DECISION ANALYSIS WITH VALUE FOCUSED THINKING AS A METHODOLOGY TO ASSESS AIR FORCE OFFICER RETENTION ALTERNATIVES

THESIS

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Abstract

Many countries realize the importance of the retention of qualified military personnel, and have tried to solve this problem using various methods. Nevertheless, the effects of those methods have not been determined or proven yet. The military retention problem is closely related to each individual's separation decision from the military. The characteristics of this decision are multi-objective and highly subjective. Accordingly, the effectiveness of various methods is heavily dependant on the value set of each individual. Decision Analysis (DA) using Value Focused Thinking (VFT) can be an excellent process to deal with this decision. Also, the data can reflect the value trends of different officer groups.

The intent of this research is to provide better understanding of the Air Force officer retention problem. This thesis effort involves building a VFT model to find out more effective alternatives in retaining pilots and non-pilots. This model, in conjunction with the results of the post-analysis, shows an example of the application of a VFT approach to the AF officer retention problem.

Results show that both officer groups have their own unique value trends concerning their jobs. As a single alternative, ***Increase Resources*** is absolutely the best one for pilots. Meanwhile, ***Close Down Rural / Overseas Bases*** is the best for non-pilots. The results also show that alternative combinations with relatively little cost can be more influential than an alternative which costs a lot of money.

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Table of Contents

Page

Abstract iv

Acknowledgments v

Table of Contents vi

List of Figures viii

List of Tables ix

I. Introduction 1

Background 1
Problem Statement 2
Thesis Overview 3

II. Literature Review 5

Chapter Overview 5
Military Retention Problem 5
Decision Analysis 11
Value Focused Thinking 13
Summary 21

III. Methodology 22

Assumption and Application Procedure 22
Step 1 - Problem Identification 22
Step 2 - Create Value Hierarchy 23
Step 3 - Develop Evaluation Measures 27
Step 4 - Create Value Functions 28
Step 5 - Weigh Value Hierarchy 33
Step 6 - Alternative Generation 35
Step 7 - Alternative Scoring 36
Summary 37

IV. Results and Analysis 39

Chapter Overview 39
Step 8 - Perform Deterministic Analysis 39
Step 9 - Perform Sensitivity Analysis 44

Page
V. Conclusions and Recommendations 50

Chapter Overview 50
Summary of Research 50
Strengths of Model.....51
Limitations of Model 51
Recommendations for Future Research 52

Appendix A. Recruitment and Retention Incentives for Medical Occupations.....53

Appendix B. Officer Influences to Leave 55

Appendix C. Description of Creating the Value Hierarchy 56

Appendix D. Description of Each Value in the Value Hierarchy 57

Appendix E. Description of Evaluation Measures in the Value Hierarchy 59

Appendix F. Exponential SDVFs for Pilots.....65

Appendix G. Exponential SDVFs for Non-Pilots.....69

Appendix H. Company Grade Pilots Influences to Leave 74

Appendix I. Company Grade Non-Pilots Influences to Leave 75

Appendix J. Description of Weight Calculation 76

Appendix K. Description of Measure Scoring.....79

Appendix L. Classification Chart of AF Officers 82

Appendix M. AF Officer Retention Survey.....83

Bibliography 86

Vita 90

List of Figures

Page

Figure 2.1 Decision-Analysis Process Flowchart 13

Figure 2.2 Overview of Value-Focused Thinking 14

Figure 2.3 Ten-Step Approach for VFT 15

Figure 2.4 F-16 Engine Modifications Value Hierarchy 16

Figure 2.5 Hierarchy with Local Weights 19

Figure 3.1 Value Hierarchy for USAF Officer Retention 24

Figure 3.2 Measure Score Continuum 30

Figure 3.3 Exponential SDVFs 31

Figure 3.4 SDVF for Leadership Index Measure 32

Figure 3.5 SDVF for Annual Pay Rate Measure 32

Figure 3.6 Local Weights for Value Hierarchy 34

Figure 3.7 Global Weights for Value Hierarchy 34

Figure 4.1 Ranking of Alternatives for Pilots 40

Figure 4.2 Ranking of Alternatives for Non-Pilots 40

Figure 4.3 Stacked Bar Ranking of Alternatives for Pilots 41

Figure 4.4 Stacked Bar Ranking of Alternatives for Non-Pilots 41

Figure 4.5 Ranking of Alternative Combinations for Pilots 43

Figure 4.6 Ranking of Alternative Combinations for Non-Pilots 43

Figure 4.7 Sensitivity Graph for Job Satisfaction 45

Figure 4.8 Sensitivity Graph for Financial 46

Figure 4.9 Sensitivity Graph for Family Support 47

Figure 4.10 Sensitivity Graph for Geographic Stability 48

List of Tables

Page

Table 3.1 Quality of Life Issues....23

Table 3.2 Evaluation Measures for Value Hierarchy....28

Table 3.3 First Tier Weights for Each Officer Group....33

Table 3.4 Possible Alternatives for AF Officer Retention....35

Table 3.5 Measure Capabilities for Value Hierarchy....36

Table 3.6 Total Value Score of Single Alternatives....37

Table 4.1 Normalized Total Potential Values....42

Table E.1 Climate Survey Leadership Questionnaire....64

Table E.2 Climate Survey Resources Questionnaire....64

Table E.3 Climate Survey Recognition of Efforts Questionnaire....65

Table E.4 Comparison of Officer Pay to Civilian Annual Wage....66

Table E.5 Locale Codes....69

Table J.1 Weight Calculation of Company Grade Pilots....82

Table J.2 Weight Calculation of Company Grade Non-Pilots....83

Table K.1 Average Number of Days TDY....85

DECISION ANALYSIS WITH VALUE FOCUSED THINKING AS A METHODOLOGY TO ASSESS AIR FORCE OFFICER RETENTION ALTERNATIVES

Chapter 1. Introduction

1.1 Background

With the end of the Cold War, the retention of military personnel has been an issue in many countries. These countries have commonly struggled with the outflow of qualified military members to the civilian sector. Though they reached their retention goals, the overall quality of military members was lower than desired. Obviously, this problem has the potential to affect the military preparedness of a country. Many methods have been used to manage human resources effectively and still meet the challenges of today's strategic environment.

In 1998, U.S. military recruiting and retention showed signs of problems. Despite the increases in recruiting resources, all services had difficulty retaining experienced personnel in technical skill areas. For example, the Air Force and Navy struggled with the outflow of aviators to the private sector. To alleviate this situation, the Pay Action in the FY00 National Defense Authorization Act raised military basic pay by 4.8 percent and committed to higher-than-usual pay increases through FY06. But officer continuation rates in the Air Force have continued to decline in recent years, especially for those in their mid-career with 6 to 13 Years Of Service (YOS) (Asch, et al., 2002).

In the Australian Defense Forces (ADF), separation of military members in highly trained employment groups such as pilots and air traffic controllers increased in the 1990s. ADF has introduced various retention bonus and completion payment schemes

since 1988 to retain military personnel. In 2000, the Australian National Audit Office (ANAO) conducted a performance audit on the retention of military personnel. The audit indicated that financial incentives represent the final tier of options to slow the rate of separation, and they need to recognize the factors that affect the separation decision in order to manage the retention problem more effectively. Also, the Australian Federal Government recognized the strong link between quality of life, family support measures, and defense capability (Johnson, et al., 2000).

In 2002, the Auditor General of Canada, Sheila Fraser, asserted in her report that the Canadian Forces have critical shortages in key military occupations; although the military leadership recognizes the problem and has taken steps to address it, it is too early to tell if these steps will be successful. According to the report, over 3,000 positions are vacant in the Canadian Forces, many of them in key occupations such as engineer, vehicle and weapons technician, and doctors and dentists (Office of the Auditor General of Canada, 2002).

Many countries realize the importance of the retention of qualified military personnel. They have tried to solve this problem using various methods, especially financial incentives. Nevertheless, the effects of those methods have not been determined or proven yet. It is hard to say that they really succeeded in retaining the "right" individuals in the military. In most cases, they did not address the reasons personnel were separating, but merely raised the price of someone who was in the market for other reasons.

1.2 Problem Statement

The military retention problem is closely related to each individual's separation decision from the military. The characteristics of this decision are multi-objective,

complicated, and highly subjective. Accordingly, the effectiveness of those methods which have been used is heavily dependant on the value set of each individual: a method might be effective for a few individuals but not all military members.

This research employs a Decision Analysis (DA) technique, Value Focused Thinking (VFT), and uses available data to deal with the military retention problem. DA with VFT can be an excellent process to deal with this complex decision. Also, the data can reflect the value trends of different officer groups. This research focuses only on the Air Force officer retention problem: officer groups with different job categories and careers are the target of this research.

The specific questions this research answers are: (1) Which alternative is more effective in retaining AF officers in each group? and (2) How sensitive are the factors in the alternatives based on up-to-date information? The results of this analysis provide better understanding of the military retention problem and help verify the effectiveness of alternatives which have been used or suggested. Ultimately, the efforts of this research provide support for effective human resource management of military personnel.

1.3 Thesis Overview

This thesis contains four themes. Chapter 2 provides the general information about the retention issues in the U.S. military and the alternatives that have been used by different organizations. It also provides an understanding of the methodology used during this research effort. Chapter 3 demonstrates the employment of DA with the ten-step VFT approach to support the recommendations for improving AF officer retention. Available data is used to find the value weights and measure scores for each officer group. In Chapter 4, model results are analyzed by using sensitivity analysis techniques in order to answer the research questions. Finally, Chapter 5 discusses the findings of the analysis

and draws conclusions based on the alternatives. Chapter 5 also includes suggested areas for further research.

Chapter 2. Literature Review

2.1 Chapter Overview

This chapter discusses the importance of personnel retention to military forces and provides a detailed background of retention issues in the U.S. military. It also explores the alternatives which have been used or suggested by different organizations to retain military members. It focuses on identifying the factors significant to the problem based on the results of those alternatives. The second and third sections provide background information necessary to understand the methodology used during this research effort. The benefits of Decision Analysis (DA) and the DA process are also described in the second section. Finally, the advantages of Value Focused Thinking (VFT) and the ten-step VFT approach are summarized.

2.2 Military Retention Problem

2.2.1 Why is it important?

Generally, the mission of military forces is to prevent or defeat the use of armed force against a country or its interests. U.S. Army Field Manual (No.1 THE ARMY) defines the military objectives.

> **Our national military objectives are to promote peace and stability, to deter conflicts, and when necessary, to defeat adversary forces in combat. These objectives defend and protect U.S. national interests.**

Accordingly, the retention or non-retention of military personnel at a desired level has the potential to affect the military preparedness of a country, and the skills and knowledge of

the members are critical to preparedness. The ability of the military to achieve its mission depends heavily upon having a sufficient number of trained, experienced personnel, due to the fact, that the military capability involves every aspect of the way it works with its people (Johnson, et al., 2000). Given the smaller number of members in the military and the increasing sophistication of weapons and methods for fighting modern wars, retaining a quality force is as important as ever.

Furthermore, personnel shortages in the military can be more difficult to correct than in civilian organizations because the military usually brings in new people only at the bottom or entry level. In other words, acquisition of military personnel has a longer lead-time than comparable tasks in the commercial or public sectors: unlike the broader workforce where lateral recruitment at all levels is normal. Gaps in higher ranks are difficult to correct if enough people are not moving through the system to be promoted to those ranks (Office of the Audit General of Canada, 2002:3). Consequently, many countries have tried to find methods which can manage their retention problem more effectively and meet the challenging strategic environment that they are faced with as well.

2.2.2 When did the issue arise?

Since January 1973, the United States has sought to accomplish what it has never attempted before, to maintain an active-duty military force of over two million, along with an expanded reserve system, on a strictly voluntary basis (Davis, 2000). When the All Volunteer Force (AVF) was adopted by President Richard Nixon, the strategic environment in which the military operated was more transparent than it is today. Distinguishing between enemies and allies was easier, and international relations were more reliable and less volatile. When the Cold War ended, so ended the era of

superpower rivalry. This Post-Cold War world has drawn the military into regional conflicts, civil wars, and ethnic disputes beyond traditional U.S. security interests. It is no small matter that the international events eliciting American military response today include not only direct U.S. security concerns but also decisions about humanitarian aid and ethical issues. The military's evolving missions affected today's military personnel management (Asch, et al., 2002). After the inception of the AVF, the U.S. military has faced two defense manpower crises.

The first crisis came in 1979. After the AVF was formed, the military had to compete in the labor market as if it were in business. Despite substantial pay raises, they quickly found that they were undermanned and those joining were of a lower quality than desired. The Army chief of staff at the time described the force as “the hollow Army” (Davis, 2000).

The second crisis came recently, in 1999. The recruit quality was still reasonably high, though it had declined steadily since 1993. The Army and Air Force did not reach their recruiting goals despite increases in recruiting resources. All Services had exceptional difficulty retaining experienced personnel in technical skill areas. Both the Air Force and the Navy struggled with the outflow of aviators to the private sector. The Air Force officer continuation rates also fell in the second half of the 1990s, particularly in critical skills such as developmental engineers, scientists, civil engineers and communications-computer officers in mid-career with 6 to 13 years in service (Asch, et al., 2002).

2.2.3 What have they done so far?

When the first crisis came in 1979 after several years of steadily worsening conditions, the U.S. government passed large increases in military pay and compensation

for FY80 and FY81, widely expanding enlistment and reenlistment bonuses, and creating controlled experiments on alternative forms of educational benefits (Asch, et al., 2002:18). The results of the experiments verified ***the importance of educational benefits as a recruiting incentive***.

After the second crisis, the FY00 National Defense Authorization Act raised the military basic pay by 4.8 percent in January 2000 and committed to higher-than-usual pay increases through FY06. Each year basic pay would be increased by 0.5 percentage point more than the change in the Employment Cost Index (An index used to monitor inflation. This measures the relative changes in wages, benefits, and bonuses for a specific group of occupations (Source: http://www.investorwords.com/).). In addition to the Pay Action, numerous steps were taken to improve retention. Another major set of resource changes were those made to ***special pays***. In some cases, the dollar amount of the pays was increased, while in other cases, the legislative limit on the maximum amount that could be paid was increased: the Act increased the nuclear officer incentive pay rate to $25,000. In other cases, new special pays were created or earlier pays were restructured: aviator continuation pay was restructured to enable aviators to receive the pay until they had 25 years of aviation service (Asch, et al., 2002). The effects of the pay increases were small relative to what would have been expected if only usual sized pay increases had occurred. Because the pay increases are mandated to continue through FY06, the effect is expected to cumulate. Although military compensation is a formidable element in achieving manning success, other factors such as advertisement, enlistment bonuses, and educational benefits as enlistment incentives also exert powerful influences. However the Services still report pockets of retention problems: continuation among Army captains, and retention of mid-career AF officers in areas that are in demand in the civilian sector such as computer system officers (Asch, et al., 2002:85-87).

Lately, the AF implemented ***an Officer Critical Skill Retention Bonus (CSRB)*** for FY03 to help retain officers in the critical skills. More than 6,000 officers in five critical skill career fields are eligible to receive a retention bonus of up to $40,000 per year for up to four years as a result of the CSRB (Hamilton, 2000).

The DoD has also been looking for ways to retain military personnel by ***improving their quality of life***. As part of its compensation, the DoD provides military members with either an allowance to help pay the cost of civilian housing or free military housing. However, about 70 percent of military housing was built before 1960, so the military housing is older, smaller, and of poorer quality compared to the housing in which members reside in the civilian sector (Buddin, et al., 1999). The current policy is for its members to rely on the private sector first for housing, but those who receive a housing allowance may pay out of pocket expenses up to $200 or more each month. Some members in civilian housing have greater out of pocket expenses because they prefer to spend more for housing: they may choose higher quality or larger residences. In 2000, as a way to retain military members by improving their quality of life, the Secretary of Defense announced an initiative to ***increase the housing allowance*** to reduce their additional costs to zero by 2005. In 2001, the General Accounting Office (GAO) analyzed the results of the broad-based 1999 Survey of Active Duty Personnel, and determined how satisfaction with housing and allowances relates to service members' intent to stay in the military. According to the analysis result, the DoD can not expect a substantial increase in retention to result solely from increasing housing allowances but the overall demand for civilian housing should increase, while the demand for military housing should decline (U.S. General Accounting Office, 2001).

In addition, the quality of education for military dependents is related to military retention. A key issue for military parents is how the learning opportunities available to their children compare to those for other children. The department supports over 70,000 military dependents in DoD schools overseas and in sixteen DoD schools in the United States. There are also over 500,000 children of military personnel served by local public schools across the United States (Buddin, et al., 2001). To enhance the quality of education for military children, the department included an additional $50 million in funds for the Federal Impact Aid Program (The primary means by which the federal government helps to ensure that the children of military personnel receive a quality education. Through this program local school districts receive grants to replace the operating revenue they lose due to the presence of military and other federal facilities in their communities.) to assist local education agencies with high concentrations of military students in FY03 (Military Impacted School Association, 2003). For reference, details of benefit and entitlement gains which have been achieved through National Defense Acts, dating back over the past 10 years, are available in the website (Holloman AFB, 2003). The information provides cumulative effects of legislative activity on personal benefits and entitlements.

2.2.4 What was wrong?

The GAO report stated that the Air Force does not have a problem with overall retention; instead retention problems are focused in certain occupations, career levels, and grades (Buddin, 1999:2-3). Also, the ANAO indicated that the financial incentives represent the final tier of options to slow the rate of separation, and the recognition of factors that affect individual's separation decision is essential to manage the retention problem more effectively (Johnson, et al., 2000).

Even though the Air Force has tried to retain members using various methods, especially financial incentives, ***the effects are somewhat controversial or not proven yet***. The point is that most of the methods failed to address the reasons members were separating. Instead, the methods merely raised the price of someone who was in the market for other reasons (Buddin, 1999). From each individual's view point, the retention problem is definitely related to each member's separation decision. The members consider not only money itself but also other values which they think important. Thus, such ***retention problems should be addressed with more targeted alternatives rather than across-the-board increases***. The incentives for medical occupations are the typical example of targeted alternatives for hard-to-fill occupations. They take advantage of various incentives to attract and retain well-qualified medical personnel. The details about the medical incentives are described in Appendix A (U.S. Army Medical Command, 2003).

2.3 Decision Analysis

2.3.1 Benefit of Decision Analysis

DA is the discipline for evaluating complex alternatives by systematic examination. When people make a decision, simply keeping all of the issues in mind at one time is nearly impossible. DA provides effective methods for organizing a complex problem into a structure that can be analyzed. Sometimes decisions are made without knowing for sure what the uncertain value will be. DA approach can help in identifying important sources of uncertainty and representing that uncertainty in a systematic and useful way. It can also provide insight to decision makers faced with hard problems.

However, it can not improve their luck. It can only help them to better understand the problems they face and thus make better decisions (Clemen, 2001:1-8).

2.3.2 Decision Analysis Process

Figure 2.1 shows the flowchart of the DA process. The first step is for the Decision Maker (DM) to identify the decision situation and to understand his objectives in that situation. People do sometimes have trouble in identifying the exact problem, and thus they treat the wrong problem. In the next step, knowledge of the objectives can help in identifying alternatives, and beyond that the objectives indicate how outcomes must be measured and what kinds of uncertainties should be considered in the analysis. The next two steps, which might be called "modeling and solution", form the heart of DA. Obviously, decomposition is the key to DA. The first level of decomposition calls for structuring the problem in smaller and more manageable pieces. Subsequent decomposition by the DM may entail careful consideration of elements of uncertainty in different parts of the problem or careful thought about different aspects of the objectives. In this research, a hierarchical model is used to understand the relationships among multiple objectives, and value functions are used to model the way in which the DM values different outcomes and trades off competing objectives.

DA is typically an iterative process. Once a model has been built, sensitivity analysis is performed. This step answers "what if" questions: "If they make a slight change in one or more aspects of the model, does the optimal decision change?" Through this process, the DM's perception of the problem changes, beliefs about the likelihood of various uncertain eventualities may develop and change. The overall strategy of DA is to decompose a complicated problem into smaller chunks that can be more readily analyzed and understood. These smaller pieces then can be brought together to create an overall representation of the decision situation. Finally, the DA cycle provides the framework

within which a DM can construct a requisite decision model that contains the essential elements of the problem and from which the DM can take action (Clemen, 2001: 5-8).

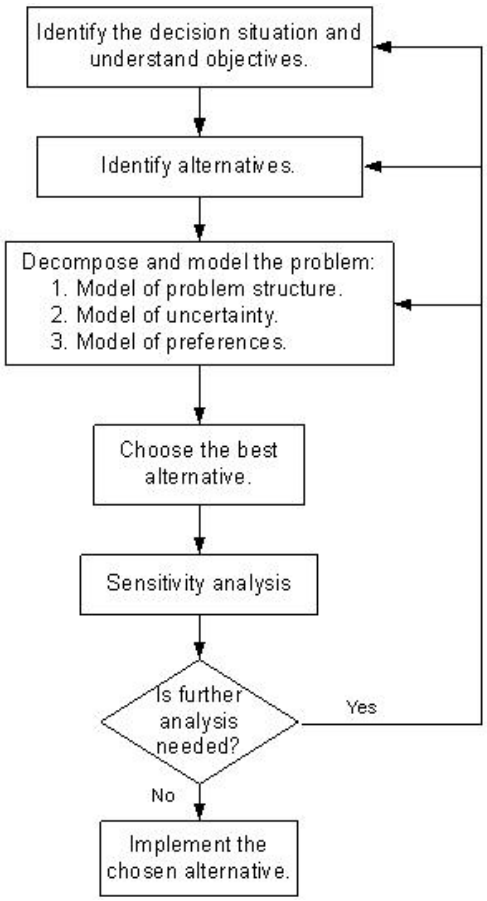


Figure 2.1 Decision-Analysis Process Flowchart (Clemen, 2001:6)

2.4 Value Focused Thinking

The method applied in this research is VFT which is a multi-objective DA technique that focuses on what an individual or organization values. Values are what people care about. As such, they should be the driving force for decision making and the basis for the time and effort people spend thinking about decisions. In VFT, people first

decide what they want and then figure out how to get it. It addresses the large void between unstructured creative thinking without bounds and very structured approaches to decision problems. In a word, it is the structuring of thinking to address decision opportunities and problems in creative ways (Keeney, 1992).

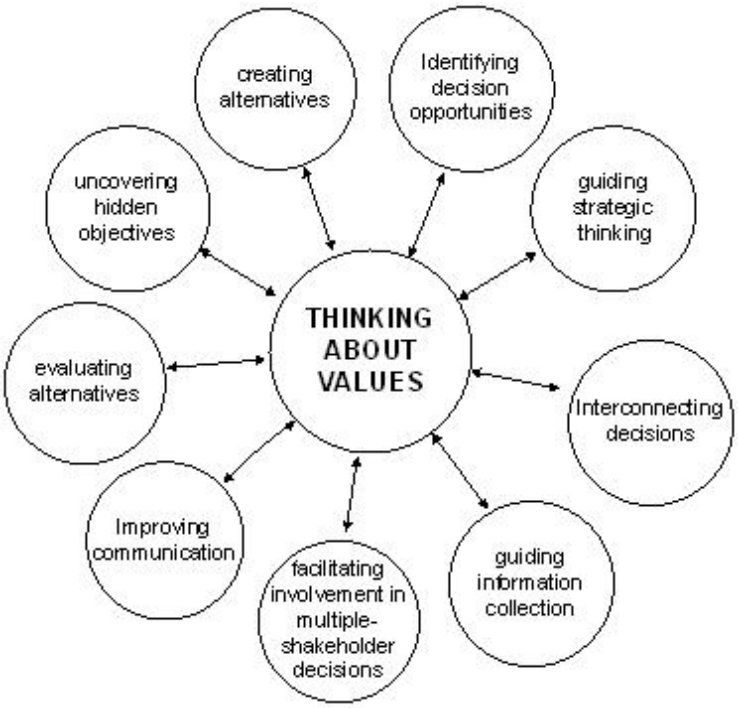


Figure 2.2 Overview of Value-Focused Thinking (Keeney, 1992:24)

The advantages of VFT are illustrated in Figure 2.2. Generally, collecting data is an expensive and time consuming effort. The values relevant to a given decision situation indicate what information is important. Once the people involved have specified their values, they should then collect information that they really need to judge the alternatives. This process can also improve communication and understanding with discussion of values that are considered important. They naturally face numerous decisions. VFT

forces them to clarify the problem, increase creativity in alternative generation, identifies value conflicts, and forces them to use values in a consistent manner. Besides, it is much more important to create alternatives than to evaluate readily available ones. In VFT, the value model guides the search for creative alternatives and the direction the search should go. Moreover, systematically appraising how well an organization is doing in terms of their values may suggest fruitful decision opportunities to formulate and pursue. Finally they could end up much closer to getting all of what they want with VFT (Keeney, 1992: 23-28).

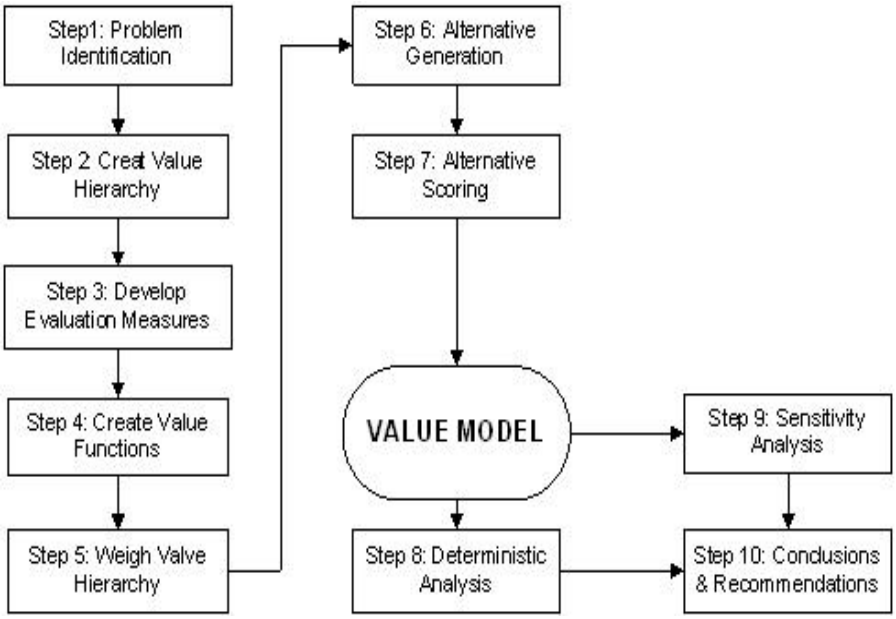


Figure 2.3 Ten-Step Approach for VFT (Chambal, 2002)

A ten-step approach for accomplishing VFT is illustrated in Figure 2.3. A brief review of this approach in the following section provides a clear understanding of the structured approach method to the problem.

2.4.1 Step 1 - Problem Identification

This step is a very important part of the decision making process. People often suggest and consider alternatives without a clear definition of the problem. This step answers the question: “what is the problem?” People must clearly identify what problem needs to be addressed. Solving the wrong problem sometimes is called an “error of the third kind” (Clemen, 2001:5). If the problem is not identified correctly, the efforts to solve the problem would be wasteful.

2.4.2 Step 2 - Create Value Hierarchy

A value hierarchy is a graphical means of structuring values in a hierarchical or "treelike" structure. The hierarchy is composed of different levels or tiers. The topmost tier is the decision to be made. The remainder of the hierarchy is broken down into branches that become more and more specific with each tier. The bottom tier becomes the evaluation considerations for which measures are determined. An example of a value hierarchy is shown in Figure 2.4. This step guides people to collect good information, helps them to better understand the full breadth of considerations that are important in evaluating alternatives, and facilitates communications among the stakeholders.

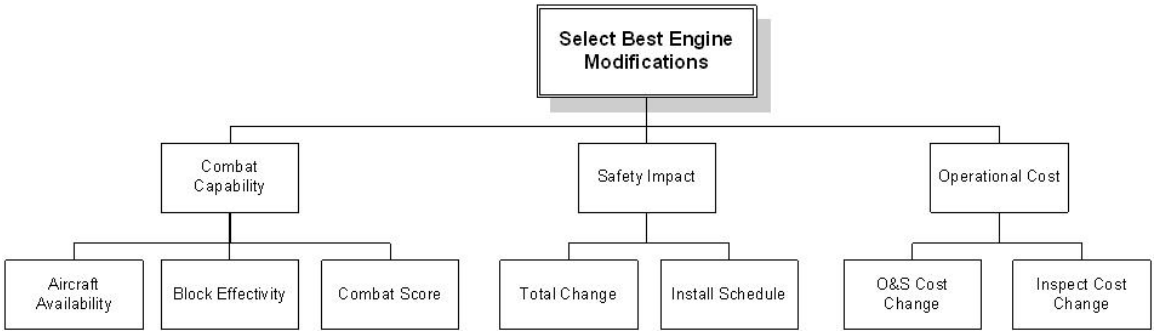


Figure 2.4 F-16 Engine Modifications Value Hierarchy (Chambal, 2002)

Desirable properties for a value hierarchy include completeness (collectively exhaustive), nonredundancy (mutually exclusive), independence, operability, and small size. For a value hierarchy to be complete, the evaluation considerations at each layer must adequately cover all concerns necessary to evaluate the overall objective of the decision. In addition to being complete, evaluation considerations should not overlap in the same layer or tier of the hierarchy. And the preference for the level of one evaluation measure should not depend on the level of the other evaluation measure to satisfy the independence property. Other things being equal, it is desirable to have a smaller value hierarchy because a smaller one can be communicated more easily (Kirkwood, 1997: 16-19).

2.4.3 Step 3 - Develop Evaluation Measures

The evaluation measures allow an unambiguous rating of how well an alternative does with respect to each objective. The ranges of these measures aid in the decision process by providing a rating of how well each alternative scores with respect to the objectives (Kirkwood, 1997). Evaluation measure scales can be classified as either ***natural*** or ***constructed***, and also as either ***direct*** or ***proxy***. A natural scale is one that is in general use with a common interpretation by everyone: "number of fatalities" for evaluation of risk of death, "profit in dollars" for a business decision. A constructed scale is one that is developed for a particular decision problem to measure the degree of attainment of an objective. Constructed scales are used in a variety of situations where natural scales are not appropriate. A direct scale directly measures the degree of attainment of an objective, while a proxy scale reflects the degree of attainment of its associated objective, but does not directly measure this. "Profit in dollars" is usually a

direct scale. “Gross National Product” is a proxy scale for the economic well-being of the country (Kirkwood, 1997:24).

2.4.4 Step 4 – Create Value Functions

To analyze alternatives, individual evaluation measure scales must be converted to common scores with value between 0 and 1. An alternative that has the least preferred scores for all of the evaluation measures will have an overall value of zero, and an alternative that has the most preferred scores will have an overall value of one. Converting the scores to units of value is accomplished through Single Dimensional Value Functions (SDVFs); they are used to standardize the units used for all the measures in the model (Jurk, 2002). The value function can be adjusted by the DM according to his judgment. Generally, there are two different forms of SDVF. One is made up of segments of straight lines that are joined together into a piecewise linear function, while the other uses a specific mathematical form called the exponential decay function for the SDVF (Kirkwood, 1997:61). When the value measure has a small number of possible different scoring levels, a piecewise linear SDVF is generally used.

2.4.5 Step 5 – Weigh Value Hierarchy

A value model requires the DM to indicate the degree of importance for every value and measure. One way to weight the hierarchy is to assign a local weight to each value and measure in each branch and tier of the value hierarchy. These local weights usually sum to one. Global weights are simply indicators of the considerations importance relative to all other considerations in the hierarchy, not just its branch and tier. The hierarchy with local weights is used in this research process and an example is illustrated in Figure 2.5.

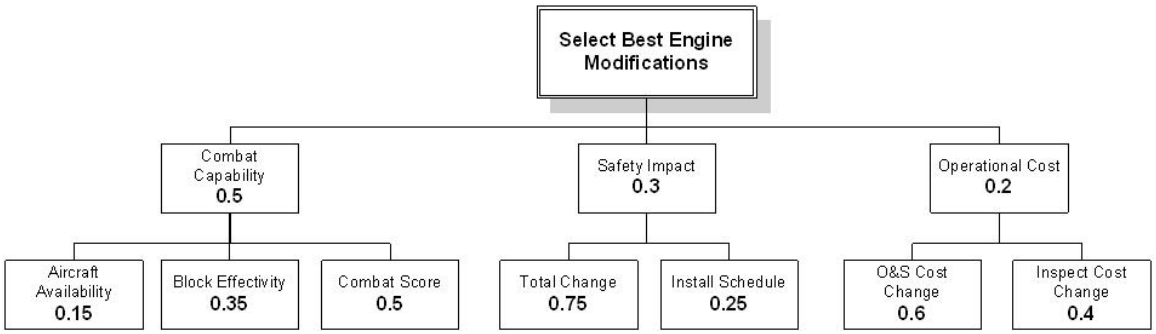


Figure 2.5 Hierarchy with Local Weights (Chambal, 2002)

2.4.6 Step 6 – Alternative Generation

The first alternatives that come to mind in a given situation are the obvious ones, those that have been used before in similar situations and those that are readily available (Kirkwood, 1997:9). Focusing on the values that are guiding the decision situation makes the search for new alternatives a creative and productive exercise. There is no substitute for a good alternative. Sometimes alternative generation is not necessary if the alternatives come from outside sources.

2.4.7 Step 7 – Alternative Scoring

To score the alternatives, the data required for each measure must be collected. This step also dictates consultation with subject matter experts about the scores (LaPietra, 2002: 24). This may be a time-consuming process. People should collect information that they really need to score the alternatives. There are too many tales about expensive efforts to collect data that turned out to be worthless (Keeney, 1992). After obtaining the credible data, alternatives are evaluated for each measure. When scoring alternatives,

maintaining proper documentation of data collection methods and resources is vital in supporting the validity of the results (Kimbrough, 2001: 250)

2.4.8 Step 8 - Perform Deterministic Analysis

This step is the mathematical process of combining the score of every measure and the associated weight for each alternative. The relative ranking of the alternatives are determined in this step. This process requires the value functions which combine the multiple evaluation measures into a single measure.

2.4.9 Step 9 – Perform Sensitivity Analysis

Sensitivity analysis answers the question: "what makes a difference in this decision?" It is used to examine how robust the choice of an alternative is to changes in the figures used in the value hierarchy; it shows how each alternative changes in ranking as the weight of any higher tier value changes. The weights within the value hierarchy tend to be a major focus of sensitivity analysis since they are often a source of disagreement within the decision maker groups (Kirkwood, 1997:82). This step can lead the DM to reconsider the very nature of the problem.

2.4.10 Step 10 – Conclusions and Recommendations

After completing the deterministic and sensitivity analysis, the results are presented to the DM and the associated organization. A presentation is a fast and potentially effective method of getting things done through other people. This step provides insight for DMs to help them make better decisions, but does not draw a conclusion as to what decision should be made (LaPietra, 2003:27).

2.5 Summary

The topics discussed in this chapter provide a better understanding for the decision problem that this research explores and the methodology that is used. The retention of qualified military personnel is a critical issue to a country. Due to the characteristics of the problem, it should be addressed with more targeted methods rather than across-the-board ones. In addition, decision analysis is an appropriate discipline for evaluating complex alternatives by systematic examination, and the VFT process can help DMs end up much closer to getting all of what they want.

The next two chapters focus on finding out the alternatives for USAF officer retention by constructing a VFT model. Especially in Chapter 4, the very nature of the problem is discovered through sensitivity analysis based on the values.

Chapter 3. Methodology

3.1 Chapter Overview

This chapter describes the application of the VFT methodology to the analysis of AF Officer Retention. It starts by explaining the main assumption of this research. Then it describes the pre-analysis steps of the VFT approach discussed in Section 2.4 (i.e. Step 1-7). Finally, it concludes with details of the alternatives to be analyzed and the scores for each measure of the hierarchy.

3.2 Assumption and Application Procedure

The main assumption of this analysis is that "***There are unique value trends about their jobs in each AF officer group***". Officers are separating from the military for different reasons; their value weights and score measures in the model differ according to the characteristics of their jobs. As a result, an alternative that satisfies the value set of a certain officer group may not coincide with the one for another officer group. This decision situation indicates that the multi-criteria decision analysis with VFT is a good methodology to answer the research question. Based on the assumption, this research categorizes the AF officers into several groups according to their job characteristics. Then it uses group data to reflect the value trends of each officer group. Finally, it determines the effective retention alternatives for each officer group.

3.3 Step 1 – Problem Identification

The first research question is, "Which alternative is more effective in retaining USAF officers in each group?" This research picked two subject groups for which data is

available in published reports: ***Company Grade Pilots*** and ***Company Grade Non-Pilots***. These groups are used in an example of the application of this methodology. This same process can be used for more specific retention problems, such as Civil Engineer (32E) and Scientist (61S) with 4 to 11 YOS.

3.4 Step 2 – Create Value Hierarchy

From an individual officer's viewpoint, the first research question corresponds to the question: "Which alternative is more influential to my separation decision?" The more people decide to separate from the military, the larger the retention problem becomes. So the value hierarchy needs to consider the factors that have an effect on the separation decision and reflect the value trends of each officer group. Even though the DM is the Air Force, the hierarchy needs to reflect each officer group's intent.

The value hierarchy has four main categories: ***Job Satisfaction, Financial, Family Support, and Geographic Stability***. Most of the values in the hierarchy are based on the variables (Appendix B) in the "2000 USAF Careers and New Directions Survey (Hamilton, 2000:35)" and "2002 Quality of Life Survey" accomplished by the Air Force Personnel Center Survey Branch.

Table 3.1 Quality of Life Issues (Air Force Survey Branch, 2002:4)

Non-Pilot	Pilot
Manpower	TEMPO
Compensation/Benefits	Manpower
Workplace Environment	Compensation/Benefits
TEMPO	Workplace Environment
Health Care	Health Care
Housing	Housing
Community and Family Programs	Community and Family Programs
Educational Opportunities	Educational Opportunities

Table 3.1 shows the Quality of Life Issues in the Quality of Life Survey in order of importance sorted by Non-Pilot and Pilot officers. Additionally, it considers "Quality of life factors (1. Remuneration, 2. Family support: accommodation, children's education, spouse employment, extended families, base facilities in remote location, support networks for spouses, 3. Career prospects / progress.)" from the report of the Australian National Audit Office (ANAO) (Johnson, et al., 2000:19). The value hierarchy is built by modifying and re-categorizing those variables. Most of the variables in both surveys are overlapped and contain such a specific meaning that it integrates those variables into more general ones. At a glance, it seems like there is some crossover of each value in the hierarchy. However, it is built to satisfy the desirable properties of a value hierarchy discussed in section 2.3.2 as much as possible. The more detailed reasoning for creating the value hierarchy is attached in Appendix C.

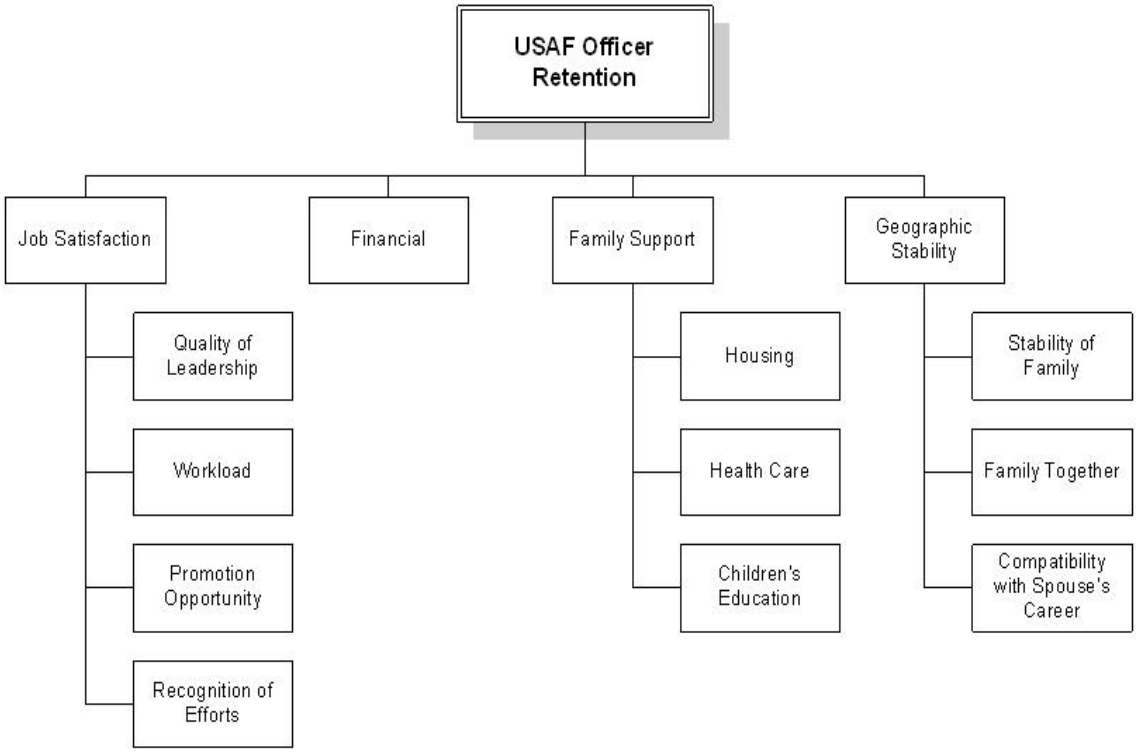


Figure 3.1 Value Hierarchy for USAF Officer Retention

It ends up with the final set of values shown in Figure 3.1 to assess alternatives for the USAF officer retention problem: 4 values in the first tier and 10 values in the second tier. All of the variables are thoroughly dissolved in the 14 values. Each value in the hierarchy is explained in the following section.

3.4.1 Job Satisfaction

Job Satisfaction is one of the key values found in the first tier of the hierarchy. It has been shown to influence the member's decision to leave the organization or to retire. Satisfied workers tend to be more committed to the organization, to have more favorable attitudes towards their work and the organization, and to be less likely to leave their jobs than are dissatisfied workers (Human Resources at CMU, 2003). A great deal of contemporary research shows that happiness results from taking on challenges and being committed to the result. When officers achieve their goals, they feel a sense of satisfaction that cannot be obtained through other means. This category encompasses *Quality of Leadership, Workload, Promotion Opportunity*, and *Recognition of Efforts.* The description of each value under ***Job Satisfaction*** is detailed in Appendix D.

3.4.2 Financial

Financial is a second key value found in the first tier of the value hierarchy. It would be a lie for people to say that money is not a motivator. While individuals consider many factors when choosing a profession or career, pay is certainly among the more important. When officers in critical skills leave the military for the private sector, they have a good chance to earn more money. As a result, pay must be both comparable to that of similar jobs elsewhere and commensurate with one's education and experience to be competitive in the labor market. This category has no second tier value, but only a

measure. ***Financial*** value includes Regular Military Compensation (RMC) (Military Compensation Background Papers, 1996:21), Special Pay, and Special Bonus. RMC includes Basic Pay, Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), and the tax advantage stemming from the nontaxability of these allowances. In addition to RMC, officers in certain skills and assignments will be paid special pay and bonuses. Individual officers usually receive no more than seven or eight financial incentives over the course of their careers.

3.4.3 Family Support

Family Support is the third key value found in the first tier of the value hierarchy. Today's military is a military of families. About one in seven active duty members enter the military married, and by the eighth year of military service, approximately three-quarters of the members are married and many also have children (Hosek, et al., 2002:3). ***Family Support*** is also closely related to the quality of life. Quality of life is an area of study that has attracted a great deal of interest, particularly in the areas of health, education, and social services. Quality of life is one of the most influential factors which contribute to the member's decision to remain in or leave the military. The goal of this value is to promote the families of military members to live in a way that is best for them within their environments. Family life in the military should be better than that in the private sector to retain qualified members. To achieve this goal, three values are included in the second tier in the value hierarchy: *Housing, Health Care,* and *Children's Education*. The description of each value under ***Family Support*** is detailed in Appendix D.

3.4.4 Geographic Stability

Geographic Stability is the forth key value in the first tier in the value hierarchy. Military duties, hardships, and risks affect not only the military members, but also the member's entire family. Military members are periodically reassigned, and Permanent Change of Station (PCS) moves generally require them to pack up their entire household and move to another location. PCS moves also accompany the school transfer of their children to a new area, and usually the working spouse has to leave one job and find another. Moreover some PCS tours involve separation from the family: about 14 percent of those who were married and/or had dependent children were not accompanied by their families in the fall of 1999 (U.S. General Accounting Office, 2001:3). This category includes, *Stability of Family, Family Together,* and *Compatibility with Spouse's Career.* The assignment issue of primary concern for leaving in Appendix B is also included in this value. The description of each value under ***Geographic Stability*** is detailed in Appendix D.

3.5 Step 3 - Develop Evaluation Measures

This model has 14 measures. Each measure is mutually exclusive from other measures and captures independent information. Some second tier values under ***Job Satisfaction*** such as ***Leadership, Workload,*** and ***Recognition of Efforts*** are so subjective that it employs AF Climate Survey Questionnaires to quantify them. Most of the measures only consider the current situation, but several measures under ***Geographic Stability*** take the ratio of certain time periods in the officer's career. Table 3.2 contains

the values, their respective measures, and lower and upper bounds on these measures in the value hierarchy. The details of each measure are explained in depth in Appendix E. Appendix E shows whether or not the measure is direct or proxy as well as whether or not it is a natural or constructed scale. It also researches the latest data available for each measure to determine the appropriate range. This is an essential process because the entire range needs to be encompassed during the value function development step.

Table 3.2 Evaluation Measures for Value Hierarchy

1st Tier Value	2nd Tier Value	Measure (scale)	Lower Bound	Upper Bound
Job Satisfaction	Quality of Leadership	Leadership Index (score)	3	6
	Workload	Resources Index (score)	3	6
		Annual Number of TDY (number)	0	40
	Promotion Opportunity	Promotion Rate (percentage)	40	80
	Recognition of Efforts	Recognition Index (score)	3	6
Financial	N/A	Annual Pay Rate (percentage)	60	150
Family Support	Housing	Out of Pocket Cost Rate (percentage)	0	30
	Health Care	Health Care Index (score)	0.6	1
	Children's Education	Total Expenditure per Student (dollar)	5,000	12,000
Geographic Stability	Stability of Family	PCS Timing Rate (percentage)	30	100
		Average Duration of PCS (year)	1	4
	Family Together	Separation Time Rate (percentage)	0	40
		Annual Days of TDY (day)	40	120
	Compatibility with Spouse's Career	Urbanization Index (score)	0.6	1

3.6 Step 4 – Create Value Functions

To analyze alternatives, SDVFs are used to convert individual evaluation measure scales to common scores with a value between 0 and 1. Since this model uses the group averaged data, all of the SDVFs are continuous with exponential curves, even though several of the measures such as Health Care and Urbanization Index employ categorical bins. To accurately assess and compare the alternatives, this model adopts the concept of ***Measure Score Continuum*** and ***Current Measure Capability*** (Pruitt, 2003). This allows constructing a more dynamic and adjustable model, and assessing the value provided by increases in the current measure score in each area. The details are summarized in the following Sections.

3.6.1 Measure Continuum Development

Each measure has a minimum acceptable score level and a target score level. For each of 14 measures, the DM and subject matter experts must clarify the lowest level of the measure score. This lower bound or "0%" level of measure score, along with the upper bound provided by the target score, produces the ***Measure Score Continuum*** displayed in Figure 3.2. This research assumes lower and upper bounds of each measure, based on the latest data. Using the minimum acceptable and target measure scores as a basis for comparison, the ***Current Measure Capability*** is identified on the measure score continuum. The ***Current Measure Capability*** is defined by determining what percent of the target level AF officers currently achieve in each area.

The difference between the target measure score and the current measure score defines a ***Measure Score Gap (100-X) %*** as shown in Figure 3.2. This represents the room for improvement in a measure score. The more an alternative can close the gaps of each measure, the more valuable it becomes. ***Percent Closure in Gap*** is the ratio of the

difference between the alternative measure score and the current measure score to the measure score gap. For example, if the minimum acceptable measure score is 3, the current measure score is 4, the alternative measure score is 5, and the target score is 6, then the current measure capability is 33% and the percent closure in gap is 50%.

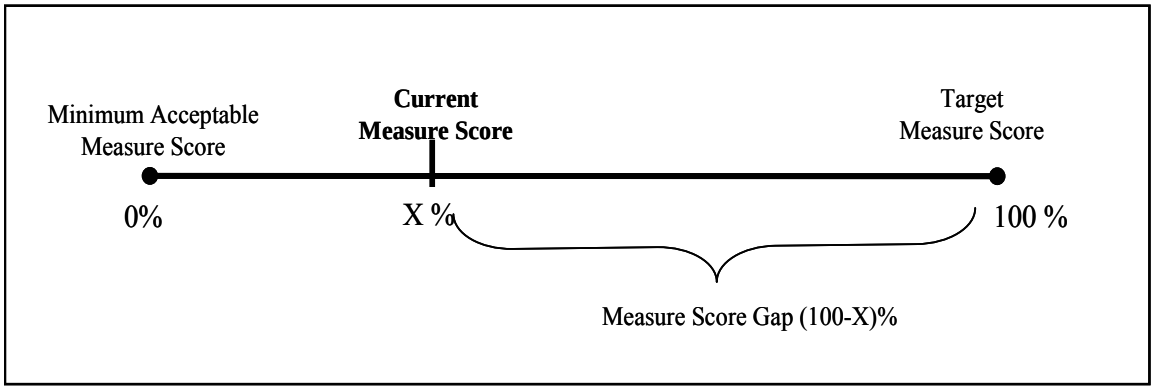


Figure 3.2 Measure Score Continuum

3.6.2 Exponential SDVF Development

Using the percent closure in gap as the X-axis, and the following equations, shapes of SDVF are shown in Figure 3.3. The SDVF for measure *i* is as follows, where *x* is the percent closure in gap and C_i is the current measure capability.

$$V_i(x) = \begin{cases} 1, & \text{for } C_i = 100 \\ \dfrac{x}{100}, & \text{for } C_i = 50 \\ \dfrac{1-e^{-x\cdot R}}{1-e^{-100\cdot R}}, & \text{otherwise} \end{cases}$$

$$\text{where} \qquad R = \frac{50 - C_i}{\rho}, \quad \text{for } \rho > 0.$$

The parameter ρ accounts for the value preferences of the DMs being solicited to create the SDVFs. In this research, ρ is defined as 1000 (Pruitt, 2003: 22-23). The graph displays the SDVFs given current measure capabilities equal to 0, 10, 20, 30, 40, 50, 60, 70, 80, and 90 percent of the target level. These current measure capabilities are annotated on each of the curves. If the current measure capability is relatively low (i.e. below 50%), then the measure score gap would be large, and the SDVF curves show that even small decreases in the gap have large value. On the other hand, if the current measure capability is high (i.e. above 50%), then the measure score gap would be close to the target value, and the SDVF curves show that large change in this small gap are needed to get any value.

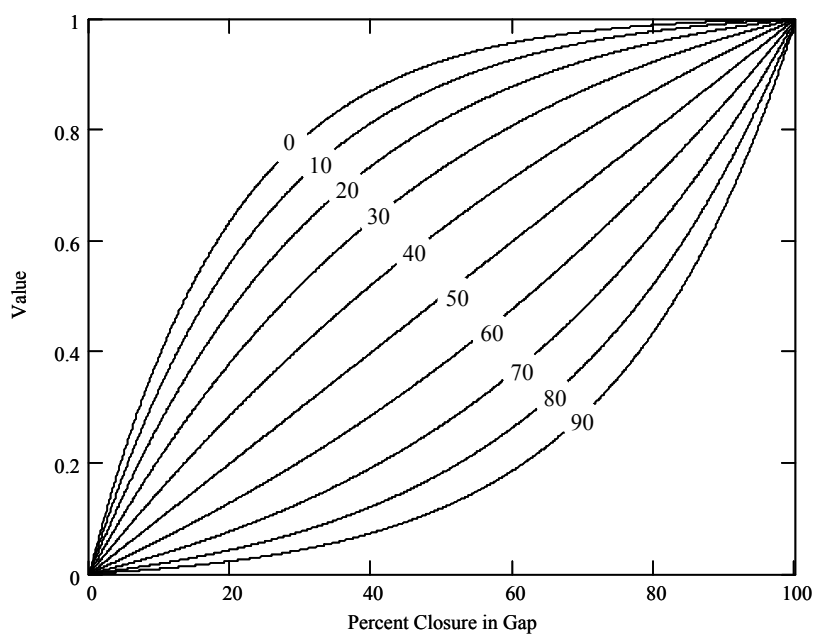


Figure 3.3 Exponential SDVFs

For example, the SDVF of ***Leadership Index*** under *Leadership* value for pilots is shown in Figure 3.4. The minimum acceptable measure score and the target one are

assumed as 3 and 6, respectively. The current measure score is 5. Accordingly, the current measure capability is 67%.

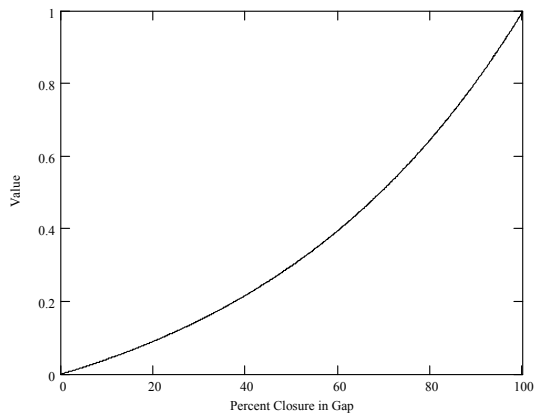


Figure 3.4 SDVF for Leadership Index Measure

The SDVF of ***Annual Pay Rate*** under *Financial* value for pilots is shown in Figure 3.5. The minimum acceptable measure score and the target measure score are assumed as 60% and 150%, respectively. The current measure score is 70%. Accordingly, the current measure capability is 11%. The rest of SDVF curves are shown in Appendix F and G. Also, the calculation procedures are explained in Section 3.9.

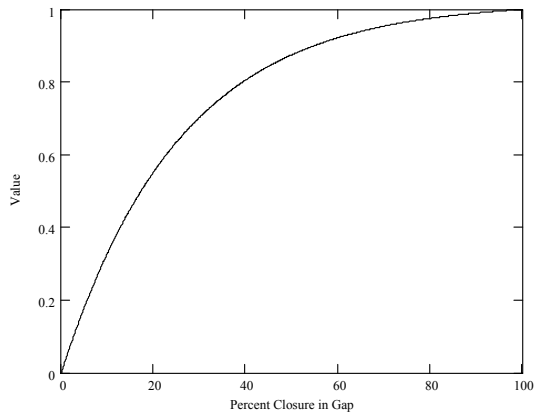


Figure 3.5 SDVF for Annual Pay Rate Measure

3.7 Step 5 – Weigh Value Hierarchy

The assignment of weights to the measures of the value hierarchy is a critical step that drives the outcome of the model. This analysis uses a top-down approach to weigh the hierarchy, and weighs each branch locally. Even though the DM of this model is the Air Force, they need the data from officers who are the subject of this analysis. This research uses the Company Grade Pilots Influences to Leave in Appendix H and the Company Grade Non-Pilots Influences to Leave in Appendix I to calculate the weights of the value hierarchy. Table 3.3 shows the weights of the first tier values of two officer groups. The reasons for calculating the weights from the Influences to Leave are attached in Appendix J.

Table 3.3 First Tier Weights for Each Officer Group

	Job Satisfaction	Financial	Family Support	Geographic Stability
Company Grade Pilots	45.7%	2.8%	19.5%	32.0%
Company Grade Non-Pilots	44.2%	6.0%	18.2%	31.6%

Figures 3.6 and 3.7 show the value hierarchy with the local and global weights of the two officer groups, respectively. The global weights of the measures, showing the percentage of importance each measure has relative to all other measures in the hierarchy, are used later in the analysis to figure out the total value of each alternative. The value trends of each officer group can be inferred from the value weights of the hierarchy.

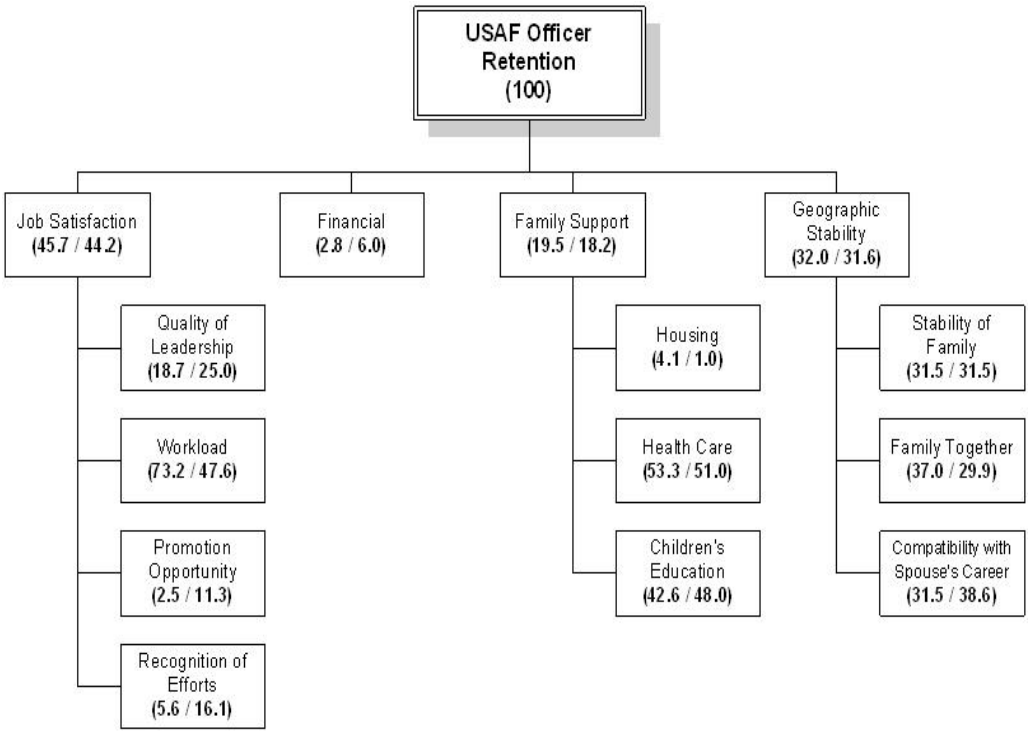


Figure 3.6 Local Weights for Value hierarchy (Pilots / Non-Pilots)

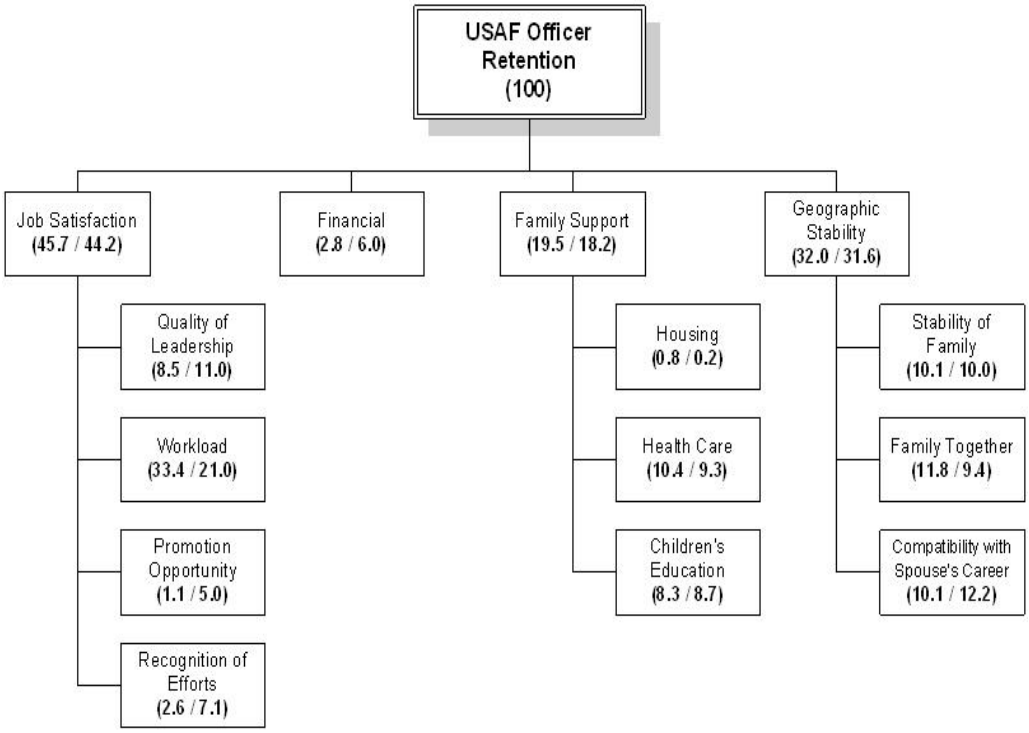


Figure 3.7 Global Weights for Value hierarchy (Pilots / Non-Pilots)

In the first tier, there are no remarkable differences except in the weight of ***Financial*** value. Also, ***Job Satisfaction*** and ***Geographic Stability*** take most of the total weight. However, in the second tier under ***Job Satisfaction***, there are definite differences as shown in Figure 3.6. ***Work load*** is the most significant value for Pilots. It is also important for Non-Pilots, but not as important as for Pilots. In the case of ***Promotion Opportunity***, Non-Pilots think it is more important than Pilots. ***Housing*** is a dispensable value for both groups.

3.8 Step 6 – Alternative Generation

The first alternatives are those that have been used before in similar situations and those that are readily available. Those alternatives are already mentioned in Section 2.2.3. Table 3.4 shows the general idea about the possible alternatives which can improve the values in the hierarchy.

Table 3.4 Possible Alternatives for AF Officer Retention

1st Tier Value	Alternative
Job Satisfaction	• ***Develop Chain of Command Feedback*** • ***Increase Resources (personnel)*** • Realign Duty Location to Minimize TDY • ***Raise the Promotion Rate***
Financial	• Increase Basic Pay • ***Increase Special Pay / Bonus***
Family Support	• ***Increase Basic Allowance for Housing*** • Modify Health Care System • ***Increase Federal Impact Aid Program Fund***
Geographic Stability	• ***Manipulate PCS Duration / Timing*** • Increase Family Separation Allowance • ***Close Down Rural / Overseas Bases***

These alternatives can be used as targeted alternatives as well as across-the-board ones. The implementation of the AF Officer CSRB is one of the typical examples of a targeted one. In reality, the Air Force needs to do cost-benefit analysis to minimize the expenditure and create more detailed alternatives, which can be induced from Table 3.4. Some alternatives are so closely related to political issues that the implementation might be difficult, even though those are the best ones to alleviate the military retention problem. This research uses eight notional alternatives which are italicized in Table 3.4. Each alternative is built to maximize a specific value.

3.9 Step 7 – Alternative Scoring

Table 3.5 Measure Capabilities for Value hierarchy

1st Tier Value	Measure (scale)	Pilots		Non-Pilots	
		Score	Capability	Score	Capability
Job Satisfaction	Leadership Index (score)	5	67%	4	33%
	Resources Index (score)	4	33%	4.5	50%
	Promotion Rate (percentage)	60	50%	50	25%
	Recognition Index (score)	5	67%	4	33%
Financial	Annual Pay Rate (percentage)	70	11%	90	33%
Family Support	Out of Pocket Cost Rate (percentage)	20	33%	20	33%
	Health Care Index (score)	0.69	23%	0.76	40%
	Total Expenditure per Student (dollar)	8,745	54%	8,745	54%
Geographic Stability	PCS Timing Rate (percentage)	60	43%	60	43%
	Average Duration of PCS (year)	2	33%	2	33%
	OS Unaccompanied Rate (percentage)	***5.3 (3~8)***	***54%***	***4.4 (3~8)***	***72%***
	Annual Days of TDY (day)	109	14%	65	69%
	Urbanization Index (score)	0.75	38%	0.81	53%

To score the alternatives, this research uses the available data as much as possible. Some scores, such as ***Leadership Index, Resources Index, and Recognition Index*** are induced from the available data sources. Some are assumed due to the lack of specific data. The details of measure score processing are depicted in Appendix K, and current measure scores and current measure capabilities are summarized in Table 3.5. Based on the current measure capabilities, Table 3.6 shows the total value score of the single alternatives for the two officer groups. ***Do Nothing*** alternative for both officer groups shows score of zero, since the SDVFs in this research use the percent closure in gap as the X-axis.

Table 3.6 Total Value Score of Single Alternatives

Alternative	Total Value Score	
	Pilots	Non-Pilots
Close Down Rural / Overseas Bases	0.157	0.122
Develop Chain of Command Feedback	0.034	0.076
Do Nothing	0	0
Increase BAH	0.026	0.020
Increase Federal Impact Aid Program Fund	0.007	0.007
Increase Resources	0.259	0.082
Increase Special Pay / Bonus	0.018	0.031
Manipulate PCS Duration / Timing	0.076	0.064
Raise Promotion Rate	0.006	0.043

3.10 Summary

This chapter has described the application of a VFT methodology to the research problem. It concludes with details of the alternatives to be analyzed and the scores for

each measure of the hierarchy. The next Chapter focuses on finding out the nature of the problem through sensitivity analysis based on measured values.

Chapter 4. Results and Analysis

4.1 Chapter Overview

This chapter describes the results and analysis of the methodology to retain AF Officers. It follows the post-analysis steps of the VFT approach discussed in Section 2.3 (i.e. Step 8-9). To begin, an explanation of the results and insight gained from the deterministic analysis for the two officer groups is presented in Section 4.2. Then, sensitivity analysis, performed on the weights of the first tier of the value hierarchy, is presented in Section 4.3.

4.2 Step 8 – Perform Deterministic Analysis

This step involves multiplying the global weight of each measure by the value of an alternative for that measure, and then summing those products over all measures. Single alternatives built in Step 6 are analyzed first. Then combinations of those alternatives are analyzed to find the best feasible one.

4.2.1 Single Alternative Ranking

Figure 4.1 and 4.2 show the total value of the single alternatives for the two officer groups, respectively. For pilots, ***Increase Resources*** is the best alternative, achieving 25.9% of potential value. ***Close Down Rural / Overseas Bases*** and ***Manipulate PCS Duration / Timing*** have ranked as second and third alternatives. The other alternatives have low value. For non-pilots, ***Close Down Rural / Overseas Bases*** is the best alternative, achieving 12.2% potential value, even though the value is smaller than those of the first two alternatives for pilots. ***Increase Resources*** and ***Develop Chain of Command Feedback*** have been ranked as second and third alternatives.

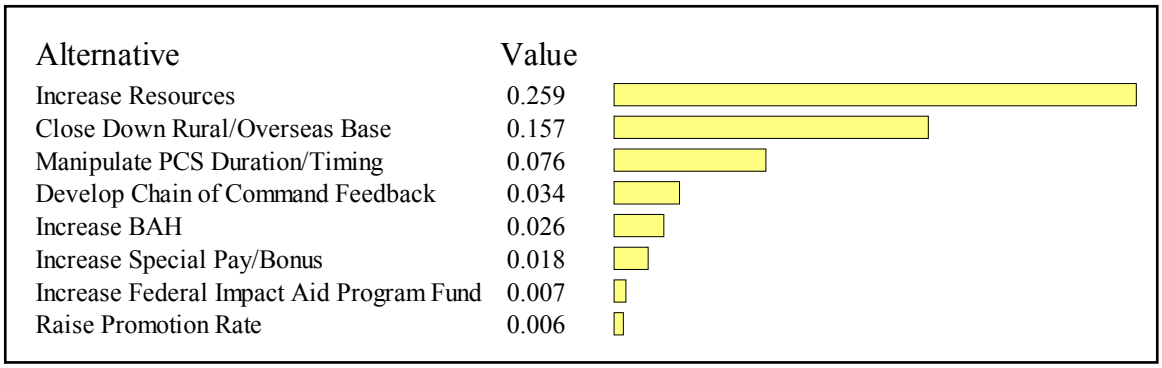


Figure 4.1 Ranking of Alternatives for Pilots

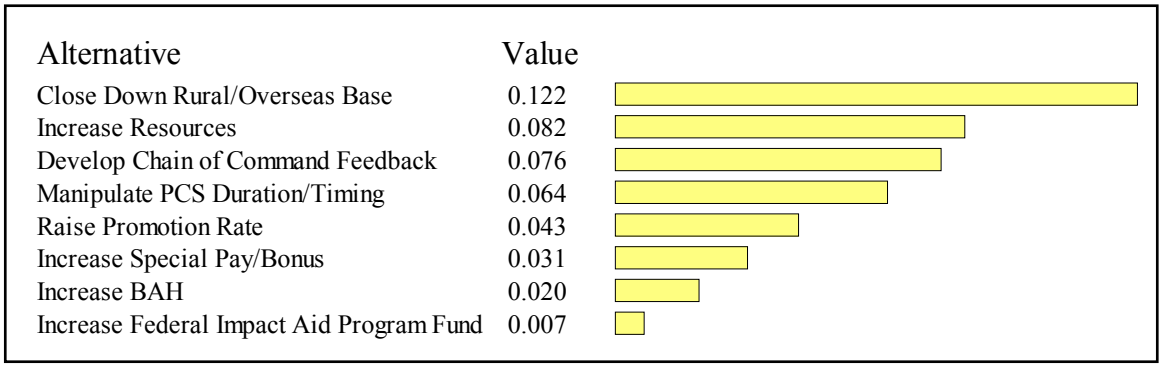


Figure 4.2 Ranking of Alternatives for Non-Pilots

4.2.2 Single Alternative Value Contribution

Understanding what each value contributes to the overall score is critical in determining how their weights affect the decision. The stacked bar charts in Figures 4.3 and 4.4 clearly indicate what each value contributes to the overall score of each alternative.

For pilots, ***Increase Resources*** prominently contributes to the *Job satisfaction* value in the first tier. ***Close Down Rural / Overseas Bases*** alternative evenly contributes to *Family Support* and *Geographic Stability* values. ***Manipulate PCS Duration / Timing*** contributes to *Geographic Stability*. The other alternatives show little contribution to the first tier values. For non-pilots, ***Close Down Rural / Overseas Bases*** contributes to *Family Support* and *Geographic Stability* values evenly. ***Increase Resources*** and

Develop Chain of Command Feedback dominantly contribute to the *Job Satisfaction* value. ***Manipulate PCS Duration / Timing*** and ***Raise Promotion Rate*** contribute to *Geographic Stability* and *Job Satisfaction* values, respectively. Particularly, the values of first two alternatives for pilots (i.e. 25.9% and 15.7%) appear to have more value than those of all alternatives for non-pilots. In other words, the alternatives have only a small effect on non-pilots. The following Section shows how combining these alternatives can achieve higher levels of value.

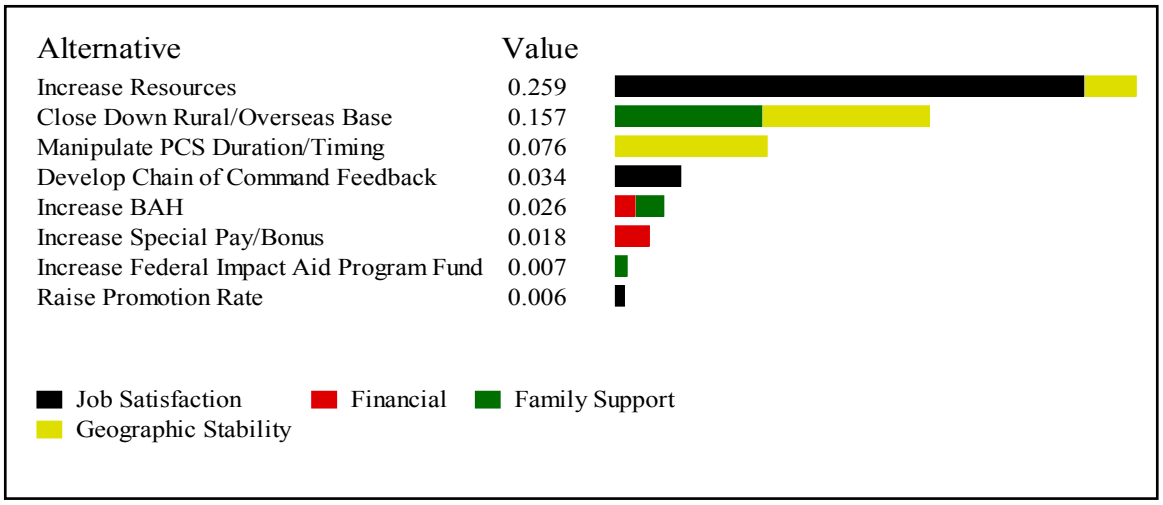


Figure 4.3 Stacked Bar Ranking of Alternatives for Pilots

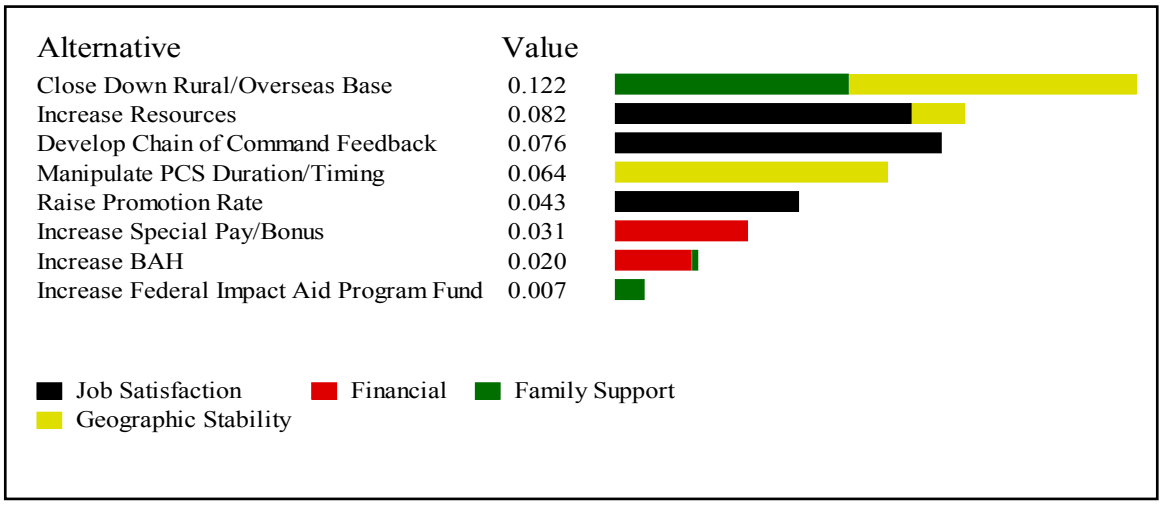


Figure 4.4 Stacked Bar Ranking of Alternatives for Non-Pilots

Applying the highest scoring alternatives per measure for pilots and non-pilots shows total potential values of 55.7% and 42.1%, respectively. Based on these values, it is possible to normalize values of each alternative with scores from zero to one. Table 4.1 shows the normalized total potential values of the first five single alternatives for both officer groups.

Table 4.1 Normalized Total Potential Values

Alternative Ranking	Pilots		Non-Pilots	
	Original	**Normalized**	**Original**	**Normalized**
1	0.259	**0.465**	0.122	**0.289**
2	0.157	0.282	0.082	0.195
3	0.076	0.136	0.076	0.181
4	0.034	0.061	0.064	0.152
5	0.026	0.047	0.043	0.102

4.2.3 Alternative Combination Ranking

Even though ***Increase Resources*** is a dominant alternative for pilots, it takes a lot of money and requires fairly long lead- time to affect the retention condition. However, the alternatives such as ***Develop Chain of Command Feedback*** and ***Manipulate PCS Duration / Timing***, cost less than the other ones, and are easy to implement. To find out the best alternatives which are feasible in reality at relatively little cost, this section analyzes the combinations of those alternatives. This analysis considers the alternative combinations of ***Close Down Rural / Overseas Bases***, ***Manipulate PCS Duration / Timing, Develop Chain of Command Feedback, Raise Promotion Rate,*** and ***Increase***

Special Pay / Bonus. The other alternatives, which have little effect on the potential total values, are excluded from alternative combinations. Figures 4.5 and 4.6 show the ranking of alternative combinations for the two officer groups, respectively.

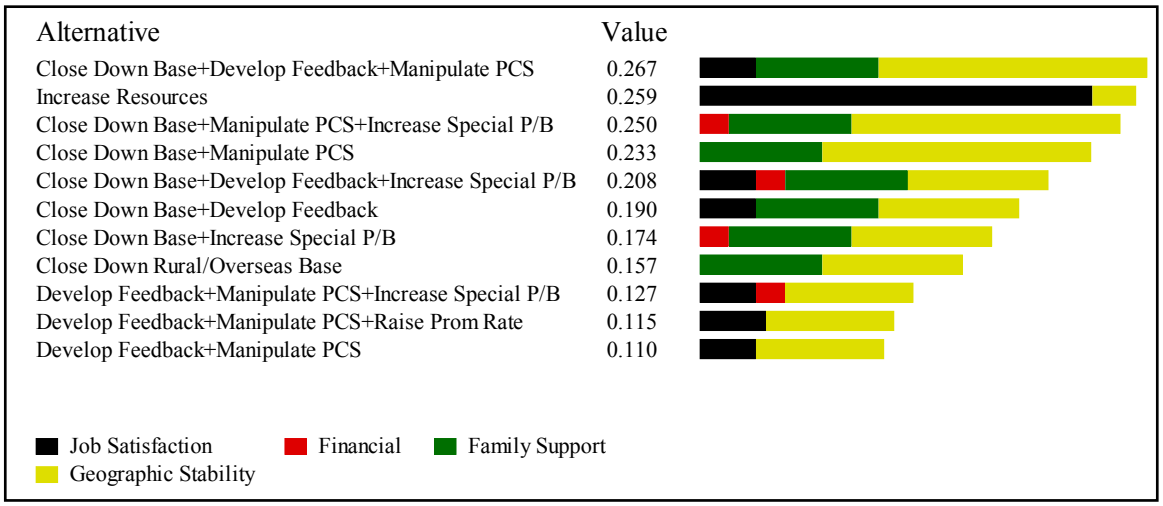


Figure 4.5 Ranking of Alternative Combinations for Pilots

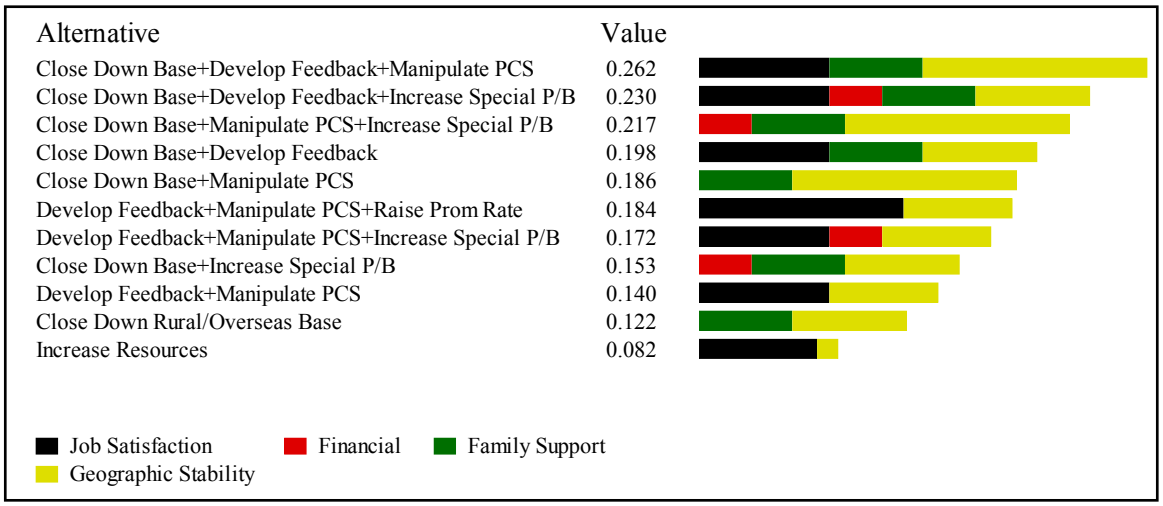


Figure 4.6 Ranking of Alternative Combinations for Non-Pilots

Close Down Bases + Develop Feedback + Manipulate PCS is the best alternative for both groups. ***Increase Resources*** is the second alternative for pilots with little value

difference from the best one (i.e. 26.7% vs. 25.9%), while this alternative shows the least total potential value for non-pilots (i.e. 8.2%). ***Close Down Bases + Manipulate PCS + Increase Special Pay / Bonus*** has been ranked the same for both groups achieving 25% and 21.7% total values, respectively. The total value of ***Develop Feedback + Manipulate PCS + Raise Promotion*** alternative for pilots is smaller than that for non-pilots (i.e. 11.5% vs. 18.4%).

4.2.4 Deterministic Analysis Summary

As a single alternative, ***Increase Resources*** is a dominant alternative for pilots achieving 25.9% (46.5% normalized) total potential value, while ***Close Down Rural / Overseas Bases*** is the best one for non-pilots achieving only 12.2% (30% normalized). However, ***Close Down Bases + Manipulate PCS + Develop Feedback*** is the best alternative for both officer groups achieving 26.7% (47.9%) and 26.2% (62.2%), respectively, as shown in Table 4.1.

4.3 Step 9 – Perform Sensitivity Analysis

Sensitivity Analysis involves varying the local weight of the first tier value from zero to one to demonstrate the impact of various weighing scenarios on the ranking of the alternatives. Around ±20% weight change might be more reasonable. The previous section considered all eleven alternatives. Five of these alternatives are dominated, however, and will never be the preferred alternative. This section considers only the six alternatives whose total values make them possibly the best retention choices. The following sections detail the results for the two officer groups.

4.3.1 Sensitivity Analysis on Job Satisfaction

Figure 4.7 shows how the alternative ranking changes if the weight on ***Job Satisfaction*** is increased or decreased from its current value. ***Job Satisfaction*** is the first tier value with the highest weight of 45.7% and 44.2%, respectively in the two officer groups. For pilots, as the weight increases from zero to one, only ***Increase Resources*** shows an increase in total value. A little weight increase makes ***Increase Resources*** the best alternative. However, for non-pilots, ***Develop Feedback + Manipulate PCS + Raise Promotion Rate***, and ***Increase Resources*** alternatives both show increases. If the weight decreases below 25%, ***Close Down Bases + Manipulate PCS + Increase Special Pay / Bonus*** is the best alternative. If the weight increases above 70%, ***Develop Feedback + Manipulate PCS + Raise Promotion Rate*** is the best alternative.

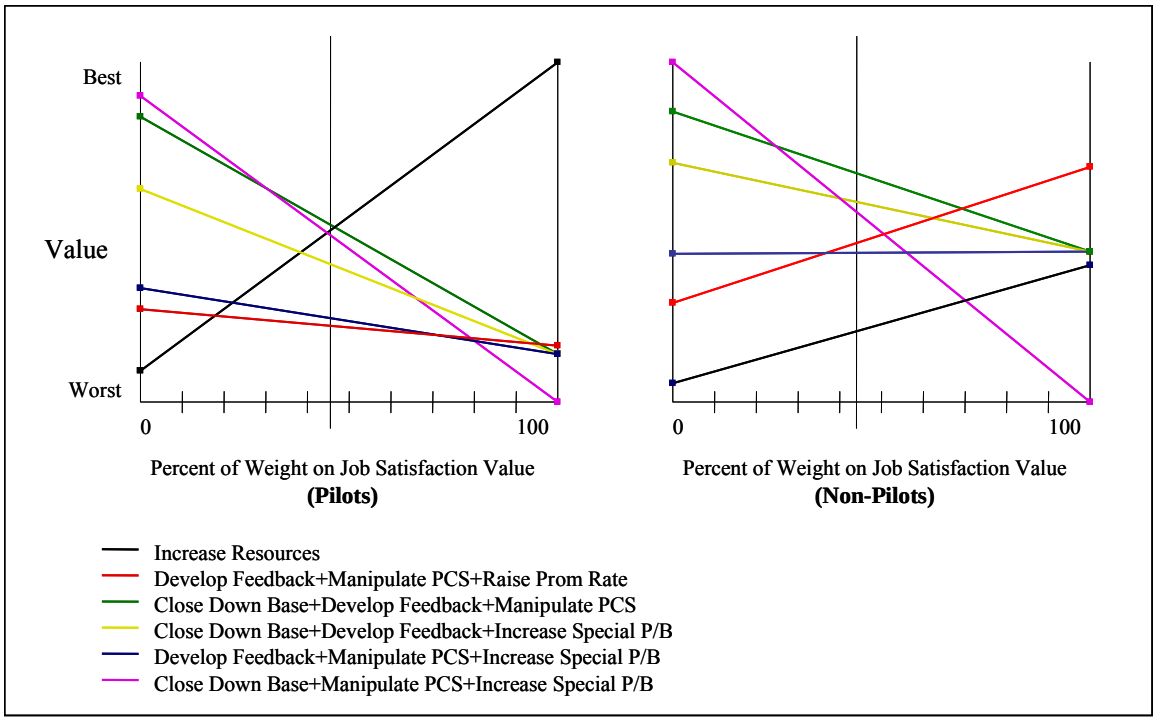


Figure 4.7 Sensitivity Graph for Job Satisfaction

4.3.2 Sensitivity Analysis on Financial

Figure 4.8 shows how the alternative ranking changes if the weight on ***Financial*** changes from its current value. ***Financial*** is the first tier value with the lowest weight of 2.8% and 6.0%, respectively in two groups. As the weight increases from zero to one, ***Close Down Bases + Manipulate PCS + Increase Special Pay / Bonus, Close Down Bases + Develop Feedback + Increase Special Pay / Bonus,*** and ***Develop Feedback + Manipulate PCS + Increase Special Pay / Bonus*** show increased total potential value in both officer groups. For pilots, a little weight increase makes ***Close Down Bases + Manipulate PCS + Increase Special Pay / Bonus*** the best alternative. For non-pilots, if the weight increases above 12%, ***Close Down Bases + Develop Feedback + Increase Special Pay / Bonus*** is the best alternative.

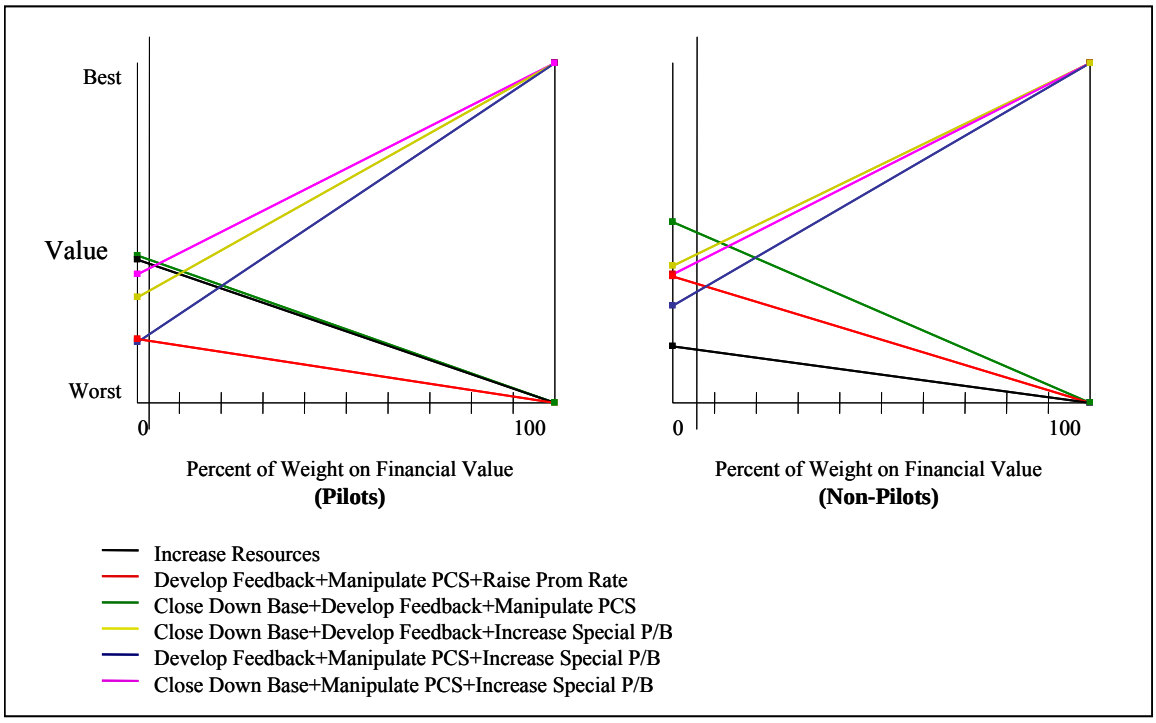


Figure 4.8 Sensitivity Graph for Financial

4.3.3 Sensitivity Analysis on Family Support

Figure 4.9 shows how the alternative ranking changes if the weight on ***Family Support*** is increased or decreased from its current value. ***Family Support*** is the first tier value with the weight of 19.5% and 18.2%, respectively in two officer groups. As the weight increases, ***Close Down Bases + Develop Feedback + Manipulate PCS, Close Down Bases + Manipulate PCS + Increase Special Pay / Bonus,*** and ***Close Down Base + Develop Feedback + Increase Special Pay / Bonus*** show increased total value in both groups. In addition, ***Increase Resources*** alternative for pilots shows a remarkable decrease in total potential value. For pilots, a little weight decrease makes ***Increase Resources*** to be the best alternative. For non-pilots, even though the weight changes, ***Close Down Bases + Develop Feedback + Manipulate PCS*** is still the best alternative.

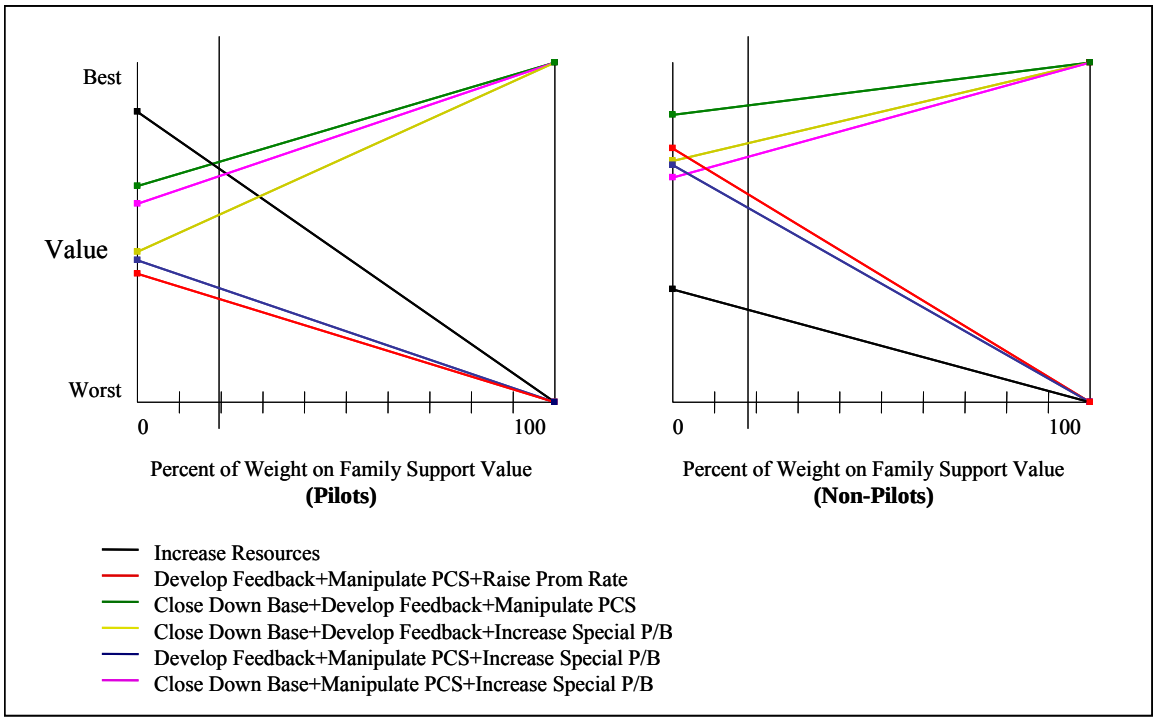


Figure 4.9 Sensitivity Graph for Family Support

4.3.4 Sensitivity Analysis on Geographic Stability

Figure 4.10 shows how the alternative ranking changes if the weight on ***Geographic Stability*** is increased or decreased from its current value. ***Geographic Stability*** is the first tier value with a weight of 32.0% and 31.6%, respectively. A remarkable difference exists between the total value of the ***Close Down Bases + Develop Feedback + Increase Special Pay / Bonus*** alternative for the two officer groups. For pilots, as the weight increases from zero to one, only ***Increase Resources*** shows decreased total potential value. A little weight change makes ***Increase Resources*** the best alternative. For non-pilots, as the weight increases, ***Close Down Bases + Develop Feedback + Increase Special Pay / Bonus,*** and ***Increase Resources*** show decreased total values. If the weight decreases below 20%, ***Close Down Bases + Develop Feedback + Increase Special Pay / Bonus*** is the best alternative.

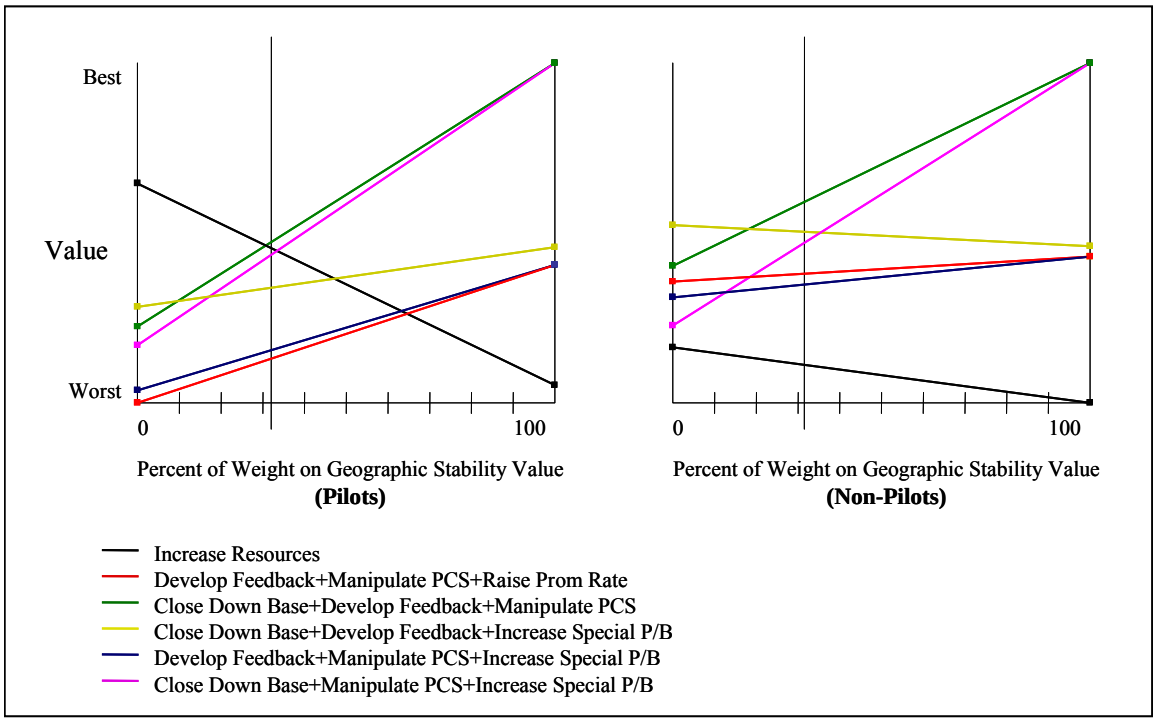


Figure 4.10 Sensitivity Graph for Geographic Stability

4.3.5 Sensitivity Analysis Summary

For pilots, alternative ranking is very sensitive to the changes in all value weights, since the gap in total value between the first and second alternatives is very small and the total value lines of alternatives intersect close to the current evaluation point. Therefore, a small shift in value weight away from the current one would result in a different preferred alternative. However, a little change in weight on each value makes ***Increase Resources*** the best one. For non-pilots, alternative ranking has nothing to do with the weight changes of ***Family Support*** value. The weight changes of the other values make other alternatives the best ones.

Chapter 5. Conclusions and Recommendations

5.1 Chapter Overview

This chapter presents a summary of the research and recommendations for the Air Force. A discussion of strengths and limitations of the VFT model for AF officer retention follows. Finally, this chapter concludes with recommendations for further research.

5.2 Summary of Research

The objective of this research is to find out more effective alternatives in retaining AF Officers. The value model captures how each officer group feels about their jobs and what they really want. This model, in conjunction with the results of the deterministic and sensitivity analysis on the two officer groups, showed an example of the application of a VFT approach to the AF officer retention problem.

This research result showed that both officer groups have their own unique value trends on their jobs. Even though both officer groups showed similar weights of the first tier values, they scored each measure quite differently. For example, pilots are more satisfied with their unit leadership quality than non-pilots. They are more dissatisfied with their current resources in their work group than with financial matters, even if they conceive that they have a fairly good chance to find an equivalent job with higher annual pay in the private sector (Hamilton, 2000:9-10). They definitely feel a much heavier workload than non-pilots. As a single alternative, ***Increase Resources*** is absolutely the best one for pilots. Meanwhile, ***Close Down Rural / Overseas Bases*** showed the biggest potential value for non-pilots. The results also showed that alternative combinations with

relatively little cost are more influential than an alternative which costs a lot of money. After all, ***Close Down Bases + Manipulate PCS + Develop Feedback*** is the best alternative for both officer groups.

5.3 Strengths of Model

First, this model can capture value trends of each officer group. It was developed to include all the factors that officers think are important about their jobs. Particularly, "AF Officers' Influences to Leave" are thoroughly encompassed in the value hierarchy. As a result, this model can find out more effective alternatives for each officer group. It can also help verify the effectiveness of the alternatives which have been used or suggested by different organizations.

Second, this model is dynamic and adjustable. This model adopted the concept of *Measure Score Continuum* and *Current Measure Capability* to accurately assess and compare the alternatives. This model can assess the values of each alternative more accurately provided by increases in the current measure score in each area.

5.4 Limitations of Model

Based on the main assumption, this model uses group averaged data without considering its distribution. There exists a shortfall when a model employs averaged data to reflect group value trends. In the case where the data may have a skewed distribution, this would not be a good approach to reflect the value trend of the officer group. Also, even within the non-pilots group, there are various officer groups with quite different job characteristics.

Second, group value trends are not fully captured in SDVFs and evaluation measures. Measure score continuums in this model are determined based on currently

available data. To create precise value functions, subject matter experts should be considered when the measure score continuums are determined. Moreover, several modifications of value hierarchy were inevitable with the lack of data. The *Annual Number of TDY* measure for *Workload* value was dropped assuming that *Resource Index* measure encompasses the workload from TDYs. The *Separation Time Rate* measure for *Family Together* value was modified to *Overseas Unaccompanied Rate.*

5.5 Recommendations for Future Research

The Air Force is using various financial incentives to retain officers, but no one knows whether or not they have really succeeded in keeping the right people. Financial incentives are more likely to show quick response, but those are not the ultimate ones. If the Air Force employs targeted alternatives for each officer group, based on the research results of combining a VFT methodology and cost-benefit analysis together, they could deal with the retention problem more effectively.

The AFPC has conducted retention research since the mid-1980s. They have published retention reports based on the data sorted only by company grade officers and field grade officers, or Pilots and Non-pilots. With the lack of available data sorted by Air Force Specialty Codes (AFSCs) in Appendix L, this research only showed an example of the application of the methodology. If AFPC can sort existing data by AFSCs or collect more detailed data, they may find better alternatives to retain AF officers. For example, by implementing the web-based "***AF Officer Retention Survey***" attached in Appendix M, they can collect more representative data and capture what officers really value.

Appendix A. Recruitment and Retention Incentives for Medical Occupations

The following pay and other incentives are currently available for use by MEDCOM activities to attract and retain qualified medical personnel.

- **Relocation Bonus.** A relocation bonus of up to 25% of base salary may be paid to current Federal employees. These bonuses require service agreements and are paid in lump sum.

- **Recruitment Bonus.** A recruitment bonus of up to 25% base salary may be paid to "newly appointed" employees. These bonuses also require a service agreement and are paid in lump sum.

- **Retention Allowance.** A retention allowance of up to 25% base salary may be paid to current Federal employees based on unique qualifications, need of the agency, and when the agency determines that the employee would likely leave Federal service without the allowance. Use of this authority requires the activity to document in writing the extent to which the employee's departure would affect the activity's ability to perform a function that is essential to its mission. It should also address the success of recent efforts to recruit candidates with similar qualifications and availability of candidates in the labor market. This allowance is calculated as a percentage of employee base pay and is included in the employee's regular bi-weekly paycheck.

- **Special Salary Rates.** Special Salary Rates approved under the Department of Defense Title 38 expedited procedures, or Special Salary Rates approved by the Office of Personnel Management, may be paid to covered occupations in certain geographic areas or locations.

- **Advanced In-Hire Rates.** Appointments of new employees may be made at advanced in-hire salary rates based on superior qualifications or special mission needs. New General Schedule employees may be paid up to step 10 of their grade.

- **Physician Comparability Allowances.** Commanders may authorize Physician Comparability Allowances for physicians and dentists, except for recently resigned or retired military members. Commanders may recommend allowances to recent military members subject to prior approval. The maximum amount payable is up to $14,000 per annum for physicians/dentists with 24 months or less of civilian service and up to $30,000 for other physicians/dentists. One or two

year service agreements are required and the length of the service requirement impacts the amount payable. In addition, payable amounts depend upon grade level, patient care responsibilities, board certification requirements, and what is actually negotiated with the physician/dentist. The allowance paid is intended to be the minimum necessary to deal with recruitment or retention problem. These allowances are paid in the same manner as regular pay.

- **Premium Pay.** When appropriate, employees may be authorized premium pay, to include overtime compensation (pay or compensatory time off), annual premium pay for standby duty, Sunday pay, holiday pay, night pay, and hazardous duty pay.

- **Incentives for Ex-Military Members.**
  - Military members can apply for civil service positions while still on active duty. In accordance with Section 5534a of Title 5 U.S. Code, they can actually begin working while on terminal leave prior to separation under honorable conditions.
  - The dual compensation restriction for regular Army officers was eliminated in October 1999. This means that ex-Army regular officers may now collect their full military retirement and their civilian pay and allowances up to a statutory maximum of $161,200 per year.
  - There is one Congressional requirement in place for which there is no relief in sight. Military retirees may not be appointed to a DOD position within 180 days of retirement unless a waiver is granted by the MEDCOM Commander. However, an exception to this policy exists and no waiver is required when Special Salary Rates have been approved for occupations in a specified geographical area.
  - Veterans' appointments are special appointing authorities for veterans under the Veteran Employment Opportunity Act (VEOA) and the Veteran's Readjustment Act (VRA). These appointments are made directly by Army activities and allow veterans who have separated from the armed forces under honorable conditions after 3 or more years of continuous service, to apply for jobs if an agency is seeking candidates from the outside through merit promotion or open continuous announcements. Applicants will find further information about veteran's appointments in CPOC and Medical Cell vacancy announcements.

- **Federal Employee Benefits.** Federal employees also enjoy the benefits of the Federal Employee Retirement System (FERS), health insurance, life insurance, periodic within-grade step increases, cost of living adjustments, 13-26 days of annual leave, 13 days of sick leave, and 10 paid holidays.

Appendix B. Officer Influences to Leave (Hamilton, 2000:35)

	2000 n=303	*1999 n=510*	*1996 n=214*
All Officers	**"Very Strong" or "Strong" Influence [Rank/% of 38 Items]**	**"Very Strong" or "Strong" Influence [Rank/% of 28 Items]**	**"Very Strong" or "Strong" Influence [Rank/% of 23 Items]**
Availability of comparable civilian jobs	1 / 61	3 / 53	1 / 43
Choice of job assignment	2 / 57	1 / 58	2 / 43
Say in base of assignment	3 / 51	2 / 55	3 / 41
Amount of additional duties	4 / 38	7 / 35	10 / 23
Overall job satisfaction	5 / 35	6 / 36	4 / 38
Home station TEMPO (Work schedule)	6 / 32	13 / 28	14 / 16
Number of PCS moves	7 / 32	10 / 32	16 / 15
TEMPO away (Number/duration of TDYs)	8 / 32	14 / 26	13 / 17
Leadership at wing or equivalent level	9 / 31	8 / 34	*
Recognition of your efforts	10 / 29	18 / 22	9 / 24
Leadership at MAJCOM/HQ USAF level	11 / 27	5 / 38	6 / 31
Retirement program that affects you	12 / 26	4 / 48	11 / 21
Availability of dependent medical care	13 / 25	16 / 25	19 / 13
Leadership at unit level	14 / 25	11 / 30	5 / 33
Unit resources	15 / 24	*	*
Compatibility with spouse's career/job	16 / 23	12 / 29	8 / 27
Pay and allowances	17 / 23	9 / 32	12 / 18
Geographic area/current base	18 / 21	*	*
Number of personnel working in my unit	19 / 20	*	*
Promotion opportunity	20 / 19	17 / 24	7 / 29
Availability of medical care	21 / 18	19 / 16	20 / 11
Implementation of Expeditionary Air Force	22 / 18	*	*
Air Force officer/enlisted evaluation systems	23 / 17	15 / 25	15 / 15
Training/experience of unit personnel	24 / 15	*	*
Potential for outsourcing and privatization	25 / 14	*	*
Bonuses/Special Pay	26 / 13	*	*
Availability of dependent dental care	27 / 11	20 / 15	21 / 8
Readiness of your unit	28 / 8	*	*
Opportunity for education and training	29 / 6	21 / 14	18 / 13
Availability of dental care	30 / 4	24 / 4	22 / 4
On-base child care/youth programs	31 / 3	25 / 2	*
Availability of base housing	32 / 3	23 / 5	*
Equal employment opportunities in the AF	33 / 3	*	*
Job security	34 / 2	22 / 7	17 / 15
On-base fitness/recreation programs	35 / 1	0	*
Patriotism	36 / 1	*	*
Availability of base exchange	37 / 1	26 / 1	*
Availability of commissary services	0	27 / 1	23 / 1

Note: * indicates no comparable item for that year

Appendix C. Description of Creating the Value Hierarchy

- *Availability of comparable civilian jobs* has dropped in the value hierarchy, even though it is one of the most influential factors in one's decision to separate. The government considers it an uncontrollable factor.

- *Choice of job assignment* and *Say in base of assignment* are also important factors in the separation decision. However, they are closely related with ***Job satisfaction*** and ***Geographic Stability***. In this model, they are included in ***Job satisfaction*** and ***Geographic Stability*** in the value hierarchy, respectively.

- *Amount of additional duties, Home station TEMPO (Work schedule), TEMPO away (Number/duration of TDYs)*, and *Number of personnel working in my unit* are mixed into ***Resources index*** and ***Number of TDY*** measures under ***Work load*** value.

- The variables, *Leadership at wing or equivalent level, Leadership at unit level,* and *Leadership at MAJCOM/HQ USAF level* are integrated in the ***Quality of leadership*** value under ***Job satisfaction***.

- Most of the "Quality of life factors" such as *Availability of base housing, Accommodation, Children's education, Base facilities in remote location,* and *Support networks for spouses* are included in ***Family support*** value.

- *Availability of medical care, Availability of dependent medical care, Availability of dental care,* and *Availability of dependent dental* care are integrated in the ***Health care*** value under *Family support*.

- *On-base child care/youth program, On-base fitness/recreation programs, Availability of base exchange,* and *Availability of commissary services* are dropped, because most bases have those facilities, and these variables are ranked low on the retention survey.

- *Pay and allowances, Remuneration* and *Bonuses/Special pay* are mixed into ***Financial*** value with *Annual pay rate* measure.

- *Geographic area/current base* and *Extended family are* modified as ***Geographic Stability*** value. Under this value, there are ***Stability of family, Family together,*** and ***Compatibility of with spouse's career*** values.

Appendix D. Description of Each Value in the Value Hierarchy

- **Quality of Leadership.** Many studies reveal that a manager's leadership directly influences job satisfaction and turnover. One in six naval male officers reported the quality of leadership as a factor in leaving, according to a report of the Navy Personnel Research, Studies, & Technology (Mottern, 2003).
- **Workload.** Heavy workload without respite makes people feel job dissatisfaction stemming from boredom. Meanwhile people sometimes feel great when they escape from the continuous workload. Reasonable workload is the opportunity to shuttle between challenge and satisfaction that keeps them to feel their jobs interesting.
- **Promotion Opportunity, Recognition of Efforts.** It is quite clear that promotion opportunity and recognition of efforts are closely related to the job challenge and satisfaction. Promotion is the visible and objective result of the job performance of members in the group. Recognition of effort forces them work hard and feel fulfilled. Both are important components of ***Job Satisfaction***.

- **Housing.** Housing is one of the most important and difficult choices for military family. First, they must choose to live on-base or off-base. Once they decided to live off-base, the varieties of characteristics that underlie the housing goods make it more complex to achieve the value. The prices vary widely depending on the type of unit, its size, the number of rooms, the location, and so on.
- **Health Care**. The ultimate purpose of Health Care is to increase the overall health-related well being of the family. It is very costly to get high-quality health care services. In response to the challenge of maintaining medical combat readiness while providing the best health care for all eligible personnel, the DoD introduced TRICARE (Regionally managed health care program for active duty and retired members of the uniformed services, their families, and survivors.). As a military family, they can get decent level of health care services provided at minimal cost. This is the most attractive benefit of military career.
- **Children's Education.** Education is also a quality of life issue and is directly related to military readiness and retention. If a military family has children, a key issue for them is how the learning opportunities available to their children compare to those for other children.

- **Stability of Family.** The military usually tries to make sure that members don't have to move until their children finish the school year. Children can have a hard enough time without having to change schools in the middle of the year. They

purposely seek tours that would provide their families with stability. The stability of family is highly related to the children's education.

- **Family Together.** Services have done a lot in the past 10 years to try to manage people's time away from home. They have made it more predictable and of a predictable duration. But family separation is still a major factor that members consider when deciding whether to stay or separate (Garamone, 2003). It is made harder, obviously, by the high deployment rate of the force over the past 10 years.
- **Compatibility with Spouse's Career**. The demands of the military also affect the spouse. Regarding of location, it is often assumed that military families live in rural areas where the job opportunities for the wife are poor. In one of the recent report (Hosek, et al., 2002:7), the authors found that, in contrast to civilian wives, military wives are willing to accept lower wages for jobs; they are less likely to work full-time; they have similar, though slightly lower, hours of work.

Appendix E. Description of Evaluation Measures in the Value Hierarchy

- **Leadership Index** (Direct Constructed). To measure the current quality of leadership, this model employs the questionnaires on the Air Force Climate Survey under the section of leadership. The average score of those five questions is used as a leadership index measure.

Table E.1 Climate Survey Leadership Questionnaire

No	Question
1	The leaders in my chain of command (in my unit) listen to my ideas.
2	The leaders in my chain of command (in my unit) are easily accessible.
3	I trust the leaders in my chain of command (in my unit).
4	I am proud to be associated with the leaders in my chain of command (in my unit).
5	I see the leaders in my chain of command (in my unit) doing the same things they publicly promote (walking the talk / leading by example).

- **Resources Index** (Direct Constructed). To measure the current workload, this model employs the questionnaires on the Air Force Climate Survey under the section of unit recourses. The average score of those four questions is used as a resources index measure.

Table E.2 Climate Survey Resources Questionnaire

No	Question
1	I have adequate time to do my job well.
2	We have enough people in my work group to accomplish the job.
3	I have the right tools/equipment to accomplish my job.
4	I have enough time to accomplish my daily workload during my duty hours.

- **Annual Number of TDY** (Proxy Natural). A reasonable amount of Temporary Duty travel (TDY) is a good opportunity for officers to feel interest in their jobs. However, excessive TDYs cause them to feel sick and tired of traveling. TDY is connected with ***Workload*** value and ***Family Together*** value as well. This measure only counts the number of TDYs in a year; this measure does not consider the length of them.

- **Promotion Rate** (Direct Natural). Promotion opportunity (A measure of the probability that an officer who seeks promotion will be promoted.) and Promotion point (A measure of years and months of service at which officers typically may expect promotions.) are generally used measures. The promotion opportunity

varies from year to year as numbers of officers eligible for promotion and changes requirements. In the early years of their military service, they are not concerned over the promotion opportunity because most of them can get promoted to be O3. But the situation changes after that. The promotion to O4 is not guaranteed any more. The general policy is to promote 80 percent of O3 rank to O4; 70 percent of O4 rank to O5; and 50 percent of O5 rank to O6 (Thie, et al., 2001:53). But the promotion rate of officers in certain job category differs from those in the other job categories. When people consider the military their career, they believe that they have a fairly good chance of being promoted to at least lieutenant colonel. This measure is the percentage chance of being promoted to lieutenant colonel from the beginning of their officer career. To calculate the rate, this research employs historical promotion data from 1989 to 2002. First, it takes the average promotion rate (of in the zone) from Captain to Major and Major to Lt.Colonel during that period, and then multiplies those rates.

- **Recognition Index** (Direct Constructed). To measure the current recognition of efforts, this model employs the questionnaires on the Air Force Climate Survey under the section of Recognition. The average score of those four questions is used as Recognition Index measure.

Table E.3 Climate Survey Recognition of Efforts Questionnaire

No	Question
1	My chain of command in my unit rewards team performance fairly.
2	My chain of command in my unit rewards individual performance fairly.
3	When deserved, my chain of command in my unit does a good job of recognizing people in all grades and types of jobs.
4	My chain of command rewards primary job expertise more than additional duty performance.

- **Annual Pay Rate** (Direct Constructed). The annual pay of officers includes not only Basic Compensation but also Special Pays and Bonuses: the total amount of money an officer can get in a year. Special pay and Bonuses are in addition to Basic Compensation for people in certain skills and assignments. Officers Basic Pay accounted for about 73 percent of RMC, and the BAH constituted about 17 percent in 1999 (Office of the Under Secretary of Defense for Personnel and Readiness, 1999:29). Officer pay should be compared to the earnings of the civilians with either a bachelor or advanced degree. To measure the Financial value, this model employs a relative measure between military and civilian, considering both experience and education level. Civilian job should be limited to those that most closely resemble the skill set of the officer career fields. Table H.4 shows the comparison of annual pay of officers with the annual wage of equivalent civilian job. For example, to calculate the Annual pay rate of a Captain with Ph.D., this model compares annual pay of the officer with the 75 percentile annual wage (Annual wages have been calculated by multiplying the hourly mean

wage by a "year-round, full-time" hour's figure of 2,080 hours (http://www.acinet.org/acinet/default.asp).) of equivalent civilian job. The data about equivalent jobs and annual wage of them are found in the America's Career Info Net website (http://www.acinet.org/).

Table E.4 Comparison of Officer Pay to Civilian Annual Wage

Officer	Rank	1st, 2nd Lt.		Capt.		Maj.	
	Ed Level	Bachelors, Masters	Ph.D.	Bachelors, Masters	Ph.D.	Bachelors, Masters	Ph.D.
Civilian		25%	Median		75%		90%

- **<u>Out of Pocket Cost Rate</u>** (Proxy Constructed). Despite poorer quality of military housing, the primary reason service members live in military housing is the economic benefit; the housing and utilities are free, so they avoid additional costs associated with living in civilian housing. Even if the military housing is older, smaller, and of poorer quality compared to the housing in which members reside in the civilian sector, most military housing residents indicated that they chose military housing because it was a better economic decision (Buddin, et al., 1999:40). To measure the housing value, this measure takes the ratio of out of pocket cost to total monthly rent. Basic Allowance for Housing (BAH) is based on geographic duty location, pay grade, and dependency status. The intent of BAH is to provide service members accurate and equitable housing compensation based on housing costs in local civilian housing markets (Diem, 2003). So the out of pocket cost rate can reflect accurate level of housing value, but the cost with dollar amounts can not. Economic value of military housing can be thought of as the implicit rent (The price that military members would have to pay for the military unit were it in civilian market (Buddin, et al., 1999:51)). Theoretically, the difference between the Basic Allowance for Housing (BAH) and implicit rent would be the out of pocket cost. But the families who live off base should also pay for utilities such as electricity, water, trash, natural gas, and so on. Total monthly rent here includes all the utilities cost. Accordingly the actual out of pocket cost is bigger than the theoretical one. Moreover, if there were few civilian housing goods available, the rent would go up as a matter of course. So the cost can also include the availability of housing goods. BAH is designed to cover 85 percent of housing expenditures, with the remaining 15 percent to be covered by the military member. However, the actual out of pocket cost for off base military families average about 20 percent of housing expenses (Buddin, et al., 1999:47). The data about BAH can be found in the Per Diem, Travel and Transportation Allowance Committee website (http://www.dtic.mil/perdiem/bahform.html).

- **Health Care Index** (Proxy Constructed). Health Care value can be quantified using both quality and availability measures. However, the quality of Health Care is a highly subjective matter. This model uses one measure for availability assuming that the quality of Military Treatment Facility (MTF) and TRICARE civilian network is satisfactory: at least above average. Some bases have a military hospital or medical center, but most of them have medical clinic. According to TRICARE, TRICARE Prime Remote (TPR) provides health care coverage through civilian network or TRICARE-authorized providers for Uniformed Service members and their families who are on remote assignment, typically 50 miles from a MTF. The data is available in the TRICARE website (http://www.tricare.osd.mil/). The more hospitals there are, the better service people can get because of the competition; the bigger the population of the region is, the more health care facilities are available. To reflect the availability of health care, this measure checks first whether the base has hospital (or medical center) available, if not then this measure checks what size of region the base is located near to mirror the availability of TRICARE civilian network. This measure places different scores on each station: base with hospital (1.0), base with clinic in city (0.8), base with clinic in large town (0.6), base with clinic in small town (0.4), and base with clinic in rural area (0.2). Health Care Index can reflect not only the availability of health care service but also some portion of its quality.

- **Total Expenditure per Student** (Proxy Natural). Recently, policymakers across the nation have pushed for smaller classes as a specific mechanism for improving quality of education. Student/Teacher Ratio does not always reflect the education quality. On the other hand, Total expenditure per student is one of the most commonly used indicators to measure education quality. This varies by the location of the school districts (U.S. Department of Education, 2003:39). The data can be found in National Center for Education Statistics (NCES) website.

- **PCS Timing Rate** (Direct Constructed). Students have about 3 month summer break time between grades. The beginning point of the break time varies depending on states or school districts: usually from mid-June to mid-August. If the military family moves during this period, the impact to children would be less than that of moving during the other period. This measure checks whether the PCS move has been during this break time or not. This model considers only the period after their dependent children enter formal schooling.

- **Average Duration of PCS** (Direct Constructed). The average time between PCS moves was about 2 years according to the 1999 DOD personnel survey (United

States General Accounting Office, 2001:3). A PCS move has an effect on not only children but also the spouse. Such moves may also involve the member's household goods. The average time between PCS moves can be considered to be equivalent to the average time children stay in the same school assuming that their family accompanies their sponsor. Consequently those with shorter time spent between moves are less likely to be satisfied with the military way of life. This measure should be used only when the dependent children have been accompanied by their families. To calculate this measure, this measure divides the number of PCS moves an officer had into the number of years of service.

- **Separation Time Rate** (Direct Constructed). About 25 percent of those who were stationed overseas were unaccompanied, compared to 17 percent of those stationed in an American territory (Such as American Samoa, Guam, the U.S. Virgin Islands, or Puerto Rico), and 12 percent of those stationed within the United States (United States General Accounting Office, 2001:25). Deployment to battlefield also causes family separations. Risk of being killed in the battle is not considered in the model because the risk is an inherent characteristic of military jobs. To measure the ***Family Together*** value, this measure takes the ratio of the separation time due to PCS to the total YOS.

- **Annual Days of TDY** (Direct Natural). Number of TDY measure under Workload value does not consider the length of them. This measure checks the annual number of days of TDY in current job to reflect the separation time from family. This model sets the maximum length of TDY as 180 days.

- **Urbanization Index** (Proxy Constructed). Some spouse may have a job for their educational level or previous experiences due to a lack of job opportunities in the local area. On the other hand, other spouses may not need to worry about job opportunities. The unemployment rate and average annual job openings are common indexes for the job availability. But these indexes can not reflect the migration of the military family. Especially, average annual job openings is highly dependant on the size of city or population. Urbanization Index is constructed to consider the urbanization level of the local area where the base is located. The bigger the city is, the more job opportunities there are: the less important compatibility with spouse's career becomes. So this model cited the Locale Codes (Also known as the Johnson codes, which were developed in the early 1980s by the U.S. Bureau of the Census. This coding system is based on both the proximity to metropolitan areas and on population size and density.) and simplified them to construct Urbanization Index. Based on the eight categories,

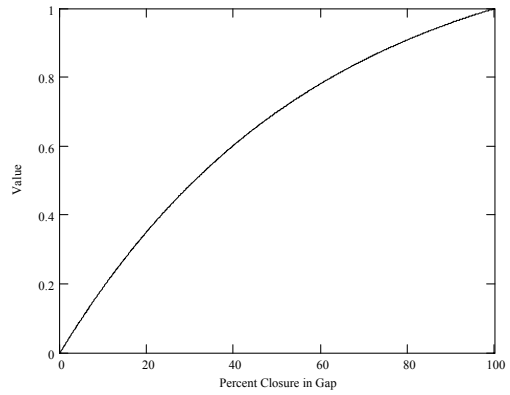
this model re-categorized them in six locations and places different scores on each base location: Large Central City or its Urban Fringe (1.0), Mid-Size City or its Urban Fringe (0.9), Large Town (0.7), Small Town (0.4), and Rural (0.2). This measure only considers the current duty location of military members, not their previous locations.

Table E.5 Locale Codes (American Association of School Administrators, 2003)

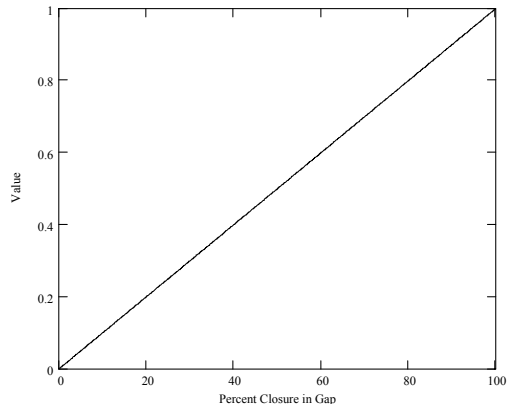
1	Large Central City	Central city of a Consolidated Metropolitan Statistical Area (CMSA) or Metropolitan Statistical Area (MSA) with population of 250,000 or more.
2	Mid-Size City	Central city of a CMSA or MSA but not designated as a large central city.
3	Urban Fringe of Large City	Place within the CMSA or MSA of a large central city.
4	Urban Fringe of Mid-Size City	Place within the CMSA or MSA of a mid-size central city.
5	Large Town	Place not within a CMSA or MSA but with population of 25,000 or more and defined as urban
6	Small Town	Place not within a CMSA or MSA with a population of at least 2,500 but less than 25,000.
7	Rural, outside MSA	Place not within a CMSA or MSA and designated as rural.
8	Rural, inside MSA	Place within a CMSA or MSA designated as rural (this code not available prior to 1998).

Appendix F. Exponential SDVFs for Pilots

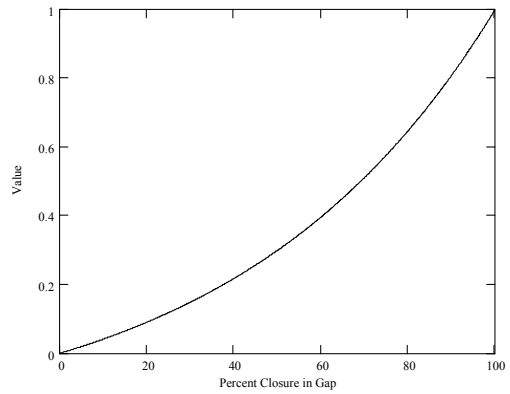
- **Resources Index.**



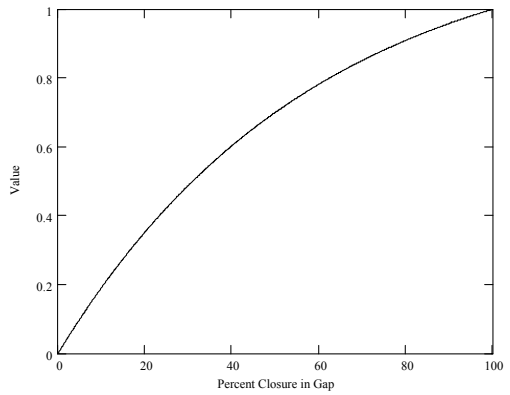
- **Promotion Rate.**



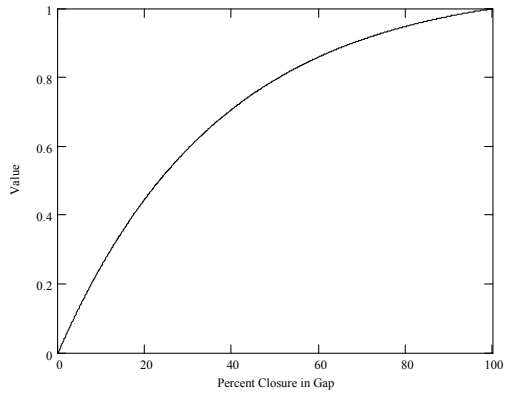
- **Recognition Index.**



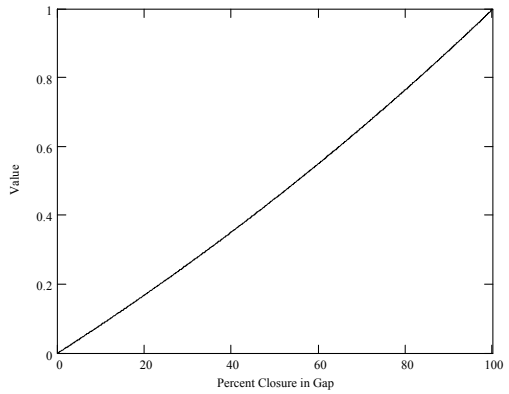
- **Out of Pocket Cost Rate.**



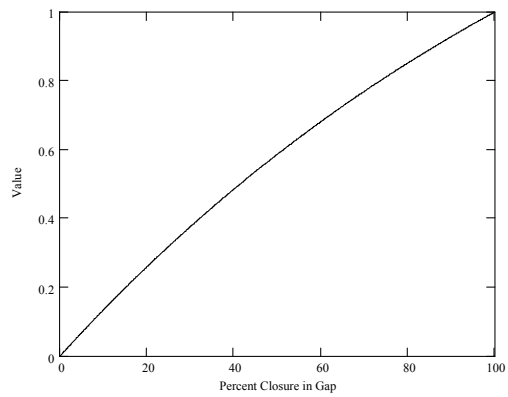
- **Health Care Index.**



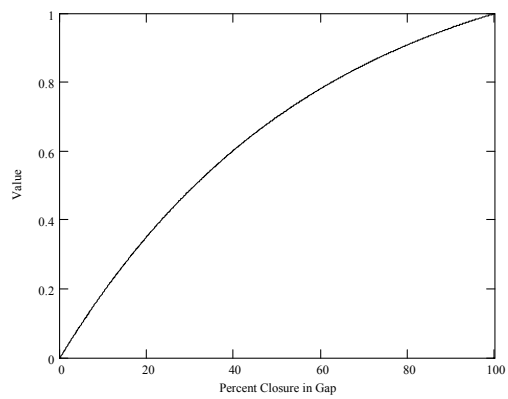
- **Total Expenditure per Student.**



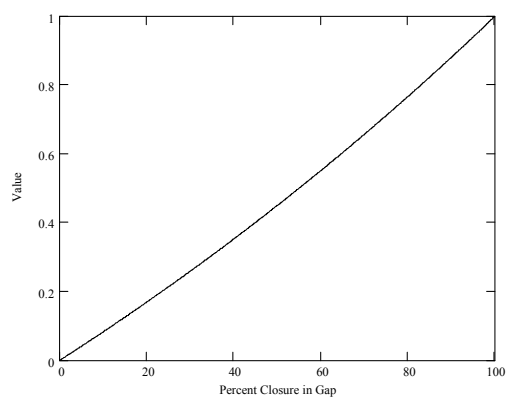
- **PCS Timing Rate.**



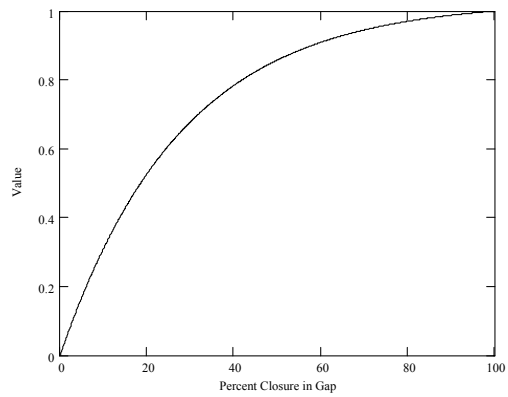
- **Average Duration of PCS.**



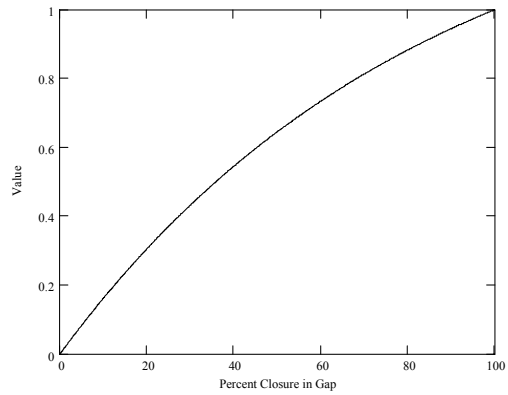
- **OS Unaccompanied Rate.**



- **Annual Days of TDY.**

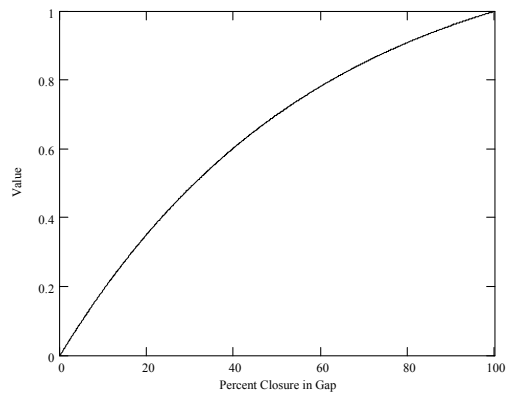


- **Urbanization Index.**

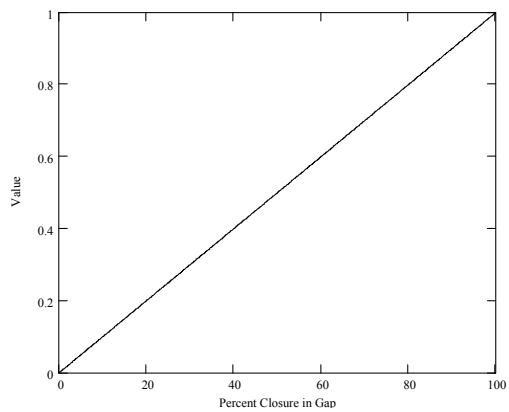


Appendix G. Exponential SDVFs for Non-Pilots

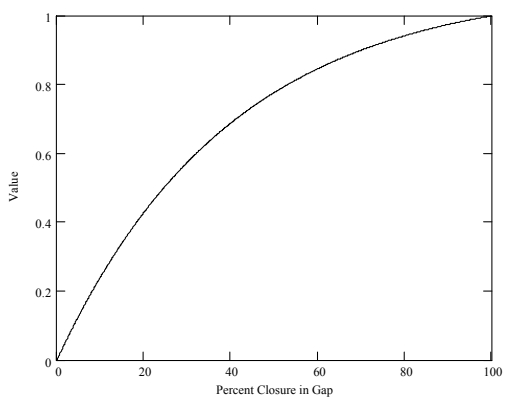
- **Leadership Index.**



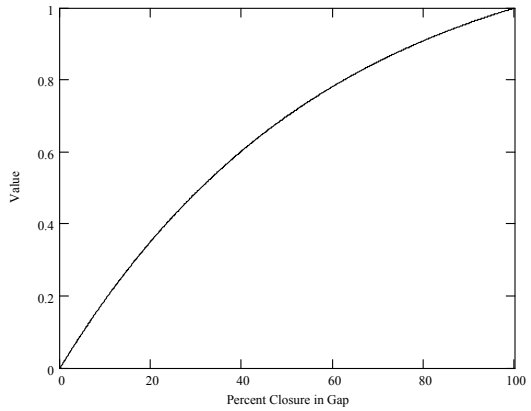
- **Resources Index.**



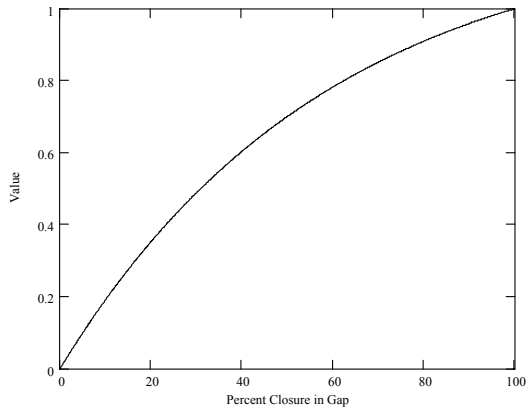
- **Promotion Rate.**



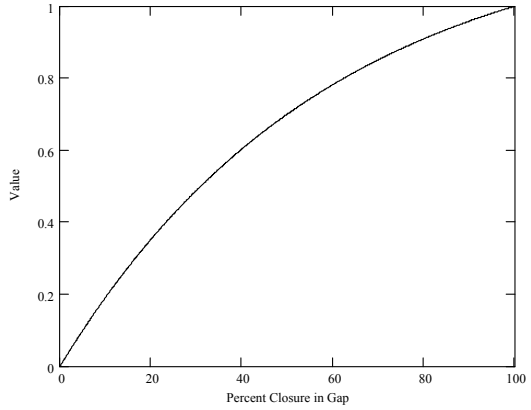
- **Recognition Index.**



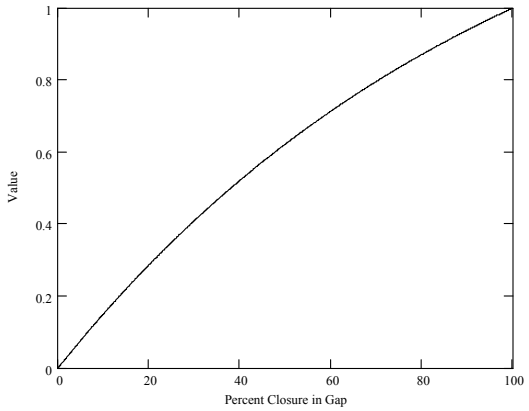
- **Annual Pay Rate.**



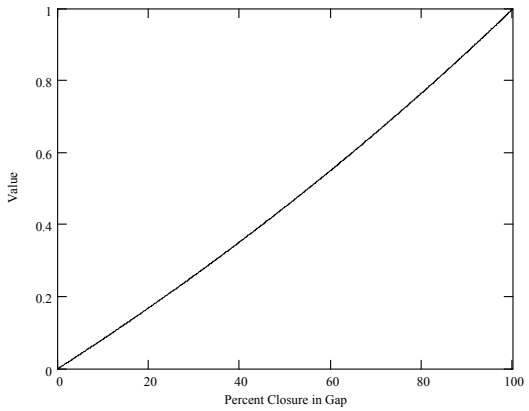
- **Out of Pocket Cost Rate.**



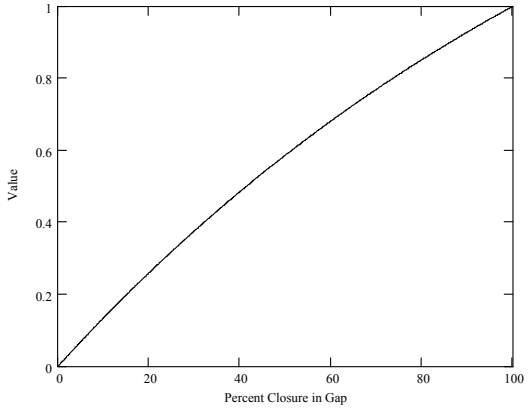
- **Health Care Index.**



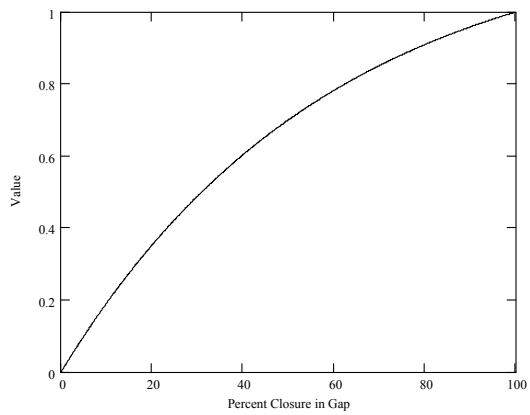
- **Total Expenditure per Student.**



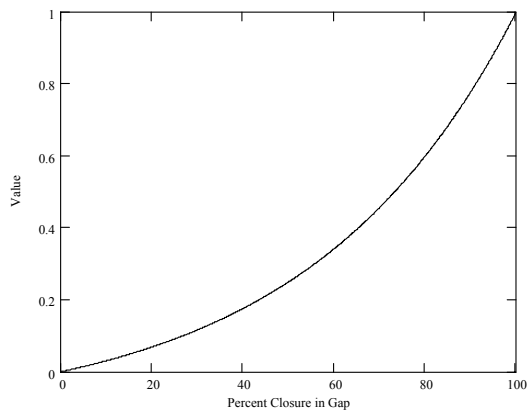
- **PCS Timing Rate.**



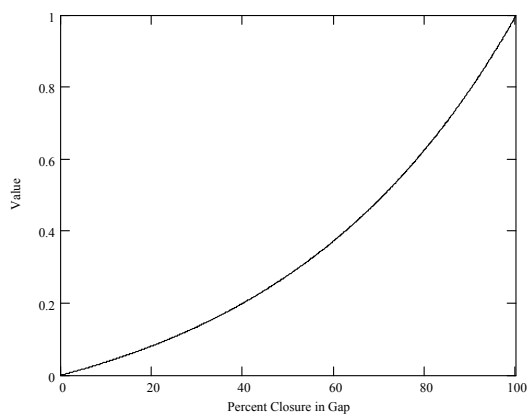
- **Average Duration of PCS.**



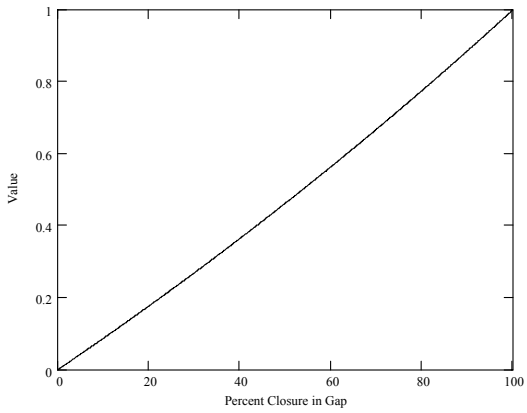
- **OS Unaccompanied Rate.**



- **Annual Days of TDY.**



- **Urbanization Index.**



Appendix H. Company Grade Pilots Influences to Leave (Hamilton, 2000:38)

	2000 n=53	*1999 n=98*	*1996 n=26*
Company Grade Pilots	**"Very Strong" or "Strong" Influence [Rank/%** of 38 Items]	**"Very Strong" or "Strong" Influence [Rank/% of 28 Items]**	**"Very Strong" or "Strong" Influence [Rank/% of 23 Items]**
Amount of additional duties	1 / 75	5 / 66	5 / 46
Availability of comparable civilian jobs	2 / 68	4 / 68	4 / 46
Home station TEMPO (Work schedule)	3/ /64	9 / 45	11 / 23
Choice of job assignment	4 / 62	2 / 69	1/ 54
Say in base of assignment	5 / 60	3 / 69	3 / 54
TEMPO away (Number/duration of TDYs)	6 / 55	7 / 48	2 / 54
Retirement program that affects you	7 / 45	1 / 70	9 / 27
Leadership at MAJCOM/HQ USAF level	8 / 38	6 / 60	6 / 39
Availability of dependent medical care	9 / 38	10 / 44	8 / 27
Number of PCS moves	10 / 38	11 / 38	14 / 16
Unit resources	11 / 36	*	*
Leadership at wing or equivalent level	12 / 28	8 / 46	*
Number of personnel in my unit	13 / 25	*	*
Availability of medical care	14 / 25	17 / 23	16 / 15
Implementation of Expeditionary AF	15 / 25	*	*
Overall job satisfaction	16 / 25	15 / 26	13 / 19
Pay and allowances	17 / 23	14 / 28	22 / 4
Geographic area/current base	18 / 21	*	*
Recognition of your efforts	19 / 19	20 / 13	15 / 15
Compatibility with spouse's career/job	20 / 17	18 / 23	17 / 15
Leadership at unit level	21 / 17	12 / 31	7 / 27
Availability of dependent dental care	22 / 15	16 / 24	20 / 12
AF officer/enlisted evaluation systems	23 / 11	13 / 31	18 / 15
Readiness of your unit	24 / 11	*	*
Training/experience of unit personnel	25 / 8	*	*
Availability of dental care	26 / 6	21 / 9	21 / 8
Potential for outsourcing and privatization	27 / 6	*	*
Promotion opportunity	28 / 6	19 / 15	10 / 23
Availability of base housing	29 / 4	22 / 7	*
Bonuses/Special Pay	30 / 4	*	*
Job security	31 / 4	23 / 4	19 / 12
Opportunity for education and training	32 / 4	24 / 4	12 / 19
Availability of base exchange	33 / 2	0	*
Equal employment opportunities in the AF	34 / 2	*	*
On-base child care/youth programs	35 / 2	0	*
Availability of commissary services	0	0	0
On-base fitness/recreation programs	0	0	*
Patriotism	0	*	*

Note: * indicates no comparable item for that year

Appendix I. Company Grade Non-Pilots Influences to Leave (Hamilton, 2000:36)

	2000 n=198	***1999 n=308***	***1996 n=161***
Company Grade Officers	"Very Strong" or "Strong" Influence [Rank/% of 38 Items]	"Very Strong" or "Strong" Influence [Rank/% of 28 Items]	"Very Strong" or "Strong" Influence [Rank/% of 23 Items]
Availability of comparable civilian jobs	1 / 58	3 / 45	3 / 39
Choice of job assignment	2 / 53	1 / 60	1 / 42
Say in base of assignment	3 / 48	2 / 54	2 / 40
Overall job satisfaction	4 / 42	5 / 39	4 / 39
Recognition of your efforts	5 / 34	13 / 25	9 / 24
Leadership at wing or equivalent level	6 / 32	11 / 29	*
Leadership at unit level	7 / 28	9 / 29	5 / 31
Number of PCS moves	8 / 28	7 / 31	16 / 14
Pay and allowances	9 / 27	8 / 31	12 / 16
Amount of additional duties	10 / 27	15 / 22	11 / 16
Compatibility with spouse's career/job	11 / 25	6 / 33	6 / 30
Leadership at MAJCOM/HQ USAF level	12 / 24	10 / 29	8 / 27
TEMPO away (Number/duration of TDYs)	13 / 24	19 / 17	17 / 13
Availability of dependent medical care	14 / 22	17 / 18	19 / 11
Promotion opportunity	15 / 21	12 / 25	7 / 28
Geographic area/current base	16 / 20	*	*
Home station TEMPO (Work schedule)	17 / 20	16 / 21	14 / 15
Unit resources	18 / 20	*	*
Retirement program that affects you	19 / 20	4 / 42	10 / 21
Number of personnel working in my unit	20 / 19	*	*
Bonuses/Special Pay	21 / 19	*	*
Potential for outsourcing and privatization	22 / 18	*	*
Availability of medical care	23 / 17	20 / 14	20 / 11
AF officer/enlisted evaluation systems	24 / 17	14 / 23	15 / 15
Training/experience of unit personnel	25 / 17	*	*
Implementation of Expeditionary Air Force	26 / 16	*	*
Opportunity for education and training	27 / 9	18 / 17	18 / 12
Availability of dependent dental care	28 / 8	21 / 10	21 / 5
Readiness of your unit	29 / 7	*	*
Availability of dental care	30 / 4	24 / 3	22 / 3
On-base child care/youth programs	31 / 4	25 / 2	*
Availability of base housing	32 / 3	23 / 4	*
Equal employment opportunities in the AF	33 / 3	*	*
On-base fitness/recreation programs	34 / 2	26 / 1	*
Job security	35 / 2	22 / 8	13 / 15
Patriotism	36 / 2	*	*
Availability of base exchange	37 / 1	27 / 1	*
Availability of commissary services	38 / 1	28 / 1	23 / 1

Note: * indicates no comparable item for that year

Appendix J. Description of Weight Calculation

This is the calculation procedure for weights of all the values in the hierarchy, and Table L.1 and L.2 show the detailed data of each officer group.

- Pick the first 30 Influences from the Influences to Leave of each group (appendix H. and I.).

- Remove those Influences which are not captured in the value hierarchy, such as Availability of comparable civilian jobs, Retirement program that affect you, Implementation of Expeditionary AF, Readiness of your unit, and Potential for outsourcing and privatization.

- Match each Influence to its related measures in the hierarchy.

- Convert "% of officer who ranked the item as Very strong or Strong" to a "Relative %" measurement.

- Calculate scores for each Influence using "Relative %" measurement, with measure scores 6 (Strongly Agree), 5 (Agree), 4 (Slightly Agree), 3 (Slightly Disagree), 2 (Disagree), and 1 (Strongly Disagree).

- Sum up all the "Relative %" measurements for each related measure in the hierarchy.

Table J.1 Weight Calculation of Company Grade Pilots

Influence	Measure	%	Relative %	Score
Amount of additional duties	Resources index	75	7.72%	4.75
Home station TEMPO (Work schedule)	Resources index	64	6.58%	4.20
Choice of job assignment	Resources index	62	6.38%	4.10
Say in base of assignment	PCS timing rate	60	6.17%	4.00
Say in base of assignment	Separation time rate	60	6.17%	4.00
Say in base of assignment	Total expenditure per student	60	6.17%	4.00
Say in base of assignment	Urbanization index	60	6.17%	4.00
TEMPO away (Number/duration of TDYs)	Annual number of TDY	55	5.66%	3.75
TEMPO away (Number/duration of TDYs)	Annual days of TDY	55	5.66%	3.75
Leadership at MAJCOM/HQ USAF level	Leadership index	38	3.91%	2.90
Availability of dependent medical care	Health care index	38	3.91%	2.90
Number of PCS moves	Average duration of PCS	38	3.91%	2.90
Unit resources	Resources index	36	3.70%	2.80
Leadership at wing or equivalent level	Leadership index	28	2.88%	2.40
Number of personnel in my unit	Resources index	25	2.57%	2.25
Availability of medical care	Health care index	25	2.57%	2.25
Pay and allowances	Annual pay rate	23	2.37%	2.15
Geographic area/current base	Health care index	21	2.16%	2.05
Geographic area/current base	Total expenditure per student	21	2.16%	2.05
Geographic area/current base	Urbanization index	21	2.16%	2.05
Recognition of your efforts	Recognition index	19	1.95%	1.95
Compatibility with spouse's career/job	Urbanization index	17	1.75%	1.85
Leadership at unit level	Leadership index	17	1.75%	1.85
Availability of dependent dental care	Health care index	15	1.54%	1.75
AF officer/enlisted evaluation systems	Promotion rate	11	1.13%	1.55
Training/experience of unit personnel	Resources index	8	0.82%	1.40
Availability of dental care	Health care index	6	0.62%	1.30
Promotion opportunity	Promotion rate	6	0.62%	1.30
Availability of base housing	Out of pocket cost rate	4	0.41%	1.20
Bonuses/Special Pay	Annual pay rate	4	0.41%	1.20
	Total		100.00%	

Table J.2 Weight Calculation of Company Grade Non-Pilots

Influence	Measure	%	Relative %	Score
Choice of job assignment	Work load	53	6.96%	3.65
Say in base of assignment	PCS timing rate	48	6.30%	3.40
Say in base of assignment	Separation time rate	48	6.30%	3.40
Say in base of assignment	Total expenditure per student	48	6.30%	3.40
Say in base of assignment	Urbanization index	48	6.30%	3.40
Recognition of your efforts	Recognition index	34	4.46%	2.70
Leadership at wing or equivalent level	Leadership index	32	4.20%	2.60
Leadership at unit level	Leadership index	28	3.67%	2.40
Number of PCS moves	Average duration of PCS	28	3.67%	2.40
Pay and allowances	Annual pay rate	27	3.54%	2.35
Amount of additional duties	Work load	27	3.54%	2.35
Compatibility with spouse's career/job	Urbanization index	25	3.28%	2.25
Leadership at MAJCOM/HQ USAF level	Leadership index	24	3.15%	2.20
TEMPO away (Number/duration of TDYs)	Annual number of TDY	24	3.15%	2.20
TEMPO away (Number/duration of TDYs)	Annual days of TDY	24	3.15%	2.20
Availability of dependent medical care	Health care index	22	2.89%	2.10
Promotion opportunity	Promotion rate	21	2.76%	2.05
Geographic area/current base	Health care index	20	2.62%	2.00
Geographic area/current base	Total expenditure per student	20	2.62%	2.00
Geographic area/current base	Urbanization index	20	2.62%	2.00
Home station TEMPO (Work schedule)	Work load	20	2.62%	2.00
Unit resources	Resources index	20	2.62%	2.00
Number of personnel working in my unit	Resources index	19	2.49%	1.95
Bonuses/Special Pay	Annual pay rate	19	2.49%	1.95
Availability of medical care	Health care index	17	2.23%	1.85
Air Force officer/enlisted evaluation systems	Promotion rate	17	2.23%	1.85
Training/experience of unit personnel	Resources index	17	2.23%	1.85
Availability of dependent dental care	Health care index	8	1.05%	1.40
Availability of dental care	Health care index	4	0.52%	1.20
	Total		100.00%	

Appendix K. Description of Measures Scoring

- **Leadership Index.** Pilots' influences which are related to the *Quality of Leadership* value were ranked lower than non-pilots influences. Instead of using the survey data, it just assumes the Leadership index of pilots and non-pilots as 5 and 4 average scores, respectively, based on the scores in the weight calculation in Appendix J.

- **Resources Index.** Pilots' influences which are related to *Workload* value were ranked higher than non-pilots influences. Instead of using the survey data, it just assumes the Resource index of two officer groups as 3 and 4.5 average scores, respectively, based on the scores in the weight calculation in Appendix J. The *Annual Number of TDY* measure for *Workload* value is dropped assuming that this measure includes the workload from TDYs.

- **Promotion Rate.** A decade's average promotion rates (O3 to O4) of pilots and non-pilot were 84% and 81%, respectively. The promotion rates (O4 to O5) of those groups were 71% and 61 % (AFPC website). Accordingly, the promotion rates (O1 to O5) of two groups are 60% and 50%, respectively.

- **Recognition Index.** Pilots' influences which are related to the *Recognition of efforts* value were ranked lower than non-pilots influences. Instead of using the survey data, it just assumes the recognition index of pilots and non-pilots as 5 and 4 average scores, respectively.

- **Annual Pay Rate.** According to a retention report from the AFPC, substantially higher percentage of pilots expect to make at least $50K more annually, with the largest difference between separating company-grade pilots and non-pilots (Hamilton, 2000:10). So it assumes the annual pay rate of two officer groups as 70% and 90%, respectively.

- **Out of Pocket Cost Rate.** With the lack of specific data, this model uses the military overall average rate of 20% for both groups (Asch, etal, 2002).

- **Health Care Index.** This measure checks first whether the base has hospital available, if not then it checks what size region the base is located near to mirror the availability of TRICARE network. This model uses the data in the Defense Manpower Data Center website (https://www.dmdc.osd.mil/) to calculate the index score. The index scores of two groups are 0.69 and 0.76.

- **Total Expenditure per Student.** Due to the lack of specific data, this model just uses the United State's averaged total expenditure per student ($8,745) from the U.S Department of Education report in 2001.

- **PCS Timing Rate.** Due to the lack of specific data, this model employs the general PCS timing rate of 60% for both groups.

- **Average Duration of PCS.** The average time between PCS moves was about 2 years, according to the 1999 DOD personnel survey (United States General Accounting Office, 2001:3). Due to the lack of specific data, this model uses 2 years as the average duration of PCS for both groups.

- ***OS Unaccompanied Rate.*** Instead of separation time rate measure, this model employs OS unaccompanied rate measure for *Family Together* value due to the lack of specific data. The rate of pilots is 5.3%, and that of non-pilots is 4.38% based on the AFPC website data.

- **Annual Days of TDY** (Direct Natural). This model employs the data from the retention survey (Air Force Survey Branch, 2002:25). Table M.1 shows the average number of days TDY (in the 12 months previous to year of survey) for two officer groups. It uses the measure scores of 109 and 65 days, respectively.

Table K.1 Average Number of Days TDY

Year of Survey	1990	1995	1996	1997	1999	2000	2002
Company Grade Pilots	72	94	98	109	99	93	***109***
Company Grade Non-Pilots	47	59	63	67	61	55	***65***

- **Urbanization Index.** This model uses the data in the Defense Manpower Data Center website (https://www.dmdc.osd.mil/) to calculate the index score. The index scores of two groups are 0.75 and 0.81, respectively.

Appendix L. Classification Chart of AF Officers

Career Area	Utilization Field Title
Operations(1X)	Pilot (11), Navigator (12), Space/Missile/Command and Control (13), Intelligence (14), Weather (15), Operations Support (16)
Logistics (2X)	Aircraft Maintenance, Maintenance, Munitions and Missile Maintenance, Logistics Readiness
Support (3X)	Security Forces (31), Civil Engineering (32), Communication-Information Systems (33), Services (34), Public Affairs (35), Mission Support (36), Manpower (38)
Medical (4X)	Health Services Administrator (41), Biomedical Clinician (42), Biomedical Specialists (43), Physician (44), Surgery (45), Nurse (46), Dental (47), Aerospace Medicine (48)
Professional (5X)	Law (51), Chaplain (52)
Acquisition and Financial Management (6X)	Scientific/Research (61), Developmental Engineering (62), Acquisition (63), Contracting (64), Finance (65)
Special Investigations (71)	Special Investigations

Appendix M. AF Officer Retention Survey

1. **General Questions**

   a. Rank : YOS: AFSC:

   b. Marital status: Gender: Education Level:

   c. Number of children: Number of schooling age:

2. **Questions about your previous duty station**:

   a. Check the size of city the base is located near:

   - Large Central City (population of 250,000 or more) or its Urban Fringe
   - Mid-Size City (at least 100,000 but less than 250,000) or its Urban Fringe
   - Large Town (population of 25,000 or more)
   - Small Town (at least 2,500 but less than 25,000)
   - Rural (population of less than 2,500)

   b. Check the military health care facility available:

   - hospital / medical center (inpatients)
   - medical clinic (outpatients)

   c. How many times did you go TDY in a year?

   d. What's the total number of days of TDY in a year?

   e. Score the **Leadership Quality** (1 to 6 agree scores, the bigger, the better)

No	Question	Score
1	The leaders in my chain of command (in my unit) listen to my ideas.	
2	The leaders in my chain of command are easily accessible.	
3	I trust the leaders in my chain of command.	
4	I am proud to be associated with the leaders in my chain of command.	
5	I see the leaders in my chain of command doing the same things they publicly promote (walking the talk / leading by example).	

f. Score the **Resources** (1 to 6 agree scores, the bigger, the better)

No	Question	Score
1	I have adequate time to do my job well.	
2	We have enough people in my work group to accomplish the job.	
3	I have the right tools/equipment to accomplish my job.	
4	I have enough time to accomplish my daily workload during my duty hours.	

g. Score the **Recognition of Efforts** (1 to 6 agree scores, the bigger, the better)

No	Question	Score
1	My chain of command in my unit rewards team performance fairly.	
2	My chain of command in my unit rewards individual performance fairly.	
3	When deserved, my chain of command in my unit does a good job of recognizing people in all grades and types of jobs.	
4	My chain of command rewards primary job expertise more than additional duty performance.	

h. You lived (on base or off base) housing (Zip code: , State:)

i. If you lived off base, how much did you spend for housing every month (including all utilities cost)?

j. If you have school age children, what's the name of school district of your children?

3. Questions about PCS

a. How many PCS moves have you had since you have been active duty? (Including your first move)

b. If you have school age children, how many PCS moves were during the summer break time?

c. Have you ever been separated from your family due to PCS? If yes how long?

4. **Questions about your Values** (The bigger you score, the more important for you.)

   a. How would you weigh these four values of your job? (sum up 100)

      i. Job Satisfaction ( )
      ii. Financial ( )
      iii. Family Support ( )
      iv. Geographical Stability ( )

   b. How would you weigh each value under **Job Satisfaction**? (sum up 100)

      i. Quality of Leadership ( )
      ii. Workload ( )
      iii. Promotion Opportunity ( )
      iv. Recognition of Efforts ( )

   c. How would you weigh each value under **Family Support**? (sum up 100)

      i. Housing ( )
      ii. Health Care ( )
      iii. Children's Education ( )

   d. How would you weigh each value under **Geographic Stability**? (sum up 100)

      i. Stability of Family ( )
      ii. Family Together ( )
      iii. Compatibility with Spouse's Career ( )

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14. ABSTRACT

The purpose of this research is to provide better understanding of the Air Force officer retention problem. This thesis effort involves building a VFT model to find out more effective alternatives in retaining company grade pilots and company grade non-pilots. This model, in conjunction with the results of the post-analysis, shows an example of the application of a VFT approach to the AF officer retention problem. Results show that both officer groups have their own unique value trends concerning their jobs. As a single alternative, *Increase Resources* is absolutely the best one for pilots. Meanwhile, *Close Down Rural / Overseas Bases* is the best for non-pilots. The results also show that alternative combinations with relatively little cost are more influential than an alternative which costs a lot of money.

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