MSC). They carry much of the spare parts for a deploying Marine MALS. Four of 63 maintenance officers indicate that they are increasingly involved in the loading and offloading of these support ships without any prior training. Since T-AVBs are intended to provide the repairable capabilities for Marine aircraft, few maintenance officers believe that it is imperative that this type training be included in MOS school and maybe in future career level courses.

e. Maintenance: Operations Planning

Several maintenance officers (3 of 63) express concerns that there is a need for more joint and operational planning experience within their officer ranks. The few maintenance officers that responded this way believe that operations planning training can help to alleviate problems between higher headquarters staff personnel and the subordinate units by having well educated officers articulating issues to commanding officers both accurately and timely.

F. THE AVIONICS COMMUNITY SURVEY

At the time that the survey was administered there were approximately 134 Marine Corps aviation avionics officers (restricted), of whom 93 (69 percent) submitted usable survey responses. Our analysis is motivated by the avionics community’s needs in a sea-based environment. The following three study questions guide our analysis:

1. Do avionics officers indicate a preference to receiving additional, advanced, or avionics-specific training as they transition to a sea base?
2. Do avionics officers find attending the supply officer's short course to be valuable?
3. What do avionics officers indicate are the major challenges that lie ahead in transitioning to a sea-based environment?

We will present an analysis for each of the study questions in separate subsections below.

1. Avionics Study Question 1: Comparisons of Additional, Advanced, and Specific Training

This study question considers the preferences of the avionics community to receiving certain types of training. The following survey questions address this issue:

Q4: I would like to receive additional training in the areas of Crypto Equipment, Keymat, and Software Management prior to executing the sea base concept.

Q6: Avionics Officers need an advanced training course within their specialty that could be used to better prepare them for duties in a sea-based environment.

Q10: Avionics Officers could use additional training prior to deployment to better prepare them for a challenging environment such as a sea base.

We use Friedman's Test for several related samples to determine if respondents express different strengths of preference for the three types of training mentioned in the survey questions. The null hypothesis is that treatments (questions related to kinds of training) on blocks

(respondents) have the same distribution. The alternative hypothesis is that there is at least one pair of treatment for which one tends to have larger responses than the other. If the null hypothesis is rejected, then the issue becomes which treatments can be regarded as having higher responses than others. This issue is addressed using a follow-up multiple comparison procedure based on Friedman's Test. Figure 13 summarizes the distribution of responses to each of the three survey questions.

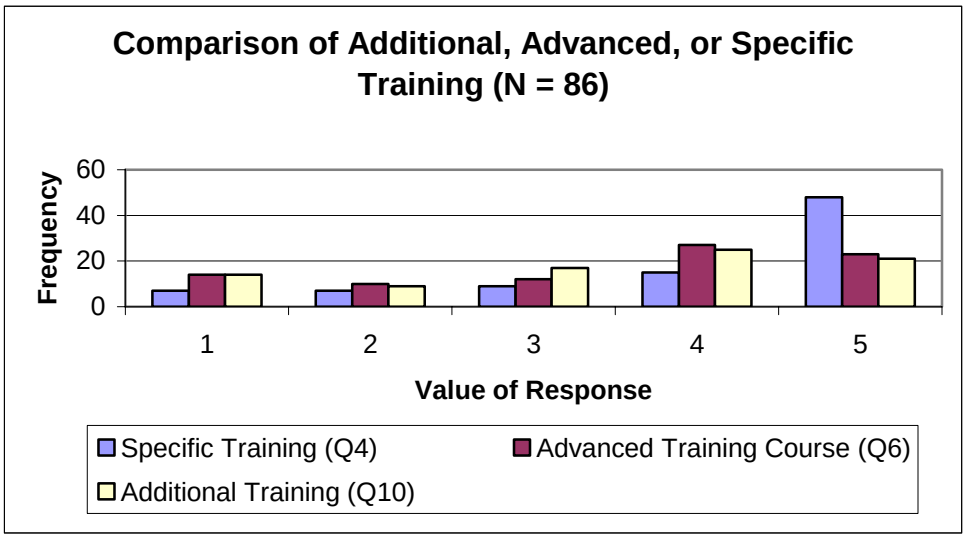

Figure 13. Marine Corps Avionics Officers' Preferences for Advance, Additional, and Specific Training

Of the 93 avionics officers that responded to the survey, 86 gave usable responses to each of the three questions of this analysis. Table 7 summarizes their responses to these questions.

Question	Frequencies		
	Low Preference	High Preference	Neither
Q4	14	63	9
Q6	24	50	12
Q10	23	46	17

Table 7. Preferences of Avionics Officers for Different Training

It is clear from Table 7 that avionics officers indicate strong preferences for each of the training options presented in the three survey questions. Friedman's Test, however, suggests that differences in preference between the questions are statistically significant. The test yields a chi-square value of 22.9488 on two degrees of freedom, which represents a p-value much smaller than .0001. The null hypothesis is therefore rejected at a .05 significance level.

Because the null hypothesis above is rejected, we next apply a multiple comparisons procedure to identify which treatments differ significantly from others. The results of the multiple comparison based on Friedman's Test is depicted in Figure 14. Table 8 reports these results in numerical form.

Q10 Q6 Q4

Figure 14. Multiple Comparison Results For Avionics Training

	Q10	Q6	Q4
Rank Sums	155.0	160.5	200.5
Interval Width = 19.1645			

Table 8. Numerical Results of Multiple Comparisons for Avionics Training

Figure 14 and Table 8 suggest that both Q10 and Q6 had significantly lower preferences than Q4. No other differences were detected as significant. Based on the survey responses, the most preferred avionics training among the options considered is in specific areas (Crypto Equipment, Keymat, and Software Management).

2. Avionics Study Question 2: Benefit of the Supply Officer's Short Course

This study question focuses on the avionics community's attitudes regarding the supply officer's short course. The following survey question addresses this issue:

Q9: It would be beneficial for avionics officers to attend the supply officer's short course.

Of the 93 avionics officers that responded to this survey, 92 provided usable responses to the survey question. Seventy respondents indicated agreement (response values of four or five) and nine indicated disagreement (response values of one or two). Seventy six percent of respondents (70 out of 92) are in agreement and a 95 percent confidence interval based on this sample percentage is (66, 84). It is clear that avionics officers regard the supply officer's short course as important.

3. Avionics Study Question 3: Challenges in A Sea-Based Environment

Study question three elicits responses from the avionics community of the major challenges they perceive lie ahead in a sea-based environment. The following question addresses this issue:

Q11: What do you predict will be the major challenge with sea basing as it relates to avionics?

Figure 15 depicts the seven major responses about the challenges that lie ahead in a sea based environment. The categories are parts availability and resupply, supply chain management (SCM), reach-back capabilities, systems integration and software management, communications security (COMSEC), Intermediate Maintenance Activity (IMA) scale-down, and corrosion control.

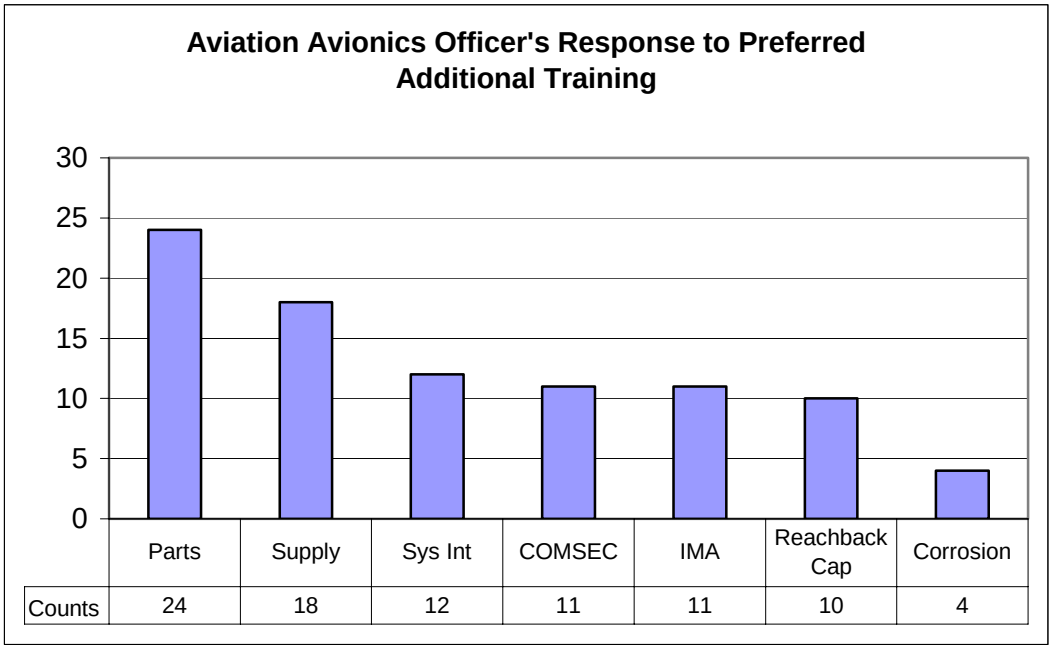

Figure 15. Marine Corps Avionics Officer's Preferred Additional Training

Seven areas identified as critical to the success of sea basing from a Marine avionics officer view point. The two acronyms COMSEC and IMA are Communications Security and Intermediate Maintenance Activity respectively. Systems integration is represented by Sys Int.

a. Avionics: Parts Resupply and Availability

Eighty percent (74 of 93) of avionics officers that responded to the survey provided usable responses to the survey question. Of that 80 percent, 32 percent (24 of 74) identified parts resupply and availability as the number one rated response in this category.

The avionics officers that responded in this category suggest that the logistics lines are slower and less forgiving and this causes longer turn around time on ready-for-issue parts. Maintenance officers also believe that the requirements to maintain supportability to units while being deployed in isolated environments makes it important to plan accordingly for Individual Material Readiness Lists (IMRL), tool, and communications support.

Maintenance officers believe possible solutions to the slow parts turnaround time (TAT) is that of performance based logistics (PBL) and just in time inventory (JIT). These are two ways that avionics officers feel that parts availability and supply could be improved.

b. Avionics: Supply Chain Management

The second most frequently occurring response is supply chain management (SCM) processes. Twenty four percent (18/74) of avionics officers that they must be educated on supply functions. One officer expressed this idea in his text response to question eleven:

> With the evolvement [sic] of performance based acquisition it is going to be more important than ever for avionics officers to know the supply system inside and out. Most gear will be "O" to "OEM" and tracking the gear off of the ship or deployed site and back will require an avionics officer to be thoroughly familiar with the process.

Aviation consolidated allowance lists (AVCALs) are also identified as important in supply chain management processes. AVCALs are lists of the range and depth of material that ships are allowed to stock in support of operations and maintenance of embarked aircraft (Integrated Publishing, 2004). Avionics officers feel that AVCALs are important because understanding them is the essential to determining how many spare parts will be stocked for a particular mission or deployment. Avionics officers express that the understanding of supply chain functions and management processes affects either positively or negatively aircraft operational availability.

c. Avionics: Reach-back, System Integration, and IMA

Avionics officers are largely concerned about reach-back capabilities to current operational systems. The text responses suggest that Commercial-Off-The-Shelf (COTS) items will be important as the transition to the two-level maintenance continues to develop. Avionics officers believe that with the intermediate maintenance activity becoming obsolete, special versions of parts will have to be tailored to meet the maintenance demands in a sea-based environment.

Also important with reach-back is the connectivity between upper echelon support systems for download of keying material (KEYMAT) and software. Avionics officers

believe that as avionics moves to more electronic media distribution of information, reach-back capability becomes critical.

Information technology, Consolidated Automatic Support Systems (CASS), Automated Software Engineering (ASE) and Automated Testing Equipment (ATE) are all important systems that avionics officers feel will have to be integrated with future repair capabilities in order to be successful in a sea-based environment. Avionics officers are identifying the IMA scale down as being a key contributor as to why reach-back capabilities and systems integration are very important. With no organic upper echelon repair capabilities, avionics officers feel systems will have to be developed and integrated in such a way that problems in TAT will not significantly affect the unit's mission.

d. Avionics: COMSEC

Communications Security training, although less frequently mentioned is certainly not the least important. Eleven of 74 (15 percent) avionics officers indicate that they are required to learn COMSEC by trial and error. New systems are introduced which require new security measures be adopted and followed to the strictest letter of the law. Avionics officers believe that the issue is that there is no training on how to maintain the systems. One avionics officer wrote:

> there is computer based training for a prospective CMS/COMSEC custodian that teaches him how to manage an account; there is no training that teaches him about proper storage containers, certification requirements for safes, vaults, or restricted areas. Additionally, when a new CMS/COMSEC system is released, the Avionics Officer & his Marines are expected to implement & maintain it WITHOUT ANY training on it.

If officers are going to be required to effectively and efficiently operate these systems, then the training must accompany the system.

4. Avionics: Possible Advanced Avionics Officer's Course

The following subjects were identified by avionics officers who took the survey as consideration for inclusion material into an advanced avionics officer's course:

- Sea Basing
- Joint Service Logistics and supply chain management
- MALSP II and Airspeed initiatives as they relate to sea basing
- Communications Security (COMSEC) and TAVB
- Maritime Prepositioned Ships (MPS)
- IMA Repair Capabilities

E. THE ORDNANCE COMMUNITY SURVEY

At the time that the survey was administered there were approximately 96 Marine Corps aviation ordnance officers (restricted), of whom 42 (44 percent) submitted usable survey responses. Our analysis is motivated by ordnance-specific training issues, such as loading and

offloading of ordnance in a sea base, as well as supply connectivity requirements. Also, we explore the effect of an acquisition tour on an ordnance officer's preference to receive ordnance-specific training. The following study questions guide our analysis:

1. Do ordnance officers prefer one kind of ordnance-specific training to another?
2. Are ordnance officers more willing to accept training in supply chain processes than advanced training in joint maintenance and supply processes?
3. Do ordnance officers regard an advanced ordnance training course as important for career enhancement?
4. Do ordnance officers express that it is important to understand acquisition processes in order to facilitate reporting on requisitioned items?
5. What additional training do ordnance officers indicate as being necessary to operate in sea-based environment?

We will present an analysis for each of the study questions in separate subsections below.

1. Ordnance Study Question 1: Specific Training Preferences

The first study question considers which specific training areas are preferred to help ordnance officers prepare for sea basing. The following three survey questions are analyzed to address this issue:

Q2: CAIMS is the Conventional Ammunition Integrated Management System. Ordnance officers should be required to operate this system.

Q3: These are the training areas within the MOS that need attention prior to establishing a full-up sea basing role: General Ordnance Load/Offload procedures, Ordnance Maintenance.

Q8: Ordnance Officers should become familiar with TPFDD (Time Phased Force Deployment Data) early in their careers.

We use Friedman's Test for several related samples to determine if respondents indicate different strengths of preference for the three types of specific training mentioned in the survey questions. The null hypothesis is that treatments (questions related to specific training) on blocks (respondents) have the same distribution. The alternative hypothesis is that there is at least one pair of treatment for which one tends to have larger responses than the other. If the null hypothesis is rejected, then the issue becomes which treatments can be regarded as having higher responses than others. This issue is addressed using a follow-up multiple comparison procedure based on Friedman's Test. Figure 16 summarizes the distribution of responses to each of the three survey questions.

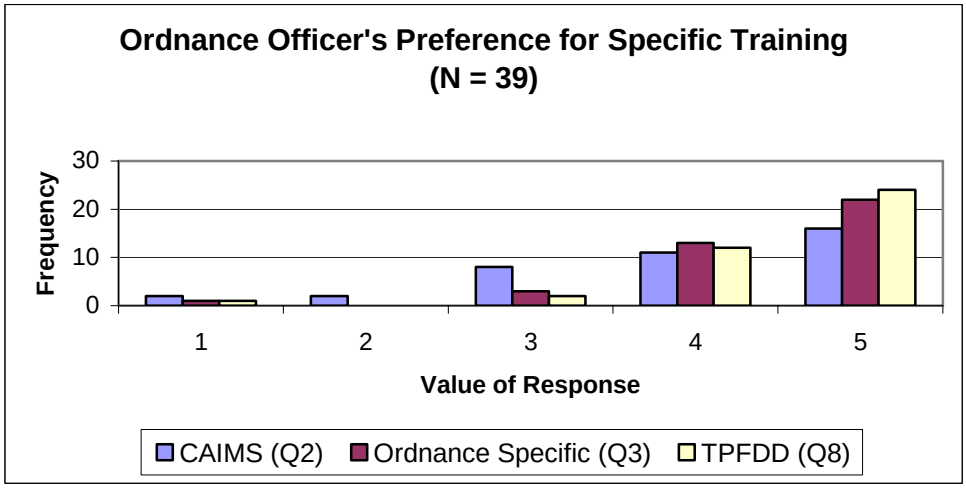

Figure 16. Marine Corps Ordnance Specific Training Preferences

Conventional Ammunition Integrated Management System (CAIMS) is a Navy-specific system and Time Phased Force Deployment Data (TPFDD) is common to the Naval services.

Of the 42 ordnance officers that responded to the survey, 39 gave usable responses to each of the three survey questions considered. Table 9 summarizes their responses to these questions.

Question	Frequencies		
	Low Preference	High Preference	Neither
Q2	4	27	8
Q3	1	35	3
Q8	1	36	2

Table 9. Preferences of Ordnance Officers for Specific Training

It is clear from Table 9 that ordnance officers indicate strong preferences for each of the training options presented in the three survey questions.

Friedman's Test, however, suggests that differences in preference between the questions are statistically significant. The test yields a chi-square value of 9.1392 on two degrees of freedom, which represents a p-value of .0104. The null hypothesis is therefore rejected at a .05 significance level.

Because the null hypothesis above is rejected, we next apply a multiple comparisons procedure to identify which treatments differ significantly from others. The results of the multiple comparison based on Friedman's Test is depicted in Figure 17. Table 10 reports these results in numerical form.

Q2 Q3 Q8

Figure 17. Multiple Comparisons Results for Ordnance-Specific Training

	Q2	Q3	Q8
Rank Sums	67.5	80.5	86.0
Interval Width = 11.91504			

Table 10. Numerical Results of Multiple Comparisons for Ordnance Training

The results of both Figure 17 and Table 10 suggest that Q2 had significantly lower preferences than both Q3 and Q8. No other differences were detected as significant. Based on the survey responses, the most desired ordnance specific training is TPFDD (Q8).

2. Ordnance Study Question 2: Supply versus Joint Maintenance and Supply

The second study question addresses the attitudes of ordnance officers with regard to both receiving training on

supply chain management issues or receiving joint maintenance and supply training. The following two questions address this issue:

Q7: Ordnance officers will be required to understand more about the supply chain process in the coming sea basing doctrine.

Q9: It would be beneficial for ordnance officers to receive advanced training in maintenance and supply processes prior to sea basing.

Of the 42 ordnance officers that responded to the survey, 39 provided usable responses to both survey questions. For Q7 26 respondents indicated agreement (response values of four or five) and 2 indicated disagreement (response values of one or two). For Q9 25 respondents indicated agreement and 3 indicated disagreement.

That there is no clear preference for supply chain specific training or joint maintenance and supply training is confirmed with the Sign Test. Applying the Sign Test to the difference of the relevant survey questions (Q7 minus Q9) yields 18 zeros, 11 values greater than zero and 10 values less than zero. Only the non-zero values are used in the analysis. Using only the non-zero differences, the p-value for the Sign Test is equal to 1, which suggests that there is no detectable departure of the median difference from zero.

3. Ordnance Study Question 3: Ordnance Advanced Training Course

The purpose of study question three is to ascertain ordnance officer’s regard for an advanced training course. The following question will address this issue:

Q10: An advanced Ordnance Officers Course should exist both for career and MOS progression.

Of the 42 ordnance officers who responded to the survey, 39 gave usable responses to this survey question. Thirty seven respondents indicated agreement (response values of four or five) and one indicated disagreement (response values of one or two). Ninety five percent of respondents (37 out of 39) are in agreement, and a 95 percent confidence interval based on this sample percentage is (83, 99). It is clear that ordnance officers regard an advanced officer's training course as important for both career and MOS progression.

4. Ordnance Study Question 4: Acquisition Training

The purpose of this study question is to assess the preference of the ordnance community for receiving acquisition training to facilitate reporting requisitioned items. The following survey question addresses this issue:

Q4: It is imperative that ordnance officers understand acquisition processes to facilitate accurate reporting on ordered items.

Of the 42 ordnance officers who responded to this survey, 40 gave usable responses to this survey question. Thirty one respondents indicated agreement (response values of four or five) and three indicated disagreement (response values of one or two). Seventy eight percent of respondents (31 out of 40) are in agreement, and a 95 percent confidence interval based on this sample percentage is (62, 88). It is clear that ordnance officers consider it important to receive acquisition training to facilitate accurate reporting on ordered items.

5. Ordnance Study Question 5: Additional Training

This study question elicits responses from the ordnance community about any additional training not previously mentioned in the survey that they regard as important. The following survey question allows the respondent to provide a text response:

Q11: Please use this space to list additional training and education that you feel are needed as it relates to sea basing?

Twenty six percent (11 of 42) of all ordnance officers gave usable responses to Q11. Of those that responded, 27 percent (3 of 11) indicated a need for more training in Aviation Ordnance Officer Career Progression (AOOCP). AOOCP is an advanced course set up by the Marine Corps that has three levels of certification. All new ordnance Warrant Officers attend this school for six weeks (the first level of training) and then report to their permanent duty stations.

Several of the respondents mentioned that, due a lack of funding for this training school, they are not afforded the opportunity to attend the higher levels of training associated with this school. In addition to ordnance specific training, levels two and three of the AOOCP provide training on Sea Basing and sea-based logistics. If ordnance officers are not able to attend this course, the training that AOOCP levels two and three would provide is learned through on-the-job training.

Other specific areas of training mentioned are as follows:

- Sea Basing
- Air and Sea Replenishment Training
- Forward Arming Refueling Points
- Joint Operational Planning and Execution System

G. COMPARISON OF SURVEY RESPONSES ACROSS MARINE CORPS AVIATION OFFICER COMMUNITIES

Analysis of preferred training across all four communities can provide statistical insight into which communities prefer certain kinds of training over others. The following three study questions guide our analysis:

1. Is there a difference among communities in their preferences for acquisition training?
2. Is there a difference among communities in their preferences for advanced training in preparation for sea basing?
3. Is there a difference among communities in their preferences for joint training (inter-service or with other armed services)?

Each of these study questions is considered in separate subsections below.

1. Community Comparisons: Study Question 1: Acquisition Training

This study question considers the preference in each community for acquisition-specific training. The following survey questions are analyzed to address this issue:

Q17 (Maintenance): Acquisition training should be required for career and professional development.

Q17 (Supply): An acquisition tour can only strengthen my MOS credibility.

Q4 (Ordnance): It is imperative that ordnance officers understand acquisition processes to facilitate accurate reporting on ordered items.

Because a comparable survey question was not asked in the Avionics survey, this community is not considered in the analysis.

We use the Kruskal-Wallis Test to compare the survey responses to the three similarly-constructed survey questions directed to the different communities. The Kruskal-Wallis Test, which is based on independent samples taken from different populations, is applied to the null hypothesis that the populations have the same probability distribution, versus the alternative hypothesis that at least one population tends to have larger values than another (Conover, 1999). If the null hypothesis is rejected, a follow-up multiple comparison procedure based on the Kruskal-Wallis Test can be used to identify which populations differ from others.

Table 11 summarizes the responses of each question by community according to preference.

Survey Question	Frequencies			Sample Size
	Low Preference	High Preference	Neither	
Maintenance (Q17)	29	50	29	108
Supply (Q17)	25	65	27	117
Ordnance (Q4)	3	31	6	40

Table 11. Preferences for Acquisition Training Across Maintenance, Supply, and Ordnance Communities.

It is clear from Table 11 that in each community more respondents expressed agreement with the importance of acquisition training than disagreement. Using the actual responses in a Kruskal-Wallis Test produced a p-value of .0137, for which the null hypothesis is rejected at a test level of .05. We therefore conclude that at least one community expresses stronger agreement with the importance of acquisition training than others, which we analyze with a multiple comparisons procedure. The results of the multiple comparisons procedure, based on the Kruskal-Wallis Test is depicted by Figure 18. Table 12 presents the results of this analysis in numerical form.

M(Q17) S(Q17) O(Q4)

Figure 18. Results of the Multiple Comparisons Procedure for Strength of Preference of Acquisition Training

	Maintenance (Q17)	Supply (Q17)	Ordnance (Q4)
Sample Sizes	108	117	40
Mean Rank Sums	120.259	135.539	159.975

Table 12. Numerical Results of Multiple Comparisons Test for Strength of Preference of Acquisition Training

The results of the multiple comparison procedure suggest that the ordnance community hold acquisition training in higher regard than either of the other two communities.

2. Community Comparisons Study Question 2: Advance Training Preference

The purpose of study question two is to determine the preference in each community for advanced training. Survey questions Q3 (supply), Q6 (avionics), and Q10 (ordnance) will address this issue:

Q3 (supply): All supply officers should attend the Advanced Logistics Operations Course (ALOC).

Q6 (avionics): Avionics officers need an advanced training course within their specialty that can be used to better prepare them for duties in a sea-based environment.

Q10 (ordnance): An advanced ordnance officer's course should exist both for career and MOS progression.

Because a comparable survey question was not asked in the Maintenance community survey, we do not include this community in the analysis.

Table 13 summarizes the responses to the three survey questions. It is clear that each of the three communities values advanced training courses. But as we show below, the differences between the communities is statistically significant.

Survey Question	Frequencies			Sample Size
	Low Preference	High Preference	Neither	
Supply (Q3)	14	96	17	127
Avionics (Q6)	24	52	12	88
Ordnance (Q10)	1	37	1	39

Table 13. Preference for Advanced Training across Supply, Avionics, and Ordnance Communities

Low preference is indicated by response values one or two and high preference is indicated by responses of four or five.

Results of the Kruskal-Wallis test for differences produce a p-value much smaller than .0001 which indicates a significant difference between at least two communities. To reveal which communities indicate higher preferences, we

use a multiple comparisons procedure based on the Kruskal-Wallis Test. Application of this procedure, which is depicted in Figure 19, suggests that each of the communities is significantly different from the others. Table 14 gives a numerical summary of the multiple comparisons.

A(Q6) S(Q3) O(Q4)

Figure 19. Results of the Multiple Comparisons Procedure for Strength of Preference for Advanced Training

A = Avionics, S = Supply, O = Ordnance

	Avionics (Q6)	Supply (Q3)	Ordnance (Q4)
Sample Sizes	88	127	39
Mean Rank Sums	99.001	133.130	173.449

Table 14. Means Rank Sums for Advanced Training Across Avionics, Supply, and Ordnance Communities

The multiple comparison procedure suggests that the ordnance community most strongly prefers advanced training compared to the other two communities. Supply officers were next followed by avionics officers.

3. Community Comparisons Study Question 3: Joint Training across All Communities

The purpose of study question three is to determine the preference in each community for joint training.

Survey questions Q6 (Maintenance), Q6 (Supply), Q9 (Avionics), and Q6 (Ordnance) address this issue:

Q6 (Maintenance): There should be joint logistics classes taught with the Naval Services and the Air Force to ease the transition to the sea base.

Q6 (Supply): I believe there should exist joint "advanced" logistics training between the Navy and other services.

Q9 (Avionics): It would be beneficial for avionics officers to attend the supply officer's short course.

Q6 (Ordnance): Joint training between the Navy and Marine Corps would facilitate more efficient movement and handling of Ordnance.

Table 15 summarizes the responses to each of the survey questions by community.

Survey Question	Frequencies			Sample Size
	Low Preference	High Preference	Neither	
Maintenance (Q6)	21	58	28	107
Supply (Q6)	12	106	10	128
Avionics (Q9)	9	70	13	92
Ordnance (Q6)	5	28	7	40

Table 15. Preference for Joint Training across All Marine Aviation Logistics Communities

It is clear from Table 15 that all communities considered in this analysis value joint training. However, the differences between communities in their levels of preference are statistically significant. A Kruskal-Wallis test produces a p-value much smaller than .0001, which indicates a significant difference between at least two communities. To further determine which community produces larger values, we use the multiple comparisons procedure. Results of the multiple comparisons procedure are shown in Table 16 and Table 17 summarizes those results in numerical form.

Question Comparisons	Statistically Significant?
M(Q6) versus O(Q6)	No
M(Q6) versus A(Q9)	Yes
M(Q6) versus S(Q6)	Yes
O(Q6) versus A(Q9)	No
O(Q6) versus S(Q6)	No
A(Q9) versus S(Q6)	No

Table 16. Results of Multiple Comparisons Procedure for Significance among Communities

Statistical significance is at the simultaneous 5 % test level.

	Maintenance (Q6)	Ordnance (Q6)	Avionics (Q9)	Supply (Q6)
Sample Sizes	107	40	92	128
Mean Rank Sums	142.654	177.175	202.022	207.742

Table 17. Means Rank Sums for Joint Training Across Marine Aviation Logistics Communities

The results of the multiple comparison procedure indicate that the supply community more prefers joint training than any other aviation logistics community. The avionics community was next followed by ordnance and then the maintenance community.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Training and education requirements for Marine Corps aviation logistics officers are examined in this thesis using nonparametric techniques to analyze ordinal responses from our survey. Table 18 summarizes responses to questions asked of each of the four military occupational specialties that isolate key training areas.

		Percentage of respondents that gave favorable ratings to the indicated type of training		
		Type Training		
Specialty	**Survey Size**	**Acquisition**	**Advanced**	**Joint**
Supply	132	56	76	83
Maintenance	113	46	N/A	54
Avionics	93	N/A	59	76
Ordnance	42	78	95	70

Table 18. Training Preferences by Marine Aviation Logistics Specialty

N/A indicates that a related survey question was not asked of the targeted specialty.

Based on the results of our analysis, we find that ordnance officers preferred acquisition and advanced training more than any other type training. Supply, maintenance, and avionics officers prefer joint training more than any other type training.

Throughout our analyses, we use nonparametric, rank-based statistical tests to determine if there are detectable differences in preferences indicated between

various types of training. Friedman's Test is used to detect differences across survey questions that were answered by the same respondent, and the Kruskal-Wallis test is used to detect differences in responses by specialties that answered the same or similar questions. The null hypothesis of no difference between treatments is rejected if the p-value for the corresponding test is less than .05. If we reject the null hypothesis we then use a multiple comparisons procedure to determine which differences are significant. The results of the nonparametric tests are further discussed below.

Supply officers indicate that they are more willing to accept tours in acquisition billets if the tour would count as a department head tour and they also respond that acquisition billets strengthen MOS credibility. While supply officers indicate a preference for attending other commodity officer's short courses, they clearly indicate that the most preferred training is in DLA and NAVICP functions and processes. They also rate highly the importance of learning Navy logistics onboard ship to understanding the flow of logistics in a sea base.

Maintenance officers agreed that MOS school should focus more on Marine Corps squadrons with a heavy maintenance focus. They also expressed a desire to receive T-AVB training as well as to attend JASMMM rather than joint training with the Air Force. In the research area of acquisition, maintenance officers find it more favorable to accept billets in acquisition provided tours would replace department head tours and they also indicate a strong agreeance to the establishment of the primary acquisition track. Maintenance officers express that more unrestricted

officers need to become familiar with Force Deployment Planning at the MALS level vice restricted officers.

Avionics officers indicate that the most preferred training is in the areas of Crypto Equipment, Keymat, and software management. They also believe that attending the supply officer's short course is important to supporting the sea base. Ordnance officers regard both acquisition training and advanced training courses as important to support a sea base and they also indicate that their most desired specific training is TPFDD.

In their text responses many of the officers that were surveyed expressed concerns about Sea Basing and its procedural application. Supply-chain management is the most frequently mentioned area of additional training that these officers said would benefit them the most to prepare them for sea basing. Officers stated that receiving training is better than not receiving any, but there should be greater effort by the Marine Corps to provide guidance and instruction on new systems and technologies as they are fielded to Marine units.

B. FUTURE AREAS OF RESEARCH

Although our research focuses specifically on Marine aviation logistics officers, its applicability extends across the range of Marine Corps logistics. The ground logistics MOSs face many of the same challenges as the aviation logistics MOSs, and it would be useful to determine the training and education requirements of officers in those specialties that are responsible for supporting the maneuver commander on the battlefield.

Logistics modernization must be able to support Marine transformation. An analysis of future logistics

information systems can provide valuable insight as to what may be expected of logisticians in a sea-based environment. With the completion of the Marine Corps' new logistical operational architecture in 2002, the Global Combat Support System-Marine Corps (GCSS-MC) has emerged as the tool for communicating supply requests for Marine units across the world (CMC, 2004). The linkage between GCSS-MC, Performance Based Logistics, and other turn-around time reduction initiatives can greatly shape the future of warfare and how Marine units are supplied. As this linkage is developed, additional training and education needs will emerge, and a study similar to that described in our thesis can lend valuable insight into those areas that will benefit the most from a dedication of resources.

C. SURVEY DATA AND REFERENCES

The author of this thesis retains the original survey data and copies of all references made to the non-published literature. Inquiries may be directed to the author for copies of unavailable references, or for additional information about the survey.

APPENDIX

A. MAIN PAGE QUESTIONS

1. How long is/was your MOS school?

2. Did you choose this MOS?

3. How long have you been in this MOS?

4. Rate your satisfaction of your MOS on a scale of 1(least satisfied) to 5(best satisfied).

5. How much prior enlisted time do you have?

6. Marine Corps Aviation should roll the four commodity logistics officer MOSs into a single MOS by the time the officer attains the rank of Major.

7. Marine Corps Aviation should roll the four commodity logistics officer MOSs into a single MOS by the time the officer attains the rank of Lieutenant Colonel.

8. Marine Corps Aviation should selectively combine some of the four commodity logistics officer MOSs into a single MOS by the time the officer attains the rank of Major.

9. Marine Corps Aviation should selectively combine some of the four commodity logistics officer MOSs into a single MOS at any rank.

10. Marine Corps Aviation should develop a training curriculum path for officers interested in aviation logistics planning.

B. AVIATION SUPPLY SURVEY QUESTIONS

1. Knowing more about Navy logistics onboard ship would facilitate more efficient operations in a sea based environment. (1-5)

2. Supply officers should be trained on transportation and material movement. (1-5)

3. All supply officers should attend the Advanced Logistics Operations Course (ALOC). (1-5)

4. Supply officers should have basic understanding of Defense Logistics Agency's and Naval Inventory Control Point's functions and procedures. (1-5)

5. Supply officers should have basic knowledge of wholesale supply system. (1-5)

6. I believe that there should exist joint "advanced" logistics training between the Navy and other services. (1-5)

7. Marines will need to learn to operate forward with T-AVBs in the future sea based environment. (1-5)

8. MOS school taught me most of what I needed to know about reading reports. (1-5)

9. I feel that my MOS school was rushed and I didn't learn as much as I could have. (1-5)

10. All supply officers should attend the Joint Aviation Supply and Maintenance Material Management Course. (1-5)

11. All supply officers should attend other services logistics officer short courses. (1-5)

12. All supply officers should attend other service logistics officer short courses. (1-5)

13. Supply officers could use more management training as it relates to supply. (1-5)

14. Enterprise Resource Planning is an upcoming concept within the supply community and supply officers

should be trained and evaluated in its procedural applications. (1-5)

15. Some areas where supply could use further training are: Supply replenishment, Shelf-Life Programs, ERP, procurement acquisition, TPFDD, JOPES, Reception Staging Onward & Integration.

16. I have been considering a tour in acquisition. (1-5)

17. An acquisition tour could only strengthen my MOS credibility. (1-5)

18. The Marine Corps should roll the four commodity logistics officer duties into a single MOS by the time the officer attains the rank of Major, Lieutenant Colonel, should not combine. (1-5)

19. A logistic officer will need to be well versed in acquisition training, procedures, and guidelines for the coming implementation of sea basing. (1-5)

20. I will accept a tour in acquisition if it could replace an eventual department head tour. (1-5)

21. I will accept a tour in acquisition even if it prevents me from getting a department head tour. (1-5)

22. I believe that tours outside my MOS, such as acquisition, hamper my opportunity to be promoted with my peers. (1-5)

23. A few of the reports that supply officers will need to be further educated on to prepare them for sea basing are: SAMMA SAL, RAO, N/A.

24. Please use this space to list additional training and education that you feel are needed as it relates to sea basing. [text box]

25. Please list any additional comments here. [text box]

C. AVIATION MAINTENANCE SURVEY QUESTIONS

1. Maintenance Officers should have OJT prior to attending MOS school. (1-5)

2. I feel that my MOS school was rushed and I did not learn as much as I could have. (1-5)

3. My MOS school should focus more on Marine Corps squadrons with a heavy maintenance perspective. (1-5)

4. My MOS school would be better utilized if the first half of training was limited to officers new to the MOS. (1-5)

5. Aviation Maintenance Officers need more MOS instructors that are proficient in management processes. (1-5)

6. There should be joint logistics classes taught with the Naval Services and the Air Force to ease the transition to the sea base. (1-5)

7. All maintenance officers should attend the Joint Aviation Supply and Maintenance Material Management Course. (1-5)

8. Maintenance Officers should receive training on basic deployment operations with the T-AVB due to the increasing realization of sea basing. (1-5)

9. Currently, there is no set mechanism to receive needed training on T-AVBs in order to operate a MALS Forward. (1-5)

10. Small satellite teams could greatly assist with T-AVB specific training. (1-5)

11. I have been considering a tour in acquisition. (1-5)

12. I would be willing to accept a tour in acquisition if it could replace a department head tour. (1-5)

13. I would accept a tour in acquisition with the provision that I still be considered for a department head tour. (1-5)

14. A tour outside of my MOS detracts from MOS credibility. (1-5).

15. Unrestricted Maintenance Officers need to be familiar with Force Deployment Planning and Execution (e.g., MAGTF II/LOG AIS, MDSS II, JOPES, TPFDD, GUDL, MDL) at the MALS level.

16. Restricted Maintenance Officers need to be familiar with Force Deployment Planning and Execution (e.g., MAGTF II/LOG AIS, MDSS II, JOPES, TPFDD, GUDL, MDL) at the MALS level.

17. Acquisition training should be required for career and professional development. (1-5)

18. Restricted maintenance officers should be allowed to attend the Advanced Logistics Officers Course. (1-5)

19. Flag officers recently approved the establishment of a primary acquisition career track. What impact does that have on the 6002 MOS?

20. Please use this space to list additional training and education that you feel are needed as it relates to sea basing. [text box]

21. Please list any additional comments here. [text box]

D. AVIATION AVIONICS SURVEY QUESTIONS

1. The job that I am required to perform in a sea based environment is the same job that I currently perform in garrison. (1-5)

2. Rate the difficulty of your MOS (1 less 5 more)

3. There are key training and education areas that must be attended to regularly in order to continue MOS Progression.

4. I would like to receive additional training in the below areas prior to executing the sea base concept. (crypto equipment, keymat, software management, etc)

5. Avionics Officers should be afforded the opportunity to do OJT prior to reporting for MOS School.

6. Avionics Officers need an advanced training course within their specialty that could be used to better prepare them for duties in a sea based environment. (1-5)

7. The advanced training course should, at a minimum, have these courses (configuration management, systems acquisition, Force Deployment Planning & Execution)

8. I have completed the supply officer’s short course. (yes or no)

9. It would be beneficial for Avionics Officers to attend the supply short course. (1 disagree – 5 agree)

10. Avionics Officers could use additional training prior to deployment to better prepare them for a challenging environment such as a sea base. (1-5)

11. What do you predict will be the major challenge with sea basing as it relates to Avionics? [text box]

12. Please use this space to list additional training and education that you feel are needed as it relates to sea basing. [text box]

13. Please list any additional comments here. [text box]

E. AVIATION ORDNANCE SURVEY QUESTIONS

1. I feel that my MOS school was rushed and I did not learn as much as I could have. (1-5)

2. CAIMS is the Conventional Ammunition Integrated Management System. Ordnance Officers should be required to operate this system. (1-5)

3. These are training areas within the MOS that need attention prior to establishing a full-up sea basing role. (MAARS, General Ordnance Load/Offload Procedures, Ordnance Maintenance)

4. It is imperative that ordnance officers understand acquisition processes to facilitate accurate reporting on ordered items.

5. Ordnance handling procedures are the same both in garrison and onboard ship.

6. Joint training between the Navy and Marine Corps would facilitate more efficient movement and handling of ordnance.

7. Ordnance Officers will be required to understand more about the supply chain process in the coming sea basing doctrine.

8. Ordnance Officers should become familiar with TPFDD (Time Phased Force Deployment Data) early in their careers.

9. It would be beneficial for Ordnance Officers to receive advanced training in maintenance and supply processes prior to sea basing.

10. An advanced Ordnance Officers Course should exist both for career and MOS progression.

11. Please use this space to list additional training and education that you feel are needed as it relates to sea basing. [text box]

12. Please list any additional comments here. [text box]

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   Naval Postgraduate School
   Monterey, California

5. Marine Corps Representative
   Naval Postgraduate School
   Monterey, California

6. Director, Training and Education, MCCDC, Code C46
   Quantico, Virginia

7. Director, Marine Corps Research Center, MCCDC, Code C40RC
   Quantico, Virginia

8. Marine Corps Tactical Systems Support Activity (Attn: Operations Officer)
   Camp Pendleton, California

9. Director, Studies and Analysis Division, MCCDC, Code C45
   Quantico, Virginia

10. Captain Roger M Mishoe
    Albany, Georgia