3-2003

Utility of the Logistics Officer Career Path Pyramid in Promotion Prediction

Gregory T. Ogorek

UTILITY OF THE LOGISTICS OFFICER CAREER PATH PYRAMID IN PROMOTION PREDICTION

THESIS

Gregory T. Ogorek, Captain, USAF

AFIT/GLM/ENS/03-09

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government.

AFIT/GLM/ENS/03-09

UTILITY OF THE LOGISTICS OFFICER CAREER PATH PYRAMID IN PROMOTION PREDICTION

THESIS

Presented to the Faculty

Department of Operational Sciences

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

Gregory T. Ogorek, BS

Captain, USAF

March 2003

AFIT/GLM/ENS/03-09

UTILITY OF THE LOGISTICS OFFICER CAREER PATH PYRAMID IN PROMOTION PREDICTION

Gregory T. Ogorek, BS

Captain, USAF

Approved:

//signed// William A. Cunningham, III, PhD (Advisor)	10 March 03 Date
//signed// Stephan P. Brady, Lt Col, USAF (Reader)	10 March 03 Date

Acknowledgments

I would like to express my sincere appreciation to my faculty advisor, William A. Cunningham, III, PhD., for his guidance and support throughout the course of this thesis effort. I would also like to thank Lt Col Stephan P. Brady for his support and input. The insight and experience of both was certainly appreciated. In addition, I would like to thank Major Daniel Lockert from the Air Mobility Command for the support, additional information and guidance given throughout the process.

I am also indebted to my family for their understanding and perseverance while I worked on this thesis. Special thanks go to SSgt Gregorios Theopistos for all of the help and data, without which this study would not have been possible.

Gregory T. Ogorek

Table of Contents

Page

List of Figures

Page

List of Tables

Page

Abstract

As part of the major restructuring of the United States Air Force, the officer career fields of transportation, supply and logistics plans have been merged into a new career field, the logistics readiness officer. The purpose of this research was to perform a statistical analysis of the career path pyramid for the logistics plans, supply, and transportation officer career fields. This will provide a baseline for the newly created logistics readiness officer, a combination of the three aforementioned career fields. Specifically, this thesis answered research questions addressing the career guidance provided by the United States Air Force, the factors involved, and their predictive value for promotion. The research questions were answered through a log-linear regression analysis of historical data. The data consisted of duty histories of officers with primary air force specialty codes of logistics plans, supply, and transportation with at least 17 years time in commissioned service. The research identified the predictive value of each factor and the presence of factors outside of the scope of current guidance influencing promotion.

UTILITY OF THE LOGISTICS OFFICER CAREER PATH PYRAMID IN PROMOTION PREDICTION

I. Introduction

Background

Since the fall of the Soviet Empire and the tearing down of the Berlin Wall, the United States military has had to change the way it organizes, trains, and fights. There was a general feeling in the United States government that without the Cold War menace and fear of nuclear war that the amount of money spent on the defense budget could now be dramatically reduced. The "peace dividend" was an across the board cut in defense spending by 40 percent, as recommended by the General Accounting Office, resulting in the necessity to reevaluate and reorganize the structure and missions of the Armed Services. (Peters, F.W., 2000)

On March 5, 1999 the United States Air Force (USAF) announced they would change force structure, moving to an Expeditionary Air Force (EAF) concept of operations. This light, lean, and lethal package broke the service into 10 Air Expeditionary Forces (AEF) that would rotate on 90 day cycles to handle ongoing operations across the globe. The shift in policy was meant to provide predictability in deployment for the troops and provide ease in planning. To facilitate this change, the Chief of Staff of the Air Force (CSAF) directed a top down review of logistics in the Air

Force, the Chief of Staff Logistics Review (CLR). This study was implemented to determine if the USAF was currently performing logistics function efficiently and to recommend changes and innovations to decrease the logistics footprint needed to deploy for the AEFs.

Another force structure change to accommodate the EAF was a restructuring of the Air Force base structure, known as the wing. The logistics group consisted of transportation, supply, contracting, aircraft maintenance, and in some cases logistics plans. Under the new wing structure, aircraft maintenance has become its own group, while transportation, supply, contracting, and logistics plans now fall under the mission support group. Further consolidation because of the CLR includes the merger of the transportation and supply squadrons and logistics plans function into a single squadron, the logistics readiness squadron. (Elliott, S., 2002)

Transportation, supply, and logistics plans had their own dedicated Air Force Specialty Codes (AFSCs), 21TX, 21SX, and 21GX respectively. These specialty officers became experts in their field. The Air Force Personnel Center (AFPC) provided career path pyramids for each, outlining a basic path that an officer should take to climb the career path and get promoted. To accommodate the move from each individual squadron to the logistics readiness squadron, the CLR implemented the merger of the 21TX, 21SX, and 21GX career fields into a single AFSC, the logistics readiness officer, 21RX. According to Lt Gen Michael E. Zettler, deputy chief of staff for installations and logistics, USAF, "This new career field will allow our officers to grow into more responsible jobs in the Air Force." (Bosker, A.J., 2001)

Problem Statement

With consolidation of three career fields into one, there are serious concerns of what career choices are to be made to ensure success and promotion in a much broader field. Can the new career path proposed by AFPC be validated statistically based on the guidance for the components that are being consolidated?

Research Objectives

Based on past performance of the individual logistics officer career path pyramids, which factors statistically need to be included from each career field in the new logistics readiness officer career path pyramid? The following investigative questions will drive the research:

- What is the career path pyramid for the transportation officer?
- What is the career path pyramid for the supply officer?
- What is the career path pyramid for the logistics plans officer?
- What are the key factors recommended for transportation officers?
- What are the key factors recommended for supply officers?
- What are the key factors recommended for logistics plans officers?
- What is the predictive capability and relative weight for each factor for promotion?
- Which factors from each need to be incorporated into the guidance for the logistics readiness career field based on their strength in the individual career fields?

Research Methodology

Regression analysis is used to apply relative weights to the career path factors. Based on the nominal nature of the independent and dependent variables, log-linear regression is used instead of linear regression. (Christensen, R., 1990)

Scope of the Research

This research is based on available historical data, the duty histories of individual officers in the USAF with primary AFSCs of 21TX, 21SX, and 21GX with at least 17 years time in commissioned service. All duty history data was obtained from the AFPC database MilPDS.

Relevance

The USAF has combined three career paths into one, and has little to no statistical research on its guidance for career progression. By analyzing the career paths of the three components of the new career field, an evaluation of the new guidance can be made with some statistical relevance. Officers entering this new career field can weigh career path options with more than just anecdotal evidence.

II. Literature Review

Introduction

While the USAF provides guidance for officer progression, little to no research has been done to validate the effectiveness of the guidance. This study is an attempt to apply regression analysis to career path guidance to determine its statistical relevance and provide comparison within and among the career fields.

Career Progression Guidance

The USAF has provided guidance for career progression through the Career Field Education Training Plan (CFETP) and the Officer Career Path Guide for each individual career path. The CFETP provides an overview of specific tasks and experiences related to each career field that are deemed to be necessary for success. The Officer Career Path Guide summarizes the CFETP and provides a pictorial representation of the career guidance, the Career Path Pyramid. The Officer Career Path Guide (OCPG), found at https://afas.afpc.randolph.af.mil/ofcr-cpguide/Default.htm, is a major tool used in career guidance, mentoring, and career choices for officers in all career fields. Due to its widespread use and ease of interpretation, the OCPG and the Career Path Pyramid are the focus of this study.

The Career Path Pyramid provides a time line approach to career progression. Starting at the bottom and working up, the Career Path Pyramid details the type of jobs and experiences the officer should have at the appropriate time and rank. Officers, their

supervisors, and functional managers use this tool as a general path to guide their career and make critical choices in assignments. (Department of the Air Force, undated)

Each Career Path Pyramid is specific to the career field and has associated text outlining and expanding on the pictorial representation. Chapter 4 of the OCPG outlines mission support officer careers, including logistics plans, supply, and transportation. A general description of each career field is also included in the OCPG, and will not be provided here. For each career field, it is emphasized that these steps are not a clear-cut road map, but a list of criteria that have historically been tied to successful careers. (Department of the Air Force, undated) Figures 1 through 3 provide the answers to the first three investigative questions in chapter 1.

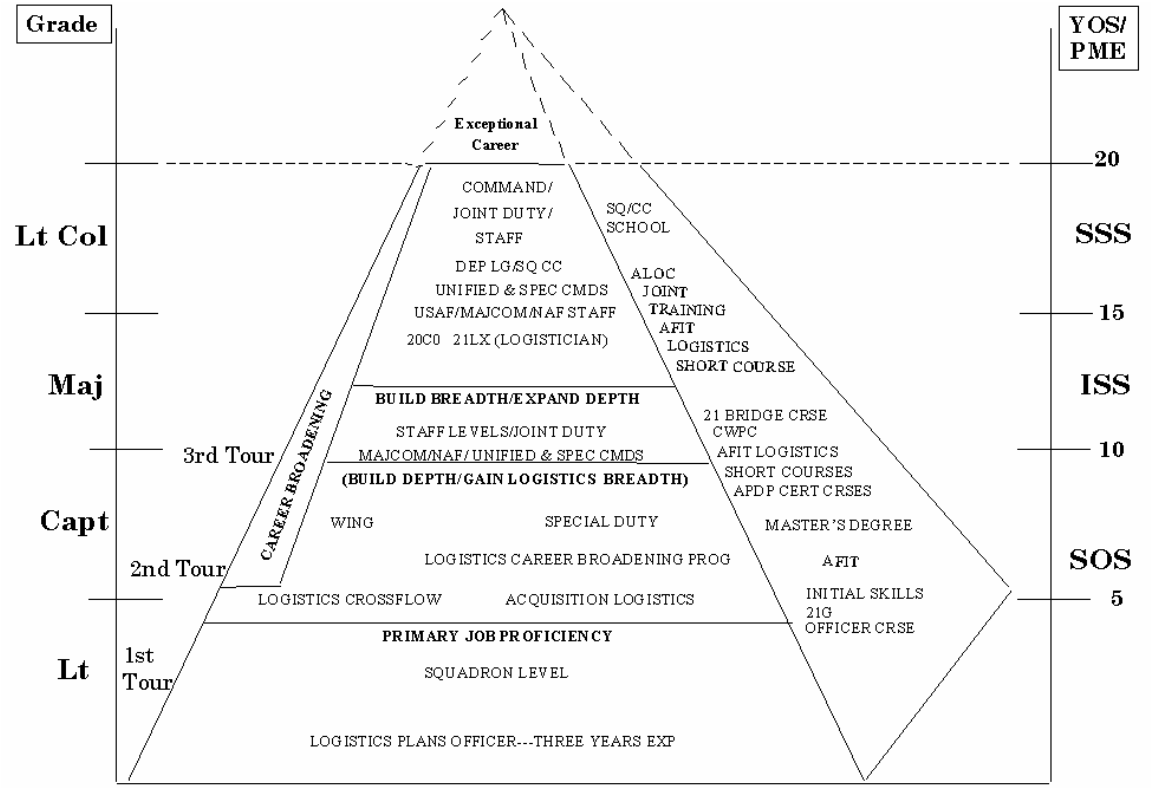

Figure 1. Logistics Plans Career Path Pyramid. (Department of the Air Force, undated, Figure 4.3)

The Logistics Plans Officer Career Path Pyramid, Figure 1, provides guidance for the logistics plans officer. The Career Path Pyramid and the associated text provide twelve areas of career guidance: breadth and depth, overseas assignments, multiple major commands (MAJCOMs) assignments, staff assignments, cross flow assignments, Air Force Institute of Technology (AFIT) assignment, special duty assignments, professional military education (PME), joint assignments, command assignments, and acquisition assignments.

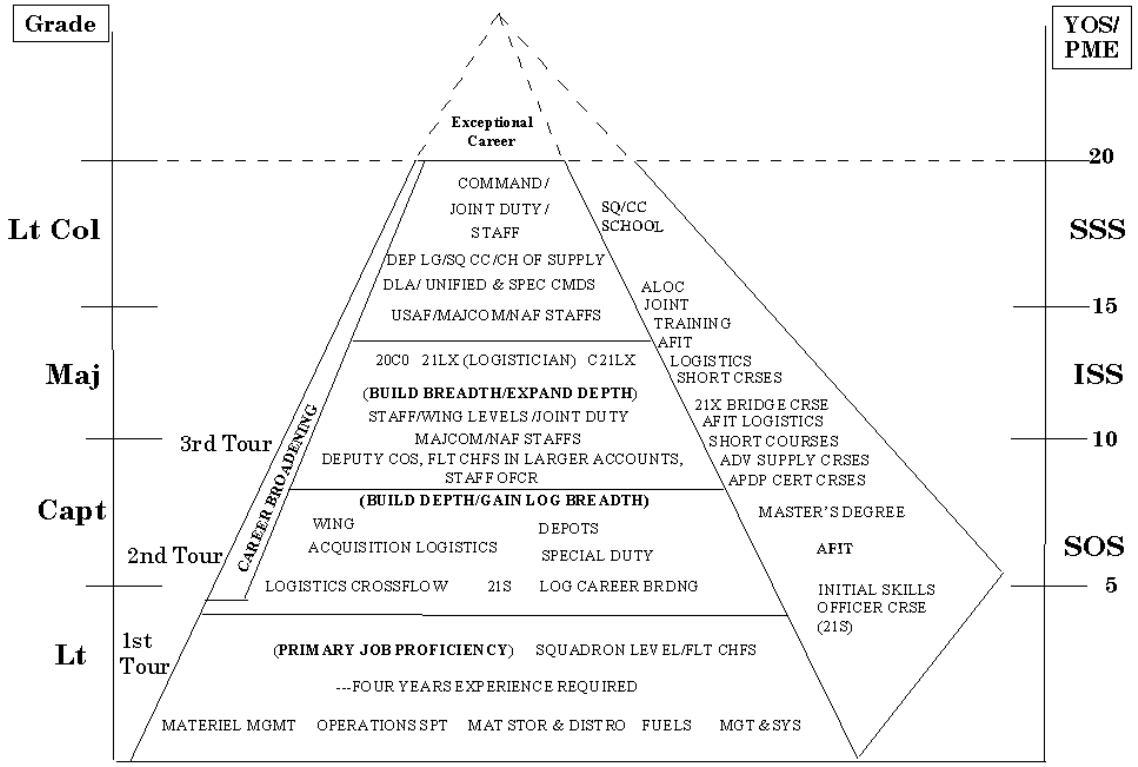

Figure 2. Supply Operations Officer Career Path Pyramid. (Department of the Air Force, undated, Figure 4.5)

The Supply Officer Career Path Pyramid, figure 1, provides guidance for the supply officer. The Career Path Pyramid and the associated text provide eleven areas of career guidance: breadth and depth, overseas assignments, multiple major commands (MAJCOMs) assignments, staff assignments, cross flow assignments, Air Force Institute of Technology (AFIT) assignment, special duty assignments, professional military education (PME), joint assignments, and command assignments.

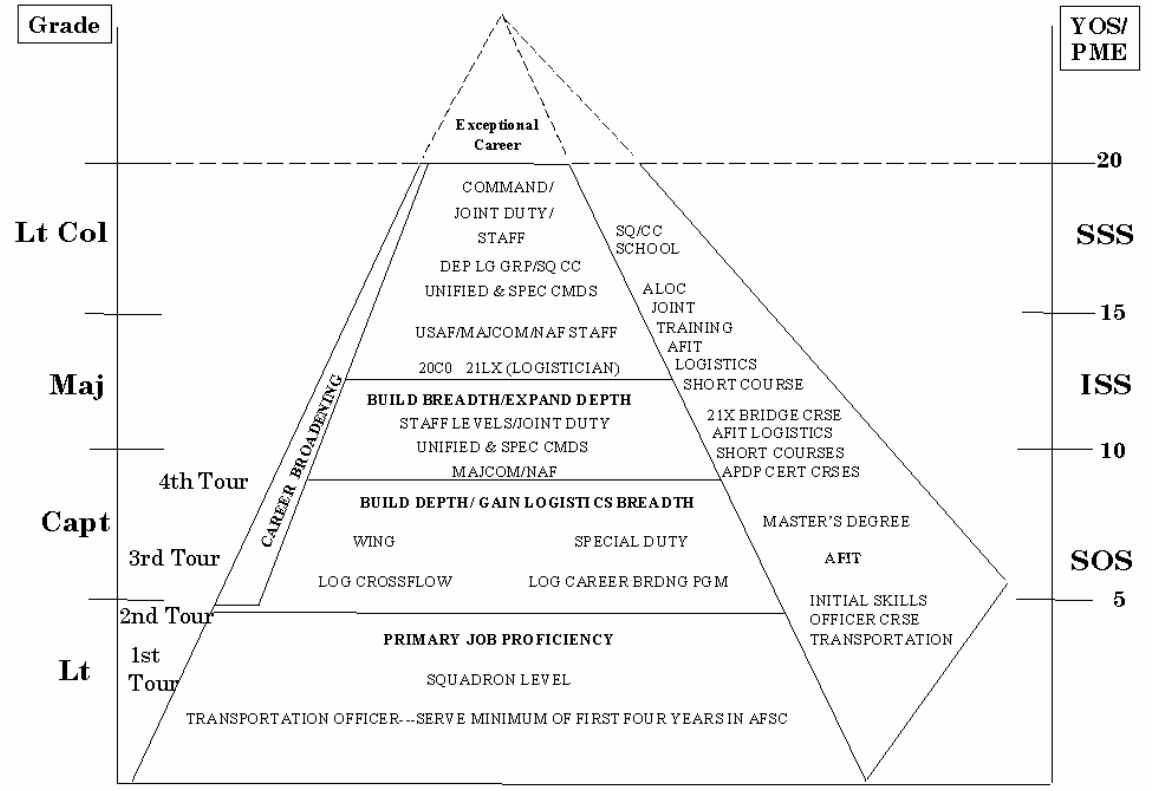

Figure 3. Transportation Officer Career Path Pyramid. (Department of the Air Force, undated, Figure 4.6)

The Transportation Officer Career Path Pyramid, figure 1, provides guidance for the transportation officer. The Career Path Pyramid and the associated text provide eleven areas of career guidance: breadth and depth, overseas assignments, multiple major commands (MAJCOMs) assignments, staff assignments, cross flow assignments, Air Force Institute of Technology (AFIT) assignment, special duty assignments, professional military education (PME), joint assignments, and command assignments.

Review of the three separate career fields shows common factors among them: breadth and depth, overseas assignments, multiple major commands (MAJCOMs) assignments, staff assignments, cross flow assignments, Air Force Institute of

Technology (AFIT) assignment, special duty assignments, professional military education (PME), joint assignments, and command assignments. Acquisition assignments are only recommended for logistics plans officers. While each career field describes the factors in terms specifically related to the AFSC, they are the exact same criteria. To avoid redundancy, each factor is described below only once.

Breadth and Depth. "When first assigned to the career field, you're expected to build depth through diverse work experience within operational logistics plans." (Department of the Air Force, undated, 4.3.1.1) Initial assignments are viewed as on the job training, and along with basic courses provided by the USAF for the career field, provide the basis for knowledge in the career field. Depth is viewed as the amount of general knowledge an officer has in their core field of expertise. Logistics officers typically complete two wing-level assignments. (Department of the Air Force, undated, 4.3.1.2) Experiencing multiple sections within the career field is defined as breadth of experience. "At least two permanent change of station (PCS) moves are generally required for you to experience the full breadth of unit level logistics plans opportunities in sufficient depth." (Department of the Air Force, undated, 4.3.1.4)

Overseas Assignments. "An overseas tour--approximately one-fourth of the logistics plans billets worldwide are overseas. Short-tour overseas assignments represent prime opportunities to quickly fill gaps in your professional development, and to hone skills in a typically austere environment." (Department of the Air Force, undated, 4.3.1.4) The USAF has multiple permanent and temporary bases around the world, and it is recommended that each officer serve some time at one or more of these locations.

Multiple MAJCOMs Assignments. "A change in MAJCOM--be mindful of the fact that experience in several different MAJCOMs will give you a broader view of the total Air Force mission and a deeper understanding of how all the "pieces" fit together." (Department of the Air Force, undated, 4.3.1.4) The USAF recommends that officers experience multiple MAJCOM experiences to obtain a "bigger picture" and understand their role in the USAF.

Staff Assignments. "For selected officers, technical expertise coupled with staff experience combine to make command material." (Department of the Air Force, undated, 4.3.3) There are many other references to staff position in this guidance. Staff assignments are defined as Numbered Air Force, MAJCOM, or higher headquarters billets designated for decision on policy, allocation of resources, and implementation of guidance. (Department of the Air Force, undated, 4.1.2.2)

Cross Flow Assignments. A cross flow assignment is recommended after an officer is fully qualified in his career field, and usually occurs after the officer has had at least four years of commissioned service. A cross flow assignment is defined as performing a tour of two to three years in another logistics AFSC. (Department of the Air Force, undated, 4.3.1) The cross flow assignment extends the breadth of knowledge to another logistics discipline, helping the officer understand their relationship with the other career fields and possibly help position them for a logistics group commander appointment. (Department of the Air Force, undated, 4.3.1.2)

AFIT Assignment. "Compete for Air Force Institute of Technology (AFIT) Degree Programs--officers graduating from these programs are assigned to advanced

academic positions that require specialized training in logistics or acquisition." (Department of the Air Force, undated, 4.3.1.5) AFIT provides the officer with a master's degree with an emphasis on Department of Defense aspects.

Special Duty Assignment. "Career broaden into an Air Force Special Duty Identifier AFSC." (Department of the Air Force, undated, 4.3.1.5) Instructors at Reserve Officer Training Corps programs, Officer Training School, Executive Officers, and other assignments that are not directly related to the career field, but are vital in the USAF are open for all career fields.

PME. "All officers need to complete PME at the appropriate time." (Department of the Air Force, undated, 4.1.3.3) Captains are eligible for Squadron Officer School, Majors for Intermediate Service School, and Lieutenant Colonels for Air War College. Each PME is offered via correspondence or in residence and prepares the officer for the expanded responsibility that accompanies the advanced rank. Due to the limited amount of space, only a percentage of each rank are chosen for in residence completion of the appropriate level of PME.

Joint Assignment. Working with other services in the Department of Defense allows the officer to experience and understand how the USAF interacts with and supports the other services. "The current emphasis is on placing the Air Force's very best officers in joint-duty billets." (Department of the Air Force, undated, 4.1.2.2)

Command Assignment. "Senior captains can compete for detachment commander positions while more seasoned majors and lieutenant colonels can compete for logistics support squadron commander positions." (Department of the Air Force, undated, 4.3.3)

A primary role of the military officer is leadership, and command is a means to exercise leadership.

Acquisition Assignment. "An assignment into the acquisition logistics arena after the second operational logistics plans assignment (captain or junior major) will allow you to meet all the training and experience requirements imposed by the Defense Acquisition Workforce Improvement Act (DAWIA)." (Department of the Air Force, undated, 4.3.1.3) Logistics plans officers are expected to understand the relationship between logistics execution and acquisition of the resources necessary for that execution. Through this understanding, the logistics plans officer will improve the over performance of the USAF logistics operations and implementation.

Career Path Pyramid Research/Validation

Little to no studies have been found to confirm that this guidance actually predicts promotion. Leighton and Elyea have done prior research in other career fields, but they merely researched if the individual officers in civil engineering and contracting respectively followed the career path pyramid. It provided no guidance on the relative weights of the factors on prediction for promotion. (Leighton, T.K., 2000) (Elyea, W.B., 2001)

III. Methodology

Introduction

This chapter will address the critical steps to determine the methodology of the research. Regression analysis allows for weighting the factors for promotion, providing ranks for each. The independent and dependent variables, or the factors for analysis, will be coded based on written guidance presented in chapter 2.

Factors for Analysis

Table 1. Factors for Analysis (Department of the Air Force, undated, 4)

		AFSC		
Code	**Factor**	21GX	21SX	21TX
D	Depth and Breadth	x	x	x
OS	Over Seas	x	x	x
M	Multiple MAJCOMS	x	x	x
S	Staff (NAF/MAJCOM)	x	x	x
X	Crossflow/Career Broadening	x	x	x
F	AFIT	x	x	x
SD	Special Duty	x	x	x
P	PME	x	x	x
J	Joint	x	x	x
C	Command (Squadron or higher)	x	x	x
A	Acquisitions	x		
O-5	Lt Col	x	x	x

The Career Path Pyramid in the OCPG defines the factors suggested for promotability for transportation, supply and logistics plans officers. Table 1 details the factors and their applicability to each career field, and answers the next three investigative questions presented in chapter 1. The inclusion of promotion to Lieutenant Colonel (Lt Col) is included as a measure of success, and is used as the dependent variable.

Method of Analysis

The method of analysis of this study is log-linear regression, using the above factors as independent and dependant variables of the regression equation. Log-linear regression is used since all dependent and independent variables are nominally coded as binary 1 = yes, 0 = no. (Christensen, R., 1990) Log-linear regression uses odds ratios to perform the regression analysis, replacing the binary code with the odds ratio in the regression equation. JMP uses the ratio of the probability of failure to the probability of success as the odds ratio. The beta weights show to what degree the factor predicts promotion. The results from JMP version 4.0.4, a statistical analysis software package, explain the relationship between the likelihood the factor is not present and the likelihood the individual will not be promoted to O-5, and the beta weights explain the degree. Positive weights show that the absence of the factor has a positive relation to not getting promoted to Lt Col; negative weights show the absence of the factor has a negative effect on not being promoted to Lt Col. For example, if an individual had a beta weight of 14 for AFIT assignment, if they did not attend AFIT, they are 14 times more likely not to be promoted to Lt Col.

For data analysis a table was created for tabulation of the rankings for individual factors.

Table 2. Data Analysis Sample (Department of the Air Force, undated, 4)

D	OS	M	S	X	F	SD	P	J	C	A	O-5
1	1	1	1	0	0	0	1	0	1	1	1

Once all of the data was coded and entered into separate tables for each separate AFSC, log-linear regression analysis was conducted using JMP. The regression equation was $O\text{-}5 = X_0 + b_1 D + b_2 OS + b_3 M + b_4 S + b_5 X + b_6 F + b_7 SD + b_8 P + b_9 J + b_{10} C + b_{11} A$. X_0 is the intercept.

The USAF maintains personnel databases, MilPDS in particular, that contain duty histories for active duty members. The data obtained from MilPDS includes duty histories for officers with primary AFSCs of 21GX, 21SX, and 21TX with at least 17 years of commissioned service. According to AFI 36-2506, the number of years of commissioned service individuals have when they obtain the rank of Lt Col is 15 to 17 years. (Department of the Air Force, 1997) With at least 17 years of commissioned service, the individual officer had the opportunity to be promoted to Lt Col. This promotion is the independent variable of the regression equation for each career field.

Table 3. Raw Data Sample (Theopistos, G., 2002)

HIST DAFSC	OFF HIST INST LOC NAME	Current Rank	PAFSC	DAS
6421	MOODY	Col	-21G1	13-Aug-01

Unit Desc	MAJCOM Desc	TAFCSD	Course Name Desc
OL PSC AFELM DLA/D SUP CT DL	ZBF	12-Jul-80	AIR WAR COL

Study Method Desc	HIST DUTY TITLE	Hist Country
NON-RESIDENCE	MANAGEMENT PROCEDURES OFFICER	US

Each factor can be extracted from the duty history data. The raw data looked like Table 3. HIST DAFS refers to duty AFSC (DAFSC) of the individual while assigned to that location, OFF HIST LOC NAME is the name of the location, Current Rank is the rank of the individual at the time of the data retrieval, PAFSC is the primary AFSC, Unit Desc is a description of the unit the individual is assigned to, MAJCOM Desc is the name of the MAJCOM assigned to, TAFCSD is the date of commissioning of the officer, Course Name Desc is the name of PME attended, Study Method Desc is the method the PME was completed, HIST DUTY TITLE is the job title of the individual, and the HIST Country is the country that the assignment took place in. A complete new line of data represents each assignment for the individual. Names and social security numbers were

included, but were deleted after the individual careers were separated due to privacy concerns. The factor is coded 1 for yes or 0 for no is based on the description of each factor in the OCPG.

Factor Description

Lieutenant Colonel. For all three career fields, if the individual had been promoted to the rank of Lt Col or higher, as indicated in the Current Rank column, they received a 1, a 0 otherwise.

Breadth and Depth. If the individual had two or more HIST DUTY TITLE and two or more OFF HIST INST LOC NAME, they received a 1, a 0 otherwise.

Overseas Assignments. If the individual served at an "other than continental United States" location, as indicated by the HIST COUNTRY column, they received a 1, a 0 otherwise.

Multiple MAJCOMs Assignments. If the individual served in two or more MAJCOMs, as indicated in the MAJCOM Desc column, they received a 1, a 0 otherwise.

Staff Assignments. Staff assignments are designated by a 4 in the fourth position of the AFSC, i.e. 21T4 would indicate a transportation staff position. (Department of the Air Force, 2001) If the individual had an AFSC with the last number of 4, as indicated in the HIST DAFSC column, they received a 1, a 0 otherwise.

Cross Flow Assignments. If the individual had a logistics AFSC other than their PAFSC, as indicated in the DAFSC column, they received a 1, a 0 otherwise.

AFIT Assignment. It is assumed that if an individual was assigned to AFIT as a student that they completed their course of study. If the individual had an assignment as

an AFIT student, as indicated in the HIST DUTY TITLE column, they received a 1, a 0 otherwise.

Special Duty Assignment. If the individual had an assignment that fulfilled the criteria described in chapter 2, as indicated by the HIST DUTY TITLE column, they received a 1, a 0 otherwise.

PME. If the individual completed the required PME in residence, as indicated in the Course Name Desc column, they received a 1, a 0 otherwise.

Joint Assignment. If the individual had a joint duty title, as indicated in the HIST DUTY TITLE column, they received a 1, a 0 otherwise.

Command Assignment. If the individual had a C prefix on their DAFSC (Department of the Air Force, 2001), as indicated in the DAFSC column, they received a 1, a 0 otherwise.

Acquisition Assignment. If the individual had a DAFSC of 63AX, 64PX, or 65AX (Department of the Air Force, 2001), as indicated in the DAFSC column, they received a 1, a 0 otherwise.

For each career field, it is emphasized that these steps are not a clear-cut road map, but a list of criteria that have historically been tied to successful careers. (Department of the Air Force, undated)

IV. Analysis and Results

Introduction

This chapter will address and explain the results of the log-linear regression analysis of the data. All figures presented in this chapter are derived from the JMP analysis tables. The full results are included in the appendix of this thesis.

Overall Results

Table 4. Beta Weights for Career Pyramid Factors

		AFSC		
Code	**Factor**	21GX	21SX	21TX
	Intercept	28.7641084	-41.000685	-15.796879
OS	Over Seas	-9.8895915	-5.9501427	-4.8910643
S	Staff (NAF/MAJCOM)	28.7798845	-5.3408483	N/A
X	Crossflow/Career Broadening	-3.4988107	16.8654787	0.16301046
F	AFIT	3.38403269	-0.1609068	5.46432218
SD	Special Duty	-3.0906128	-0.1609068	0.1655644
P	PME	10.393876	6.36696131	5.18811278
J	Joint	-0.3350358	23.3427326	-0.5732579
C	Command	27.3318997	17.4020404	1.92269575
A	Acquisitions	10.6046351	N/A	N/A

The following research question was asked in chapter 1: what is the predictive capability and relative weight for each factor for promotion? Since each individual had a 1 as a value for D, depth and breadth, as well as M, multiple MAJCOMS, these factors

were eliminated from the analysis for all AFSCs. Each individual with a PAFSC of 21TX had a 1 for S, staff, so it was eliminated from the analysis for that AFSC. As noted in chapter 3, acquisition was not a requirement for 21SX and 21TX career fields.

Two important measures of the value of regression models are the coefficient of multiple determination, or R^2, and the chi-squared goodness of fit test. R^2 provides the percentage of variation explained by the model (Devore, J.L., 2000) and the probability of greater than the chi-square goodness of fit test shows the "probability of obtaining a greater chi square value by chance alone if the specified model fits no better than the model that includes only intercepts." (Sall, J., Lehman, A., and Creighton, L., 2001) Obviously, the lower the value is the better. An acceptable range for this goodness of fit test is less than or equal to 0.05, or 5 percent. For each model, the values have been calculated and are presented below, and all models meet the acceptable level of statistical significance.

Table 5. R^2 and Chi-Squared Goodness of Fit Test Results

AFSC	21GX	21SX	21TX
R^2	0.9359	0.6097	0.5496
Prob>ChiSq	< 0.0001	0.0043	0.0053

If promotion for all officers is based on adherence to the career path pyramid for each career field, it would be expected that each regression would have similar R^2 values. From Table 5, the logistics plans officers model behaves well, with 94% of the variance explained. However, there is a drastic drop for supply officers and transportation officers, with only 61% and 55% of variance explained respectively. These results are

inconsequential, and the reason will be explained in the next few paragraphs. All three of the models fall within the acceptable range for the chi-squared goodness of fit test.

Results by Career Field

For each regression model, a Wald Chi-Square effects test was performed on each factor to test its statistical significance. The Wald Chi Square parameter is computed as (Estimate/Standard Error)^2, which is used to compute the Prob>Chi-Square, as described earlier. (Sall, J., Lehman, A., and Creighton, L., 2001) The acceptable level is less than or equal to 0.05.

The logistics plans officer model factor weights indicated in Table 4 have been ranked for evaluation in Table 6.

Table 6. Logistics Plans Officer Beta Weights

	AFSC		
	21GX		
Code	**Factor**	**Beta Weight**	**Prob>ChiSq**
OS	Over Seas	-9.8895915	0.9887
X	Crossflow/Career Broadening	-3.4988107	0.9948
SD	Special Duty	-3.0906128	0.9954
J	Joint	-0.3350358	0.9998
F	AFIT	3.38403269	0.999
P	PME	10.393876	0.9967
A	Acquisitions	10.6046351	0.9842
C	Command (Squadron or higher)	27.3318997	0.9746
	Intercept	28.7641084	0.9878
S	Staff (NAF/MAJCOM)	28.7798845	0.9854

From Table 6, none of the factors are statistically significant based on the Wald Chi-Square test. This is probably an indication of an over specified model or spurious correlation. Since none of the factors are statistically significant, the model is useless.

The supply officer model factor weights indicated in Table 4 have been ranked for evaluation in Table 7.

Table 7. Supply Officer Beta Weights

	AFSC 21SX		
Code	**Factor**	**Beta Weight**	**Prob>ChiSq**
	Intercept	-41.000685	0.9529
OS	Over Seas	-5.9501427	0.9725
S	Staff (NAF/MAJCOM)	-5.3408483	0.9734
F	AFIT	-0.1609068	0.8537
SD	Special Duty	-0.1609068	0.8187
P	PME	6.36696131	0.9867
X	Crossflow/Career Broadening	16.8654787	0.9539
C	Command (Squadron or higher)	17.4020404	0.9524
J	Joint	23.3427326	0.9549

From Table 7, none of the factors are statistically significant based on the Wald Chi-Square test. This is probably an indication of an over specified model or spurious correlation. Since none of the factors are statistically significant, the model is useless.

The transportation officer model factor weights indicated in Table 4 have been ranked for evaluation in Table 8.

Table 8. Transportation Officer Beta Weights

	AFSC		
	21TX		
Code	**Factor**	**Beta Weight**	**Prob>ChiSq**
	Intercept	-15.796879	0.9616
OS	Over Seas	-4.8910643	0.9825
J	Joint	-0.5732579	0.608
X	Crossflow/Career Broadening	0.16301046	0.8481
SD	Special Duty	0.1655644	0.8517
C	Command (Squadron or higher)	1.92269575	0.012
P	PME	5.18811278	0.9542
F	AFIT	5.46432218	0.9805

From Table 8, only one of the factors is statistically significant based on the Wald Chi-Square test. This is probably an indication of an over specified model or spurious correlation. The factor, command, was tested in a simple log-linear regression with the results listed in table 9.

Table 9. Command Beta Weight

AFSC

21TX

Code	Factor	Beta Weight	Prob>ChiSq
	Intercept	-0.7790718	0.2290
C	Command	2.16536613	0.0008

When a simple log-linear regression was run with command as the only independent variable, the R^2 was 0.51 and a Prob>Chi-Square of < 0.0001. The model has an appropriate goodness of fit with approximately 51 percent of the variance explained by the model. This time, the factor meets the criteria of the Wald Chi-Square test statistic, meaning that it is statistically significant. These results show that about half of the variance of not having a command assignment predicting not being promoted to Lt Col is explained by the model.

Although the Chi-Squared goodness of fit test shows that each model is a good fit as a whole, the only model with an individual factor that has statistical significance is the transportation model. Any comparisons between factors and career fields is purely speculative and not statistically relevant. Do the negative results of the regression models mean that officers do not need to follow the career path guidance in the OCPG? A possible reason for the negative result could be that most of the officers followed the basic guidance to some degree. When the promotion boards met, they may have used factors outside of the guidance to determine who got promoted. The promotion board could have looked for awards won by the individual, special achievements, etc., to pick

individuals that stood out from their peers and deemed them more promotable. While not proven by this study, it is reasonable to assume that the factors from the OCPG form a baseline but are not discriminators, while the factors that are not in the guidance are the actual discriminators in selection for promotion.

V. Conclusions and Recommendations

Introduction

With analysis of the historical data complete, conclusion of the research, limitations of the research, and recommendations for future research will be presented.

Conclusion

Upon reviewing the OCPG for each individual AFSC, it was obvious that each career field had similar guidance in each career path pyramid. It would be expected that the logistics readiness officer career path pyramid, unreleased as of the date of this research, would also be a very generic version of the main factors and look almost identical to the three logistics career path pyramids in this study. The final research question asked, "which factors from each need to be incorporated into the guidance for the logistics readiness career field based on their strength in the individual career fields?" Since all but one of the factors from the three regression models had no statistical significance in the samples from this thesis, the effectiveness of the career path pyramid for predicting promotion could not be statistically validated by this study. Further study needs to be conducted to determine the actual drivers that effect promotion.

Limitations of Research

With AFPC migrating from the PC III personnel database to the MilPDS personnel database, there have been numerous challenges. One of the challenges was the fact that not all individuals' data were transferred in the migration. This is clear in the data for this research. Numerous individuals fit the criteria but did not show up in the

database query. However, each sample size was at least 30, providing a large enough sample for testing purposes.

The data was also historical in nature. While the results are accurate for this population over the specified time frame, it may not be representative of future results. (Dooley, D., 2001) The data also does not identify or contain individuals that may have got chosen for promotion but due to personal reasons decided to get out of the military.

The number of field grade officers in the services is capped by US Code Title 10 chapter 831. (United States Congress, 1956) Because of this, only a percentage of the officers up for review for promotion can be selected, and is not represented in the data for this thesis. If all or most of the officers roughly follow career path pyramid guidance, then other factors would be needed to determine the percentage allowable for promotion at that particular board. It also does not include individuals that left the service due to non selection for promotion.

Recommendations for Future Research

The first suggestion for future research is a log-linear regression analysis for all officer AFSCs in the USAF. This research could provide more insight into the validity of the career path pyramid as a whole across the USAF. This research pointed out the differences of three career fields, it may be beneficial to validate if the career path pyramid is even needed, or if new career guidance needs to be established. This is especially relevant in light of the fact that most factors were not statistically significant in the regression models.

Another possible area for research is a factor analysis of promotion at each promotion milestone. This study assumed that the guidance given were necessary conditions for promotion to Lt Col, but the absence or presence of certain factors may come into play at earlier promotions. This could present the presence of correlation that could skew the results of a regression analysis.

The three career fields studied no longer exist in the USAF, having been replaced by the logistics readiness officer career field. Any career guidance put forth will not be fully realized until the new accessions reach the point where they are before promotion boards. Until then, there will be a mixture of time spent under the old guidance and time spent under the new guidance. This will confound any analysis of future career guidance. A possible solution would be a survey of individuals on promotion boards. The individuals could be asked for their criteria for selection and then the actual selectees information could be analyzed and compared to the original criteria. This could validate the use of the career path guidance for selection as well its use in the process for any career field.

This study held its research to individuals with at least 17 years time in service. Studies could be done measuring promotion at each rank, evaluating the strength of the career guidance at each promotion. This could possibly show which factors influence promotion at each stage of career progression, and form the basis of new career path guidance.

While the above recommendations are limited to the career guidance presented by the USAF, a broader analysis could be done. Factor analysis could be performed using

promotion board results and the full records used in the determinations. Statistical analysis may provide a more comprehensive list of the factors that drive promotion, providing input for new career guidance for USAF officers.

It is clear that the USAF has transformed in many ways in the past few decades. From the way they train, equip, and fight to their very structure. Career paths have merged and have been redefined as the service looks for a way to best handle the new challenges associated with the changes. There are many areas that are ripe for research, career guidance being just a small part.

Appendix A. JMP Results

Nominal Logistic Fit for O-5/21GX

Iteration History

Iter	LogLikelihood	Step	Delta-Criterion	Obj-Criterion
1	-22.87385696	Initial	2481173401	.
2	-6.406763542	Newton	2.40600856	2.56626153
3	-3.491614745	Newton	1.20098408	0.83251557
4	-2.295899763	Newton	1.02721094	0.51854595
5	-1.762581863	Newton	42.9682012	0.30087067
6	-1.534452686	Newton	0.7893657	0.14770875
7	-1.442785477	Newton	0.26125705	0.06309755
8	-1.407451003	Newton	0.21942153	0.02492818
9	-1.394148483	Newton	0.18469293	0.00947373
10	-1.389199318	Newton	0.15656322	0.00353714
11	-1.387366881	Newton	0.13560494	0.00131135
12	-1.386689901	Newton	0.11950383	0.0004847
13	-1.386440123	Newton	0.10678982	0.00017887
14	-1.386348048	Newton	0.09650485	0.00006594
15	-1.386314128	Newton	0.08801788	0.00002429
16	-1.386301637	Newton	0.08089836	0.00000895

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	20.244597	9	40.48919	<.0001
Full	1.386302			
Reduced	21.630899			

RSquare (U)	0.9359
Observations (or Sum Wgts)	33

Converged by Objective

Lack Of Fit

Source	DF	-LogLikelihood
Lack Of Fit	15	0.0000073
Saturated	24	1.3862944
Fitted	9	1.3863016

Parameter Estimates

Term		Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	Unstable	28.7641084	1883.5115	0.00	0.9878
OS[0]	Unstable	-9.8895915	697.9072	0.00	0.9887
S[0]	Unstable	28.7798845	1574.25	0.00	0.9854
X[0]	Unstable	-3.4988107	535.93841	0.00	0.9948
F[0]	Unstable	3.38403269	2599.9954	0.00	0.9990
SD[0]	Unstable	-3.0906128	536.07041	0.00	0.9954
PR[0]	Unstable	10.393876	2535.4235	0.00	0.9967
J[0]		-0.3350358	1119.4525	0.00	0.9998
C[0]	Unstable	27.3318997	857.90231	0.00	0.9746
A[0]	Unstable	10.6046351	535.71822	0.00	0.9842

For log odds of 0/1

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
OS	1	1	0.0002008	0.9887
S	1	1	0.00033422	0.9854
X	1	1	0.00004262	0.9948
F	1	1	0.00000169	0.9990
SD	1	1	0.00003324	0.9954
PR	1	1	0.00001681	0.9967
J	1	1	8.95718e-8	0.9998
C	1	1	0.001015	0.9746
A	1	1	0.00039185	0.9842

Nominal Logistic Fit for O-5/21SX

Iteration History

Iter	LogLikelihood	Step	Delta-Criterion	Obj-Criterion
1	-20.79441542	Initial	1433825084	.
2	-10.96826034	Newton	20.4876635	0.89505575
3	-9.055235472	Newton	30.2602124	0.2110287
4	-8.12760018	Newton	1.65976091	0.11399372
5	-7.656580619	Newton	0.79008579	0.06143802
6	-7.393981136	Newton	0.60339022	0.03546734
7	-7.246262466	Newton	0.39214296	0.0203574
8	-7.186467371	Newton	0.27544775	0.00830895
9	-7.16460902	Newton	0.21466489	0.00304663
10	-7.156613112	Newton	0.17632167	0.00111572
11	-7.153679434	Newton	0.14975982	0.00040952
12	-7.152601338	Newton	0.13020991	0.00015052
13	-7.152204887	Newton	0.11519444	0.00005535
14	-7.152059062	Newton	0.1032907	0.00002036
15	-7.152005419	Newton	0.093619	0.00000749

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	11.173924	8	22.34785	0.0043
Full	7.152005			
Reduced	18.325929			

RSquare (U)	0.6097
Observations (or Sum Wgts)	30

Converged by Objective

Lack Of Fit

Source	DF	-LogLikelihood
Lack Of Fit	12	1.0835798
Saturated	20	6.0684256
Fitted	8	7.1520054

Parameter Estimates

Term		Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	Unstable	-41.000685	693.92459	0.00	0.9529
OS[0]	Unstable	-5.9501427	172.36869	0.00	0.9725
S[0]	Unstable	-5.3408483	160.27712	0.00	0.9734
X[0]	Unstable	16.8654787	291.73774	0.00	0.9539
F[0]		-0.1609068	0.8724576	0.03	0.8537
SD[0]		-0.1609068	0.7019636	0.05	0.8187
PR[0]	Unstable	6.36696131	380.73287	0.00	0.9867
J[0]	Unstable	23.3427326	412.76249	0.00	0.9549
C[0]	Unstable	17.4020404	291.7379	0.00	0.9524

For log odds of 0/1

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
OS	1	1	0.00119162	0.9725
S	1	1	0.00111039	0.9734
X	1	1	0.00334204	0.9539
F	1	1	0.03401419	0.8537
SD	1	1	0.05254358	0.8187
PR	1	1	0.00027966	0.9867
J	1	1	0.00319818	0.9549
C	1	1	0.00355807	0.9524

Nominal Logistic Fit for O-5/21TX

Iteration History

Iter	LogLikelihood	Step	Delta-Criterion	Obj-Criterion
1	-20.79441542	Initial	1450548233	.
2	-9.677683503	Newton	1.59675855	1.14751188
3	-8.626602626	Newton	0.92902732	0.12170073
4	-8.378896674	Newton	0.55511515	0.02952783
5	-8.299729234	Newton	0.3619602	0.00952708
6	-8.271303674	Newton	0.26514948	0.0034325
7	-8.260907023	Newton	0.2093184	0.00125701
8	-8.257090239	Newton	0.17300675	0.00046168
9	-8.255687192	Newton	0.14746448	0.00016974
10	-8.255171184	Newton	0.12850515	0.00006243
11	-8.254981375	Newton	0.11386934	0.00002297
12	-8.254911551	Newton	0.10222775	0.00000845

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	10.071018	7	20.14204	0.0053
Full	8.254912			
Reduced	18.325929			

RSquare (U)	0.5496
Observations (or Sum Wgts)	30

Converged by Objective

Lack Of Fit

Source	DF	-LogLikelihood
Lack Of Fit	5	4.0960285
Saturated	12	4.1588831
Fitted	7	8.2549116

Parameter Estimates

Term		Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	Unstable	-15.796879	328.41274	0.00	0.9616
OS[0]	Unstable	-4.8910643	223.25281	0.00	0.9825
X[0]		0.16301046	0.8509917	0.04	0.8481
F[0]	Unstable	5.46432218	223.25537	0.00	0.9805
SD[0]		0.1655644	0.885828	0.03	0.8517
PR[0]	Unstable	5.18811278	90.387394	0.00	0.9542
J[0]		-0.5732579	1.1177681	0.26	0.6080
C[0]		1.92269575	0.7652449	6.31	0.0120

For log odds of 0/1

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
OS	1	1	0.00047997	0.9825
S	0	0	0	0.0000
X	1	1	0.03669276	0.8481
F	1	1	0.00059906	0.9805
SD	1	1	0.03493294	0.8517
PR	1	1	0.0032946	0.9542
J	1	1	0.26302477	0.6080
C	1	1	6.31277421	0.0120

Nominal Logistic Fit for O-5/21TX Command only

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	9.351600	1	18.7032	<.0001
Full	8.974329			
Reduced	18.325929			

RSquare (U)	0.5103
Observations (or Sum Wgts)	30

Converged by Gradient

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	-0.7790718	0.6476169	1.45	0.2290
C[0]	2.16536613	0.6476169	11.18	0.0008

For log odds of 0/1

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
C	1	1	11.179602	0.0008

Bibliography

Bosker, A.J. "New Officer Career Field Facilitates AEF." Excerpt from unpublished article. n. pag. http://www.af.mil/news/Jul2001/n20010720_0985.shtml. 21 November 2002.

Christensen, Ronald. ***Log-Linear Models.*** New York, NY: Springer-Verlag New York, Inc., 1990

Department of the Air Force. ***Officer Career Path Guide.*** Washington: HQ USAF, undated.

Department of the Air Force. *Officer Classification*. AFI 36-2105. Washington: HQ USAF, 30 April 2001.

Devore, Jay L. ***Probability and Statistics for Engineering and the Sciences*** (5th ed., pp.488-542) Pacific Grove, CA: Duxbury Thomson Learning, 2000.

Dooley, David. *Social Research Methods* (4th ed.) Upper Saddle River, NJ: Prentice 2001.

Elliot, Scott. "Wings Undergo Major Reorganization." Excerpt from unpublished article. n. pag. http://www.af.mil/lib/policy/letters/pl2002-05.html . 21 November 2002.

Elyea, William B. *Investigation of the Contracting Officer Career Pyramid*. MS Thesis, AFIT/GAQ/ENV/01M-04. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright –Patterson AFB OH, March 2001 (AD-A 391 586)

JMP IN. Version 4.0.4,., 113 MB, Windows XP, disk. Computer software. SAS Institute, Inc., Pacific Grove CA, 2001.

Knode, David and Burke, Peter J. ***Log-Linear Models.*** Beverly Hills CA: SAGE Publications, Inc., 1980.

Leighton, Travis K. *Investigation of the Contracting Officer Career Pyramid*. MS Thesis, AFIT/GEE /ENV/00M-11. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright –Patterson AFB OH, March 2001 (AD-A20000515 028)

Peters, F. Whitten, Secretary of the Air Force. "AFA Policy Forum." Address to the Air Force Association Convention, Secretary of the Air Force Luncheon, Washington DC, 30 September 2000.

Sall, John, Ann Lehman, and Lee Creighton. *JMP Start Statistics* (2nd ed.) Pacific Grove, CA: Duxbury, 2001.

Theopistos, Gregorios. Noncommissioned Officer in Charge Personnel, Air Force Institute of Technology, Mission Support Squadron, Wright Patterson AFB OH. Correspondence. 10 September 2002.

United States Congress. *US Code Title 10, Armed Forces, chapter 831.* Washington GPO, 1956.

Vita

Captain Gregory T. Ogorek graduated from Euclid High School in Euclid, Ohio. He entered undergraduate studies at Cleveland State University, Ohio where he graduated with a Bachelor of Science degree in Biology in June 1995. He was commissioned through Officer Training School.

His first assignment was with the 99th Transportation Squadron, Nellis AFB, Nevada in January 1997 where he served as the traffic management flight officer in charge and the combat readiness flight commander. In January 1999, he was assigned to the 100th Transportation Squadron, RAF Mildenhall, United Kingdom where he served as vehicle operations flight commander and vehicle maintenance flight commander. While stationed at Nellis, he deployed overseas in March 1998 to spend two months in Cold Lake, Canada as the transportation officer for the NATO exercise Maple Flag. In September 2002, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to Head Quarters Air Force Materiel Command, Wright Patterson AFB, Ohio.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
03-25-2003	Master's Thesis	March 2002– March 2003

4. TITLE AND SUBTITLE

UTILITY OF THE LOGISTICS OFFICER CAREER PATH PYRAMID IN PROMOTION PREDICTION

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Ogorek, Gregory T., Captain, USAF

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)

Air Force Institute of Technology
Graduate School of Engineering and Management (AFIT/EN)
2950 P Street, Building 640
WPAFB OH 45433-8865

8. PERFORMING ORGANIZATION REPORT NUMBER

AFIT/GLM/ENS/03-09

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

As part of the major restructuring of the United States Air Force, the officer career fields of transportation, supply and logistics plans have been merged into a new career field, the logistics readiness officer. The purpose of this research was to perform a statistical analysis of the career path pyramid for the logistics plans, supply, and transportation officer career fields. This will provide a baseline for the newly created logistics readiness officer, a combination of the three aforementioned career fields. Specifically, this thesis answered research questions addressing the career guidance provided by the United States Air Force, the factors involved, and their predictive value for promotion. The research questions were answered through a log-linear regression analysis of historical data. The data consisted of duty histories of officers with primary air force specialty codes of logistics plans, supply, and transportation with at least 17 years time in commissioned service. The research identified the predictive value of each factor and the presence of factors outside of the scope of current guidance influencing promotion.

15. SUBJECT TERMS
Logistics, Officer Personnel, Promotion, Statistical Analysis

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			William A. Cunningham, III, PhD AFIT/ENS
U	U	U	UU	48	19b. TELEPHONE NUMBER *(Include area code)* (937) 255-6565, ext 4283 (William.cunningham@afit.edu)

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18