A DECISION ANALYSIS MODEL FOR ALLOCATING THE MILITARY FAMILY HOUSING INVESTMENT BUDGET

THESIS

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AFIT/GEE/ENV/97D-11

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The views in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or US Government

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Timothy G. Imdieke, Capt USAF

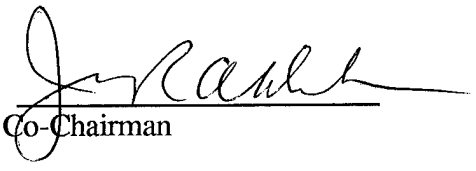
Presented to the Faculty of the Graduate School of Engineering

of the Air Force Institute of Technology

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Engineering and Environmental Management



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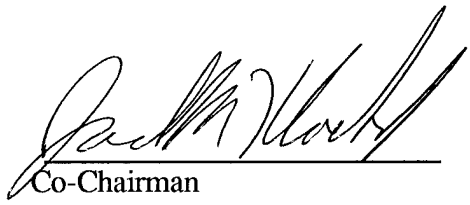

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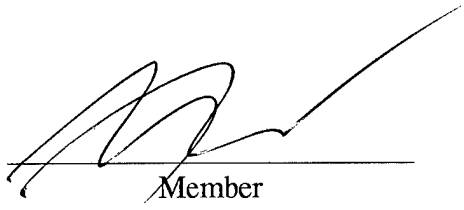

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Abstract

Allocating resources is a difficult task when resources fall considerably short of the requirements, and there are many different opinions on what requirements should have priority. The Air Staff Housing Division must decide how to allocate a $250M/year budget to best achieve the Air Force goals for military family housing. The decision is complex because requirements are much larger than the available resources, and there are many conflicting objectives to consider. This research uses value-focused thinking and multiattribute utility theory to develop a decision analysis model to assist the decision maker in selecting a budget strategy. A deterministic analysis (using Logical Decisions software package) on the data submitted from four Major Commands (MAJCOMs) demonstrates the model's capabilities by ranking 87 budget strategies based on how well they meet the decision maker's objectives. The model allows for sensitivity analysis to display the effects of changes in the decision maker's preferences and changes in the input data. Overall, the model provides a set of tools that can help the Air Staff make a better decision that is quantifiable, transparent, and defensible. It also provides metrics to evaluate how effective the military family housing investment program is in meeting Air Force goals.

A DECISION ANALYSIS MODEL FOR ALLOCATING THE MILITARY FAMILY HOUSING INVESTMENT BUDGET

Chapter 1 : Introduction

General Issue

Providing quality housing for military families is a significant challenge for Air Force leaders. The quality and availability of Military Family Housing (MFH) for Air Force members has been identified as having a major influence on the quality of life, which in turn affects retention rates (Bland, 1990:50). The Air Force leadership has committed to improving the quality of life for Air Force members in order to raise the morale and to keep retention rates high. In recent years, there has been an added emphasis to provide excellent housing facilities for all military members and their families (Dept of AF, 1996:1). To meet this objective, allowances are provided for finding housing in the local community, and by providing MFH when there is not enough adequate housing available locally.

A sizable investment is required to maintain and improve the MFH inventory. In 1998, the Air Force will spend approximately $735 Million to operate MFH, and $229 Million to replace and revitalize the aging inventory (Dept of AF, 1996:16,289). The Air

Force Civil Engineer is responsible for the MFH program, and the Air Staff Housing Division Chief, working under the Air Force Civil Engineer, must decide how to allocate the MFH budget to each Major Command (MAJCOM) in order to meet the Air Force goal of providing the maximum amount of quality housing for Air Force members.

This thesis uses value focused-thinking (Keeney, 1992 and 1994) to identify strategies that optimally allocate the MFH investment budget based on the Air Staff's objectives for the MFH investment program. With the insight provided on the budget strategies, the Air Staff can select the strategy that funds projects that are most in line with the Air Staff's objectives. MAJCOMs will compete for funds on the basis of how well their programs meet the Air Staff's objectives, thus encouraging development of innovative projects and portfolios of projects by the MAJCOMs.

Background

History. The majority of the Air Force's current housing inventory was built during the 1950s and 1960s under the Wherry-Spence Act and the Capehart Act (Snyder and others, 1996:1, 2). These two programs provided approximately 92,000 housing units for the Air Force (Munsie and Weldon, 1996:2).

Demand for MFH has increased dramatically since World War II with the changes in the force structure (GAO, 1996:15). The large force maintained during the cold war years, along with the large increase in the marriage rate for enlisted personnel, has driven up the demand for MFH. The end of the selective draft in 1973 brought in the era of the all volunteer force, which is older, better educated, and career oriented. Increased

emphasis was placed on quality of life programs such as housing to attract and retain high quality volunteers. Today approximately 40% of Air Force families reside in MFH (Munsie and Weldon, 1996:2).

Air Force Goals and Department of Defense (DoD) Policy. The goal for the Air Force is to provide quality housing for all members. This is done by providing MFH, or by paying Basic Allowance for Quarters (BAQ) and Variable Housing Allowance (VHA) to military members in order for them to find housing in the local communities around the military installation. Relying on the local community as the primary source of housing is DoD policy as outlined in DoD policy manual 4165.63-M. If acceptable and affordable housing is not available in the local area, the military attempts to provide enough MFH to cover the deficit. Minimum standards to be considered acceptable and affordable include (1) within a one hour commute during normal commuting hours; (2) not within an area designated as unacceptable for health and safety reasons by the installation commander; (3) monthly cost must not be greater than 150% of the basic housing allowance plus the variable housing allowance; (4) unit must be structurally sound and have at least one full bathroom and a kitchen and meet other specific standards such as square footage minimums, access to laundry facilities, and electrical, heating, cooling, and sanitation requirements (DoDI 4165.63-M, 1993).

MFH Budgets. The Air Force gets approximately $250M per year to replace, add to, or revitalize existing housing inventory (Snyder and others, 1996:2). At this level of funding, Munsie and Weldon estimate that it will take 26 years to renovate or replace the units that are currently unsuitable (Munsie and Weldon 1996:3). Their estimate does not

account for houses added to the unsuitable category due to deterioration from normal wear over the next 26 years.

Problem Statement

The current budget allocation strategy and appropriation rate for MFH will not allow the Air Force to bring the current inventory up to the whole-house standards identified in the Air Force Housing Guide (Dept of AF, 1995:2-3) in a reasonable length of time. Although Congress has resisted deep cuts in the MFH appropriations the past two years, funding levels still do not meet the requirements. As the military has been downsized, there is additional pressure to reduce defense budgets; therefore, the Air Staff needs to evaluate new strategies for investing MFH funds.

The Air Force Housing Division is developing a MFH master plan to outline a comprehensive strategy that will attempt to efficiently guide MFH investments to maximize return on investments (ROI) while providing quality housing (Munsie and Weldon, 1996:11). Part of this plan is to implement a cost effective budget allocation strategy in order to provide quality housing. Some objectives that could possibly be incorporated into a budget allocation strategy are

- Transferring government housing to the private sector.
- Reducing surplus units.
- Letting mission requirements drive the funding decisions.

To achieve the goal of providing sufficient, quality housing with a limited investment budget, a method to allocate the budget insuring that funds are being applied to

appropriate projects must be developed. The difficulty in meeting this goal is that there is currently no method for analyzing how well budget allocation strategies meet the Air Force's objectives for providing quality housing. Because budget allocation is a highly sensitive issue, the Air Staff needs a methodology that differentiates between different funding strategies, and allows the value of each strategy to be quantified. Value in this context is a unit-less measure which indicates alignment of an alternative budget strategy with respect to the Air Staff's stated housing objectives.

Research Goals and Objectives

The goals of this research are to design a method to quantify the value Air Staff derives from a budget allocation strategy, and to compare, quantitatively, various budget allocation strategies to the current strategy. The following research objectives support these goals:

1. Determine the Air Staff's objectives pertaining to MFH.
2. Develop evaluation measures to gauge how well a strategy meets the objectives.
3. Develop value functions to capture the value achieved by a strategy.
4. Quantify the decision maker's preferences.
5. Obtain the MAJCOM's data for the projects each MAJCOM would undertake given various levels of MFH investment funds, and develop budget allocation strategies based on the funding levels for which data is submitted.
6. Score and rank the budget allocation strategies with the evaluation measures.
7. Perform sensitivity analysis on the recommended strategy.

Scope of Research

The scope of this research is limited to allocating the budget for MFH investment funds to the Air Force MAJCOMs. Although this research did not consider how the other military services allocate MFH investment budgets, the same types of funding and inventory issues pertain to them as well, and this model could be tailored to their particular values. This research does not address how MAJCOMs should select projects for the housing programs they submit to the Air staff; however, understanding the Air Staff's values will aid the MAJCOMs in building high value MFH programs.

Overview

In Chapter 2 of this thesis, the problem is characterized, some methods for allocating resources are reviewed, and the principles of decision analysis using multiattribute utility theory are presented. Chapter 3 covers the methodology used to obtain the decision maker's objectives hierarchy, value functions, evaluation measures, and preferences. To assist in verification and analyzing the results, two theoretically identical implementations of the final model are developed to analyze the strategies; one using the software package DPL and the other using the software package Logical Decisions. A case study using data from four MAJCOMs is analyzed in Chapter 4, and conclusions are presented in Chapter 5.

Chapter 2 : Background

Air Force MFH Investment Budget Allocation Strategy

Prior to 1995, the budget allocation strategy for MFH investment funds was based on the proportion of assets owned (Weldon, 1997:intreview). If a particular MAJCOM had 10% of the housing assets, they received 10% of the investment funds.

In 1995 the Air Staff Housing Division developed housing facility assessments to devise an objective method for determining the condition of a unit. The details on how the assessment is done are presented in appendix A. Housing units can fall into one of three levels; level one is unsuitable, level two is degraded, and level three is satisfactory. Starting in 1995, investment funds have been allocated proportionally, based on the number of level one units that a MAJCOM owns (Murphy, 1997:interview). The goal behind the change in the budget allocation strategy was to reduce the number of level one units by either replacing or improving them; the rationale is that the worst houses should be fixed first in order to provide higher quality housing.

In addition to distributing the budget based on the proportion of level one units, a portion of the budget is used to reward MAJCOMs who do the best job of executing their program (Murphy, 1997:memo). The reward money is to entice commands to expeditiously award contracts. If funds are not promptly awarded, the Office of the Secretary of Defense (OSD) is reluctant to believe the urgent need for additional housing funds for the following years, and a portion of Air Forces' budget may be reallocated to

the other services (Murphy, 1997 interview). In addition, promptly executing the funds provides a faster turn around of level one units to modern, quality housing.

Factors Influencing Air Staff's MFH Investment Strategy

Alternatives to MFH

Privatization. In 1995 the Marsh Task Force analyzed the DoD housing problem and one of the top recommendations was to privatize housing assets to accelerate the improvement of government family housing (Dept of AF, 1997:1-1). Statutory authority to implement the privatization concept was included in the 1996 National Defense Authorization Act (PL 104-106, Sec 2871-2885, 1996 National Defense Authorization Act, Military Housing Privatization Initiative). This legislation removed many of the restrictions formerly placed on transferring federal assets to private parties (Dept of AF, 1997:1-1). The concept behind privatization is that the military offers a steady rental stream, capital assets, and/or land, and in return the private developer would build new houses or renovate existing units. The developer would then be responsible for keeping the units maintained, but military members would have the first option at renting the units at a cost equal to their BAQ and VHA allowances.

Although there is hope that privatization will decrease the time it takes the military to update its housing, the results are still to be proven. The contract for the Air Force's pilot privatization project at Lackland AFB is expected to be awarded in March 1998 (Weldon, 1997:interview).

Housing on the Economy. As previously stated in chapter 1, the DoD policy for housing military is to rely primarily on the local communities. A housing market analysis (HMA) is conducted at least every three years to determine if enough housing exists in a community (Dept of AF, 1996:5-6). If the requirements exceed the market area inventory, then additional MFH can be programmed to cover 90% of the deficit (Desaulniers and others, 1996:59).

Age and Condition of Inventory. The average age of the Air Force's 110,000 units is 34 years, and 58,000 of these old housing units require expensive modernization and repair projects to bring them up to standards (Munsie and Weldon, 1996:3). Fifty-three percent of the inventory falls into the level one category and it is estimated that it will take 26 years with current strategy and funding to fix the level one units (Munsie and Weldon, 1996:3). The current funding strategy dictates that all MFH investment funds be spent on level one units.

Replacing vs. Improving. Air Force policy is to design improvement projects to the whole-house standards listed in the Air Force Housing Guide (Dept of AF, 1994:6). If the cost to improve the unit is above 70% of the replacement cost, the unit should be replaced vs. improved (Dept of AF, 1994:6). This drives the number of revitalized units down because of the high cost to build new units and the disposal cost of the old units.

Surplus Housing. Due to the military downsizing and restructuring over the past decade, some bases have more MFH than the requirement identified in the HMA supports. Although the housing is considered surplus, there is still a demand for the units and commanders are reluctant to dispose of any units as long as there are waiting lists to get

into MFH (Martin and others, 1997: interview). OSD does not support the Services revitalizing surplus housing, so decisions on how to manage the surplus housing must also be considered when developing an investment strategy (Weldon, 1997: interview).

Other Factors. Executing the MFH program has already been discussed as having an influence on the strategy, but other less traditional factors the Air Staff would like to consider are aligning the MFH strategy to provide a high quality of life for the military personnel who deploy often, and to target improvements in the housing for junior ranking members (Weldon, 1997: interview).

Resource Allocation Methods

There are many methods detailed in the literature for allocating scarce resources, and this section will discuss only a few of the methods available. Engineering economic analysis techniques are usually a good starting point when selecting a method for optimally allocating resources. Included in this group of methods is present worth analysis, annual cash flow analysis, rate of return analysis, benefit cost ratio analysis, and payback period analysis (Newnan, 1991:chapters 5-9). These methods attempt to maximize profits, or minimize costs. The underlying assumption is that there is a return on the investment, either through cost savings or increased profits. For the decision on how to allocate MFH investment funds, the Air Staff would like to consider non-monetary criteria, such as the quality of life for the residents. Therefore, other methods that handle multiple criteria need to be used.

McPherson and Watts surveyed a number of the common multicriteria decision making methods in their thesis effort on allocating resources for pollution prevention projects. Their findings show that the distance-based techniques, where an alternative is compared to an ideal solution, result in a solution that attempts to satisfy the majority of the objectives without performing too badly on any one objective (McPherson and Watts, 1992: 2-1—2-3). This provides a good solution, but does not necessarily find the optimum solution.

Linear programming based methods for handling multicriteria problems include goal programming, the analytical hierarchy process (AHP), and multiattribute utility theory. In goal programming, the multiple criteria are related to a common attribute, such as dollars, and an objective function is developed to maximize or minimize the common attribute, subject to constraints (Winston, 1994:772-783). Reaching the goal for one criteria will likely keep the goal for another criteria from being reached; therefore, the cost of the trade-offs are specified in the objective function. This method is difficult to use if the multiple criteria are not easily related by a common term. With AHP, pairwise comparison techniques are used to develop the relative importance of the criteria and the alternatives (Winston, 1994:798-804). The difficulty in using this method for modeling the MFH investment decision is the large number of alternatives. Each of the $\underline{n}$ alternatives must be compared to each other to establish the rank order, and each of the $\underline{m}$ criteria must be compared to each other to establish the weights for the criteria. If either the set of criteria or the set of alternatives is large, the method becomes cumbersome. To choose the best strategy for the MFH investment decision, decision analysis techniques

were employed, specifically value-focused thinking and multiattribute utility theory. These methods are discussed in detail in the following sections.

Decision Analysis

The multiple conflicting objectives the Air Staff has for MFH make it difficult to come to a consensus on an investment strategy. Decision Analysis provides a structured methodology for assisting decision makers in handling difficult decisions. Clemen (1994) lists four types of decision situations in which decision analysis is an effective method for modeling the decision maker's problem, and providing insights on which alternative to choose (Clemen, 1994:2-3):

1. Complex situations where it is difficult to grasp all of the issues that need to be considered.
2. Decisions where there is a lot of uncertainty in the outcomes, the sources of the uncertainty and the probabilities must be understood.
3. When the decision maker is trying to achieve multiple objectives, but the objectives conflict.
4. The problem involves several decision makers, each with his/her own perspective that leads to a different conclusion.

The Air Staff's decision on how to allocate the MFH investment budget is difficult because there are many issues to be considered, there are multiple conflicting objectives such as fixing the units that are in the worst condition first while trying to maximize the number of units revitalized, and there are many stakeholders with different perspectives on how the budget should be allocated.

The structured methodology of decision analysis gives the decision maker insights on the uncertainties, the value of the alternatives, the trade-offs (the importance placed on one objective over another), and ultimately the course of action to take (Clemen, 1994:4). Bunn (1984) states that

> ...the basic presumption of decision analysis is not at all to replace the decision maker's intuition, to relieve him or her of the obligations in facing the problem, or to be, worst of all, a competitor to the decision maker's personal style of analysis, but to complement, augment, and generally work alongside the decision maker in exemplifying the nature of the problem. Ultimately, it is of most value if the decision maker has actually learned something about the problem and his or her own decision-making attitude through the exercise (Bunn, 1984:4).

Kirkwood (1997) gives a 5 step method for implementing decision making (Kirkwood, 1997:3):

1. Specify evaluation measures and scales for measuring how well an alternative meets an objective(s).
2. Develop alternatives.
3. Determine how well the alternatives meet the objectives.
4. Develop the trade-offs among the objectives.
5. Select the alternative that best achieves the objectives considering the uncertainties, risks and the decision maker's preferences.

This method allows the analyst to use objective modeling techniques to handle the decision maker's subjective preferences, uncertainties and value trade-offs. The result is not a particular alternative, but rather an insight into how the alternatives rank against each other given the preferences specified by the decision maker.

Kirkwood's method for implementing decision analysis assumes that the objectives are known, which is often not the case. Without clear objectives, it is difficult to know

which alternative to choose; therefore, a critical step in decision analysis is identifying good objectives. Keeney (1994) suggests that the starting point for developing the objectives should be the decision maker's values (Keeney, 1994:33).

Value-Focused Thinking. Value-focused thinking uses the decision maker's values to structure the decision analysis model. By concentrating on the values, the true motive for a decision is uncovered, which allows objectives to be developed that capture the essence of what is important (Keeney, 1994:33). For an example, a couple trying to decide between several different cars stated that their objectives were maximizing the amount of luxury and minimizing the cost. The analysis clearly showed that the Lincoln was less expensive and more luxurious than the other choices; however, the couple did not seem happy with the results. Upon further questioning of their values, it was revealed that they felt status amongst their neighbors, coworkers, etc. was important, and that they perceived that foreign luxury cars gave them more status. By focusing on their values, a hidden objective was uncovered.

The difference between value-focused thinking and the more commonly practiced alternative-focused thinking is illustrated in figure 2-1. With alternative-focused thinking the existing alternatives are treated as being fixed, so the decision maker attempts to distinguish between the differences in the alternatives and then picks the best choice. Value-focused thinking is different because the decision maker's values are used to create new alternatives if the existing ones are unacceptable, and the metrics used to evaluate the alternatives are tied to the values. The decision maker specifies what the underlying important considerations are regarding the decision, and then uses those values as the

standard for how good an alternative is (Keeney, 1994:33). Keeney describes several advantages to using value-focused thinking which are illustrated in figure 2-2.

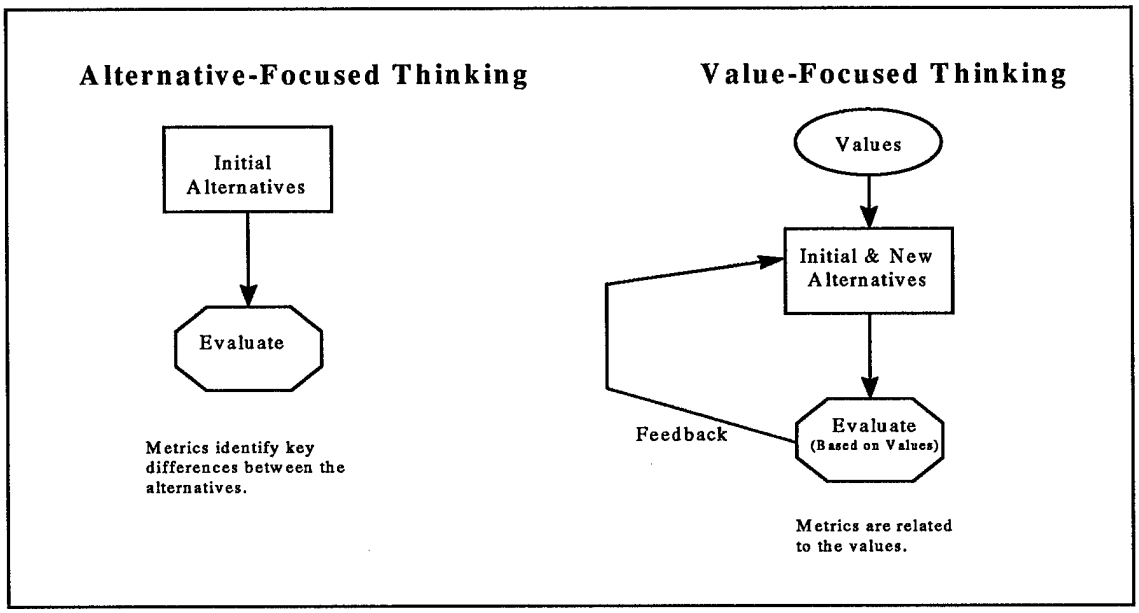

Figure 2-1. Value-Focused vs. Alternative-Focused Thinking (Jackson, 1997:notes)

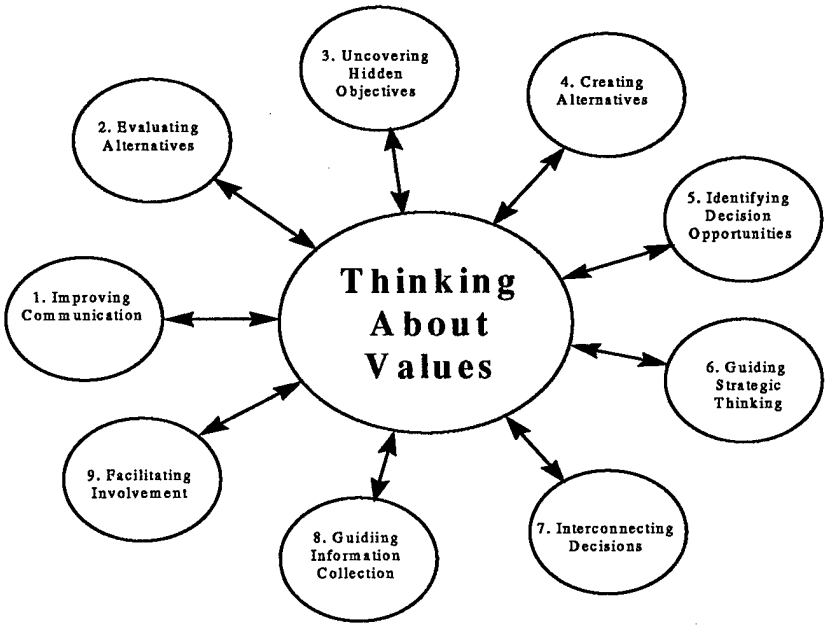

Figure 2-2. Uses For Value-Focused Thinking (Keeney, 1992:3-28)

Objectives Hierarchy. Using the decision maker's values, a hierarchy of objectives can be defined for a given decision opportunity. The hierarchy resembles an organizational chart in that it starts at the top with a few fundamentally important but general objectives, and then broadens out with more specific objectives underneath, or lower in the hierarchy. The general objectives at the very top of the hierarchy are often difficult to measure; therefore, they are broken down into more specific objectives until each objective can be measured. Figure 2-3 illustrates the car buyer's objectives hierarchy from the previous example. The primary objectives were to minimize cost, provide status, and to maximize comfort. Cost can be evaluated directly, but status and comfort need to be further defined. Status is broken down further into the brand and aesthetics, and aesthetics is further broken down into the style and appearance. Comfort can be defined by the handling, amenities, and space. Now the hierarchy is sufficiently defined to where each objective at the end of a branch (the leaves) is specific enough that evaluation measures can capture how well an alternative meets the objective.

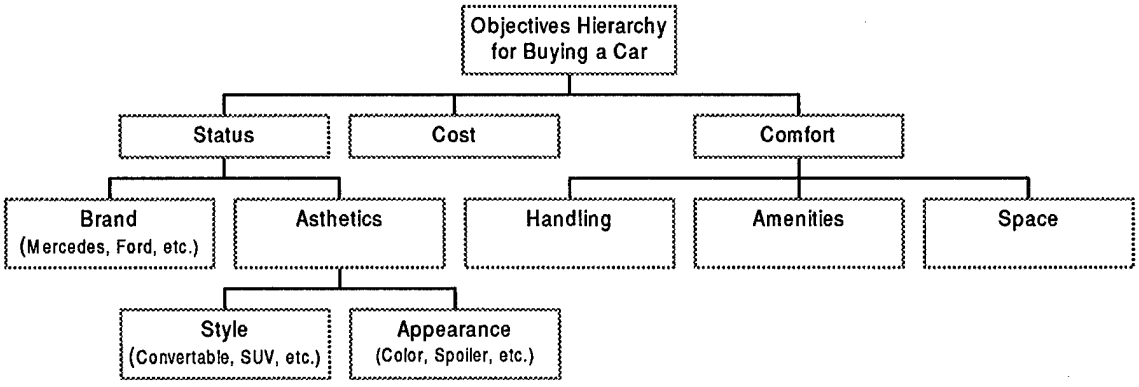

Figure 2-3. Example Objectives Hierarchy

A properly constructed objectives hierarchy should have the following properties (Kirkwood, 1997:16-19):

- **Completeness**; The evaluation measures at each level taken together as a group should adequately capture the overall objective of the decision.
- **Non-redundancy**; Evaluation measures should be mutually exclusive.
- **Decomposability or Independence**; All evaluation measures for a specific objective should be independent of one another.
- **Operational**; Evaluation measures should be meaningful to the decision maker. If the decision makers and other stakeholders can easily relate to the measures, the analysis will be more meaningful and will provide greater insight to the problem.
- **Minimum Size**; Along with the previous properties, the set of evaluation measures should be kept to a minimum to avoid confusion and unnecessary complexity.

Typically decisions are based on more than one objective, and often times maximizing one objective can only be done at the expense of another objective. In the car buyer example, the objectives of high status, low cost, and high comfort probably conflict with each other. The car that maximizes status will probably not be the car that minimizes cost. In this case the decision maker is faced with a value trade-off; how much value should be given to the status objective vs. the cost objective. Trade-offs require the subjective judgment of the decision maker and they are usually based on the decision maker's personal values (Keeney and Raiffa, 1976:18-19).

Multiattribute Utility Theory. Multiattribute utility theory (MAUT) presents a technique for ranking the alternatives where multiple objectives need to be considered. The method consists of determining value functions and weights for each evaluation measure, and then combining the multiple functions and weights into a single function that

measures an alternative's overall value (Kirkwood, 1997:53). The mathematics and theory that support the melding of multiple functions into a single function based on the decision maker's trade-offs are developed in Kirkwood (1997) and Keeney and Raiffa (1976).

A simple additive function can be used if two conditions are met: there is no uncertainty in the outcomes, and mutual preferential independence holds between the evaluation measures (Clemen, 1996:580). An evaluation measure Y is preferentially independent of X if preferences for specific levels of Y do not depend on the level of X (Clemen, 1994:579). If it can also be established that preferred levels of X do not depend on the level of Y, then X and Y are mutually preferentially independent. Using the car example to illustrate this concept, the evaluation measure cost is always preferred to be lower for any level of status or comfort; the level of status is always preferred to be higher for any level of cost or comfort; and the level of comfort is always preferred to be higher for any level of status or cost; therefore, status, cost, and luxury are mutually preferentially independent.

Value Functions. Value functions convert the evaluation measure scores into unit-less values. This allows objectives with unrelated units of measure to be combined. For example, minimizing the cost of the car is measured in dollars, but the maximizing comfort would be measured in some form of subjective measurement such as how well the car handles in city traffic. By creating value functions for these objectives, the two can be compared. Single dimensional value functions (SVF) are created for each objective with an evaluation measure. An additive multidimensional value function is then

used to combine the weights or preferences for each objective with the values to return an overall value score.

The SVFs are developed by determining the range of interest for the evaluation measures and assigning a corresponding value. The worst end of the range is assigned a value of 0, and the best end of the range gets a value of 1. (Using 0 and 1 as the range for the values is arbitrary and other ranges can be used as long as there is consistency among all of the SVFs.) Once the range is set, the decision maker determines the corresponding values between 0 and 1 for any point in the range. For an example on developing a SVF, the couple purchasing the car were considering spending between $20,000 and $40,000. For the minimize cost objective, the best score is $20,000 so it gets a value of 1, and the worst score is $40,000, so it returns a value of 0. Figure 2-4 shows three possible value functions the couple may have. Function f(cost) decreases rapidly as the price goes up, function g(cost) decreases at a constant rate, and function h(cost) decreases slowly as the price increases, until the price gets very high. For this example, assume the couple's value function was function f(cost). Then a car that cost $20,000 would return a value of 1, a car that cost $23,000 would return a value of 0.5, and a car that cost $40,000 would return a value of 0.

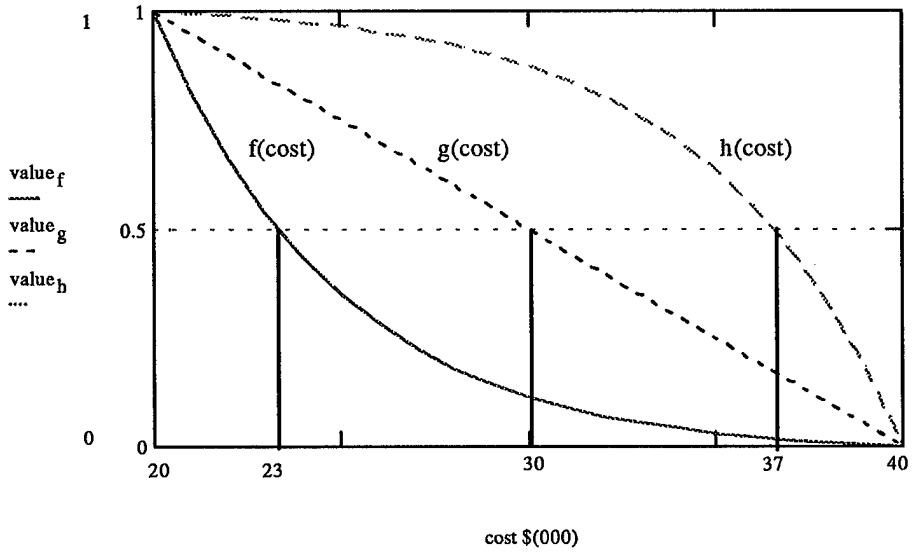

Figure 2-4. Value Functions for Minimizing Cost

Weights. The trade-offs between objectives are set by determining the weight or relative importance a decision maker places on each objective. When determining the weights, it is critical that the ranges of the evaluation measures are considered (Clemen, 1994:133). For example, initially a car buyer may state that the cost of a car is much more important than comfort if the cost range of all cars being considered is very large. But after narrowing down his/her choices to five alternatives that are all within $1000, the car buyer would likely put much more emphasis on the comfort objective since the relative difference in cost between the alternatives is small. In this situation, the decision maker would change the weight for the cost objective because the range for the cost evaluation measure had changed.

There are many methods in the literature for determining the weights (see Kirkwood (1997), Clemen (1994), Logical Decisions (1997)). After experimenting with

several methods, the decision maker felt the most comfortable with using pairwise weight ratios (Logical Decision, 1997:152-153). A pair of objectives are selected and the decision maker defines the ratio of how much more they prefer having an alternative that scores well for one objective compared to the other. If there are n objectives to consider, then n-1 nonredundant pairs must be assessed. Imposing the constraint that the sum of the weights must equal one, then the n-1 ratios provide enough equations to define the weights. For an example consider the three objectives for the car example: maximize status, minimize cost, and maximize comfort. If the couple consider cost to be equal to status, and cost to be three times greater than comfort, then the three equations to find the weights are

$$1=W_{\$}+W_c+W_s \qquad (2.1)$$

$$W_{\$}=W_s \qquad (2.2)$$

$$W_{\$}=3W_c \qquad (2.3)$$

where $W_{\$}$, W_c, and W_s are the respective weights for the cost, comfort, and status objectives. Solving the three equations for $W_{\$}$,

$$1= W_{\$}+ W_{\$}+ W_{\$}/3 \qquad (2.4)$$

and substituting the results from equation (2.4) back into equations (2.2) and (2.3) gives the results shown in Table 2-1.

Table 2-1. Summary of Weights

Objective	Ratio of Cost Objective to Other Objectives	Weight
Minimize Cost	1	3/7
Maximize Status	1	3/7
Maximize Comfort	3	1/7

Multidimensional Value Function. An additive value function is used to combine the weights and SVFs to return an overall value. The additive value function, as defined with MAUT, is the weighted average of the individual functions. Mathematically it is

$$v(x_1, x_2, \ldots, x_n) = \sum_{i=1}^{n} \lambda_i v_i(x_i) \qquad (2.5)$$

where:

$\sum_{i=1}^{n} \lambda_i = 1$

$v_i(x_i)$, $\lambda_i \geq 0$ for all i

λ_i is the weight for objective i

$v_i(x_i)$ is the value from objective i with evaluation measure score x_i

v_i(worst possible x_i)=0, v_i(best possible x_i)=1

(Keeney and Raiffa, 1976:118-119)

To complete the car example, assume the value scores for maximizing status, minimizing cost, and maximizing comfort have been found for each alternative. With the single objective value scores from table 2-2, and the decision makers weights from table 2-1, the overall value for each alternative is calculated with the additive value function. Table 2-2 summarizes the data and equation 2.6 shows how the overall value is found for the Toyota alternative. Note that the car with the highest value to the decision maker is the Ford. The Ford had the lowest score for status, but it had the highest score for cost.

Although status was important to the decision maker, cost was equally important. This shows how one of the decision maker's objectives had to be traded off for another.

Table 2-2. Summary of Values for Car Buyer's Alternatives

Weights	.43	.43	.14	**Overall**
Alternatives	**v(status)**	**v(cost)**	**v(comfort)**	**Value**
Ford	.3	.9	.5	.586
Toyota	.7	.2	.7	.485
Mercedes	.9	.15	.7	.550

Example: Overall Value for Toyota=(.43*.7)+(.43*.2)+(.14*.7)=.485 (2.6)

Decision Analysis Summary. Decision analysis provides a structured methodology for evaluating decisions with multiple objectives. Value-focused thinking helps to structure the decision maker's objectives and MAUT provides techniques to quantify the value of competing alternatives so they can be ranked and evaluated.

Chapter 3 : Methodology

Structuring the Decision

The Air Force does not have enough resources to meet the identified requirements for their MFH investments; therefore, the Air Staff must make difficult decisions on allocating the MFH budget. The Air Staff has multiple objectives to consider when deciding on an investment strategy. A method is needed to quantify how well a strategy meets the Air Staff's objectives, so that the Air Staff has a defensible method for choosing a strategy that also gives insight into the problem.

Decision analysis techniques were used to model the decision environment and to quantify the value Air Staff places on a strategy. Value-focused thinking was used to build the Air Staff's objectives hierarchy because it helps the decision maker zero in on the key objectives they want to achieve with a decision. Multiattribute utility theory was used to quantify the strategies because it allows multiple attributes to be considered, and it uses the decision maker's values to quantify and rank the strategies.

Objectives Hierarchy. The objectives hierarchy is developed using the decision maker's values, so the initial challenge for structuring a decision opportunity is to determine who the decision maker is, or who is a good proxy for the decision maker if the decision maker is unavailable. The Air Staff Housing Division (AF/ILEH) is responsible for developing the MFH investment program. They must consolidate and develop rules

for allocating the MFH investment budget so the Air Force MFH goals are met; therefore, the Housing Division Chief's values were used to develop the objectives hierarchy. The Housing Division Chief felt that his values reflected the Air Force corporate values (Murphy, 1997:interview).

Before the objectives hierarchy was developed, personnel at AF/ILEH were interviewed to gain an understanding of the challenges encountered in delivering quality MFH. To get the MAJCOM's perspective, housing programmers from two of the MAJCOMs were also interviewed. Using the insights from the interviews as a starting point, a proposed objectives hierarchy was presented to AF/ILEH. Then, through a series of interviews with AF/ILEH, the objectives hierarchy representing AF/ILEH's values emerged. Three fundamental objectives were identified:

- Maximize the return on investments.
- Execute the program promptly.
- Provide quality of life improvements for MFH residents.

The fundamental objectives at the top of the hierarchy were decomposed until more specific measurable objectives were established. Figure 3-1 shows the Air Staff's objectives hierarchy and is followed by a description of the objectives. The fundamental objectives are at the top of the hierarchy followed by lower level general objectives (boxes with Roman Numerals) and the lowest level specific objectives (boxes with dashed lines).

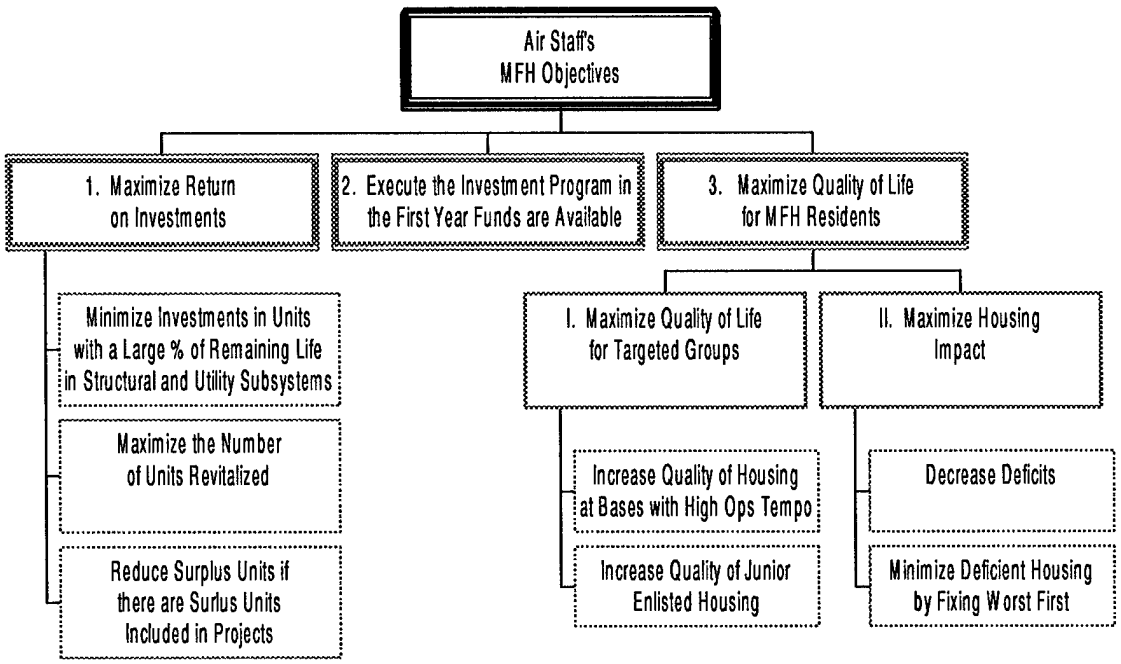

Figure 3-1. Air Staff's Housing Objectives Hierarchy

Fundamental Objective 1: Maximize Return on Investment (ROI): Public agencies are entrusted to spend the taxpayer's dollars wisely. Maximizing the ROI allows more to be done with the limited budgets. The following objectives support the ROI objective:

- **Minimize Investments in Units With a Large Percentage of Remaining Life in Structural and Utility Subsystems:** Operating expenses are higher for structurally unsound homes with poor utility systems, and modernizing these types of units should take precedence over units that are in good condition but are rated a level one because they don't meet the housing guidelines for amenities and room standards. MFH residents who live in units that are substandard primarily because they are undersized or they lack amenities, are not inconvenienced as much as residents who live in units with poor utility and structural subsystems. Safe, sound, and reliable utility and structural subsystems are required in order to keep a

unit in operation, but a unit with small rooms and few amenities can still provide adequate housing.

- **Maximize the Number of Units Revitalized:** There are three ways to increase the number of units revitalized for a given budget:
  - Spend less per unit by capturing the economies of scale.
  - Improve more units vs. replacing, by designing improvement projects to stay within 70% of the replacement cost.
  - Leverage the housing assets by privatizing.

The number of units revitalized can be increased if the cost per unit is reduced, and lower costs may be possible if projects are large enough to capture the economies of scale. If projects are large enough, contractors will have lower costs due to the lower percentage of mobilization costs and overhead expenses. More companies will be inclined to bid the project and the competition should result in lower prices.

If designs for improvement projects keep the costs below the 70% replacement value while remaining within the intent of the whole-house standards in the Air Force Housing Guide, more units can be improved vs. costly replacement projects. When units are replaced, the remaining economic value is lost and disposal costs are incurred.

Privatization leverages the existing MFH assets by transferring ownership to private developers who provide capital to modernize and maintain the units (AF Housing Privatization Guide, 1997:2-1). MFH investment funds may be required to help offset the developer's initial cost to modernize the units. Privatization may

be a viable alternative for some bases to dramatically increase the number of units revitalized.

- **Maximize the Percentage of Surplus Units Reduced.** Continuing to operate surplus units leaves less money available for established requirements. However, it is usually not feasible to demolish large tracts of surplus MFH because there is a demand for the units, and the local rental market could be affected (Jameson and others, 1997:interview). Generally if a base has surplus units (as defined by the Housing Market Analysis), there is still a waiting list to occupy them; therefore, commanders do not want to see surplus units that are in good shape demolished. If a large amount of units are removed quickly, the sudden influx in the demand for rental units in the local economy may outstrip the supply, leading to shortages and price hikes.

  OSD looks very closely at proposed projects that revitalize housing units at bases where there is a surplus (Weldon, 1997 interview). If none of the surplus is being reduced, the project may be cut from the President's budget. Air Staff believes the best way to reduce the surplus inventory is to remove surplus units when it is no longer cost effective to maintain them. By waiting until the units require revitalization efforts, the economic loss of the demolished units will be minimized.

Fundamental Objective 2: Execute the MFH Program in the First Year Funds are Available. OSD wants at least 75% of MFH investment funds obligated in the first year. If any of the Services (Army, Navy and Air Force) are having a difficult time executing the

funds, OSD may reallocate a portion of the funds to Service that is able to execute promptly (Murphy, 1997:interview). Additionally, improved housing will be available sooner if execution rates are high. The Air Staff also places importance on timely execution of programs from prior years. If a MAJCOM does not get funds executed from the previous years, their current execution rate is reduced to reflect the past difficulties.

Fundamental Objective 3: Maximize Quality of Life for MFH Residents. MFH policy can have the greatest effect on quality of life if the available resources are applied where they can have the largest impact. Targeting specific groups for housing improvements and applying the resources where they have the greatest overall impact are the two lower level objectives.

--Maximize Quality of Life for Targeted Groups. MFH is an integral part of the quality of life equation. Specific groups can be targeted for increases in their housing quality, which in turn will provide a better quality of life for that group. The following objectives support the maximize quality of life objective:

- **Maximize Quality of Housing for Families of Personnel Who Frequently Have Temporary Duty Assignments (TDY).** Assuming that families of personnel who are often TDY have a lower quality of life, increasing the housing benefits at bases with a high TDY tempo can help offset the quality of life imbalance. The operations tempo has become a very large concern for the AF and the Air Staff believes that the allocation of MFH investment budgets should be influenced by the operations tempo at a base.

- **Maximize Quality of Junior Enlisted Housing** Junior enlisted personnel have the least disposable income, and they cannot easily afford the option of moving out of MFH housing if they are assigned to poor quality quarters. Improving the quality of their housing will help maintain their quality of life.

--Maximize Housing Impact. There are more projects to undertake than there are available funds, so resources should be concentrated where they will have the greatest impact. Fixing the worst units first and alleviating housing deficits will have larger impacts than spending funds on moderately deficient units, or surplus units. The following objectives support the maximize housing impact objective:

- **Minimize Deficit Housing.** If there is a shortage of housing in the local area, the demand for rental units will drive the rent prices higher; therefore, providing additional MFH at bases with deficits will have a large impact by increasing the supply of houses which will lower personnel's housing costs and alleviate shortages. Shortages at the bases with the worst percentage of deficits should be fixed first. There are three ways to lower the deficit:
  1. Add new houses to the inventory by building houses with MFH investment funds.
  2. Add new houses to the inventory through privatization projects.
  3. Surplus housing for one grade can be reclassified to a grade that has a deficit.
- **Minimize Deficient Housing by Fixing Worst First.** Larger quality of life impacts can be obtained by fixing the worst units first vs. fixing moderately deficient units.

Developing Evaluation Measures. The evaluation measures must capture how well a *budget strategy* meets the objectives, not how well the *individual projects* submitted by the MAJCOMs meet the objectives. The Air Staff has a $250M budget pie to achieve their housing objectives. The evaluation measures need to quantify the results achieved from the strategy employing the entire pie, and not the results achieved from the individual slices. The value functions for each objective are stated in ranges consistent with what can be achieved with a $250M budget, so applying a $10M project to those functions would be meaningless. Figure 3-2 illustrates the relationship between the budget strategy, the projects submitted by the MAJCOMs, and the overall value for a strategy.

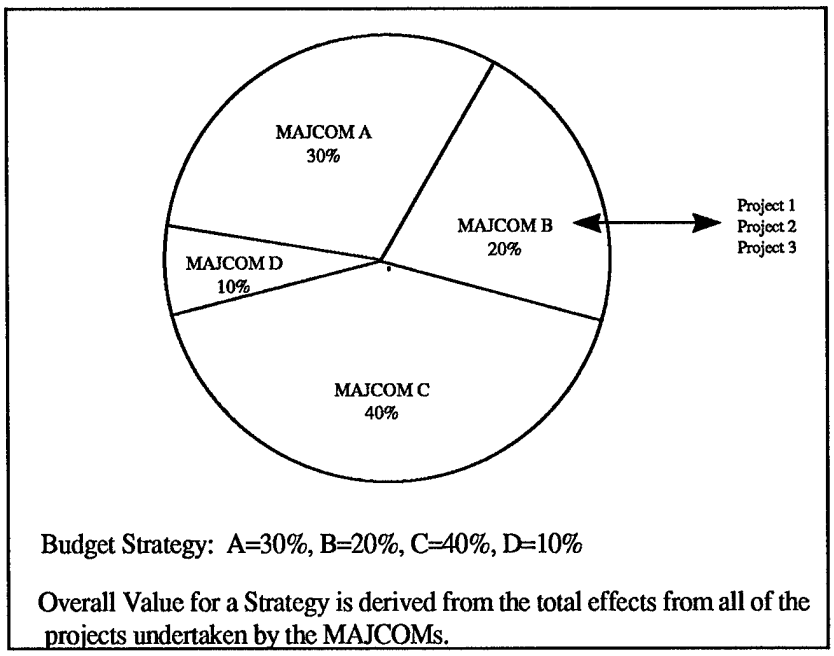

Figure 3-2. Relationship Between a Budget Strategy and Projects

The evaluation measures also were developed to be independent of the location where the projects were constructed. The Air Staff does not want a budget strategy to be affected by regional cost of construction differences. To account for the difference in

construction costs found at different locations, evaluation measures derived from the cost of a project were adjusted by area cost factors. Without this adjustment, strategies that provide a large proportion of the budget to low cost areas of the country would be favored.

Initially, several measures were proposed to AF/ILEH for the eight objectives that are at the end of the objectives hierarchy branches and the effectiveness of each measure was discussed through a series of telephone meetings with AF/ILEH. After each meeting, the revised measures were forwarded to AF/ILEH for review and comments. Table 3-1 summarizes the final evaluation measures that were determined to support the objectives in figure 3-1, and is followed by detailed descriptions of each measure.

Table 3-1. MFH Budget Allocation Evaluation Measures

Objective	Evaluation Measure
Minimize investments in units with a large % of life remaining in utility/structural subsystems	Average percentage remaining for utility and structural subsystems
Maximize units revitalized	Number of Units
Reduce surplus units if surplus units are being revitalized	Percent reduction of surplus units included in projects
Maximize the program execution rate	Weighted execution rates for previous three years
Increase quality of housing at bases with high TDY rates	TDY rates adjusted by the percent of accompanied personnel
Increase quality of junior enlisted housing	Percent of budget spent on junior enlisted housing
Decrease the number of unit deficits, particularly at bases with a high deficit percentage	Number of deficit units decreased, weighted by a factor that adjusts for the severity of the housing shortage
Minimize deficient housing by fixing the worst units first	Housing facility assessment score

Note: Common variables for the equations that follow are defined as

$\underline{cost_i}$ is the cost of project i

$\underline{budget}$ is the size of the total MFH investment budget

$\underline{n}$ is the number of projects

- **Minimize Investments in Units With a Large Percentage of Remaining Life in Structural and Utility Subsystems.** The metric used is the average percentage of life remaining of the following subsystems: Electrical, Plumbing, Heating, Air Conditioning, Windows, Exterior Doors, Siding, Roof Shingles or Tiles, and Insulation. This data is available from the Housing Facility Assessment. The formula for aggregating the average percent remaining for the individual projects is

$$\text{Avg\%Remaining} = \sum_{i=1}^{n} (\%\text{remaining}_i * \text{cost}_i / \text{budget}) \qquad (3.1)$$

where $\%\text{remaining}_i$ is the average percentage of useful life remaining for the utility and structural systems of the units in project i.

- **Maximize the Number of Units Revitalized.** The metric is the number of units revitalized adjusted by the area cost factors. Although cost is not explicitly stated in this measure, the number of units that are revitalized is directly related to the cost of construction at the project location. Therefore, the number of units is adjusted by the acf to keep the metric independent of the location. The formula for the total number of units revitalized is

$$\text{TotalUnits} = \sum_{i=1}^{n} (\text{acf}_i * \text{units}_i) \qquad (3.2)$$

where

units_i is the number of units in project i

acf_i is the area cost factor for project i

- **Maximize the Percentage of Surplus Units Reduced.** The percent reduction in surplus units relative to all of the surplus units included in the projects is the metric. This metric was designed to not penalize MAJCOMs who own surplus units, as long as the units are not being revitalized. The formula is

$$\%\text{SurplusReduced} = (\sum_{i=1}^{n} \text{reduced}_i / \sum_{i=1}^{n} \text{surplus}_i) * 100 \qquad (3.3)$$

where

reduced_i is the number of surplus units reduced in project i

surplus_i is the number of surplus units included in project i

If there are no surplus units included in any of the projects, the %SurplusReduced score is set to 100% because the Air Staff gets maximum value from either reducing all of the surplus units included in a project, or not having surplus units included in any of the projects.

- **Execute the MFH Program in the First Year Funds are Available.** A proxy for this measure is the MAJCOM's past performance on executing prior year programs. The MAJCOM execution rate is a function of the execution rates from the three previous years; (100*the percentage of current year program awarded by 31 Mar) - (20*the percentage of prior year program not awarded by 30 Sept of the prior year) -

(40*the percentage of two years prior program not awarded by 30 Sept of the prior year). The execution rate measure was developed by the Air Staff for the purpose of allocating the reward money in the current method used for allocating the budget (Murphy, 1996:memo). The formula for the metric is

$$\text{AvgExecutionRate} = \sum_{i=1}^{n} (\text{MAJCOMRate}_i * \text{cost}_i / \text{budget}) * 100 \qquad (3.4)$$

where MAJCOMRate_i is the execution rate for the MAJCOM who owns project i.

- **Maximize Quality of Housing at Bases with High TDY Rates:** Undertaking more projects at bases with high TDY rates will increase the overall quality of housing at those bases, and strategies that have a high average TDY rate will have the majority of the projects at bases where the TDY rate is high. The TDY rate for a base is defined as

$$\text{TDYrate} = \text{TDYdays} / \text{MILdays} \qquad (3.5)$$

where

TDYdays is the number of days military personnel assigned to the base were TDY in a year (days/year)

MILdays is the number of military personnel assigned to the base times 365 days (days/year)

To account for the fact that only accompanied personnel live in MFH, the rate is adjusted by multiplying it by the fraction of accompanied military at a base. The adjusted average is

$$\text{AvgTDY\%} = \sum (\%\text{accompanied}_i * \text{TDYRate}_i * \text{cost}_i / \text{budget}) \qquad (3.6)$$

where

%accompanied$_i$ is the percentage of accompanied personnel at the base where project i is located

TDYRate$_i$ is the TDY rate at the base where project i is located

- **Maximize Quality of Junior Enlisted Housing.** The percentage of the MFH budget used to revitalized junior enlisted housing is the metric; for this purpose, junior enlisted is defined as E1-E6.

$$\%\text{JNCO} = \sum_{i=1}^{n} (\text{JNCOunits}_i / \text{units}_i) * (\text{cost}_i / \text{budget}) * 100 \qquad (3.7)$$

where JNCOunits$_i$ is the number of JNCO units revitalized in project i.

- **Minimize Deficit Housing.** Deficits are defined as the number of existing units divided by the number required per the HMA. Reducing a deficit at a base with a small shortage does not provide the same impact as reducing a deficit at a base with a large shortage. A large shortage indicates a tight market for housing. Personnel will have a harder time finding acceptable housing, and average rental prices will be higher. To reflect this in the measure, the number of homes added to the inventory is adjusted by a deficit factor. The deficit factor function is shown in figure 3-3. With a deficit of less than 10%, the factor is 0 because MFH is intended to cover only 90% of the deficit. Any deficit above 50% returns the maximum deficit factor of 10, because there is no base that has a deficit that is much higher than 50%. The formula for the deficit factor is

$$DeficitFactor_i = 0 \text{ if } \%Deficit_i < 10\%$$

$$DeficitFactor_i = 10 \text{ if } \%Deficit_i > 50\%$$

$$DeficitFactor_i = -1.25 + .225 * \%Deficit_i \quad \text{otherwise} \tag{3.8}$$

where $\%Deficit_i$ is the deficit percentage at the base where project i is located.

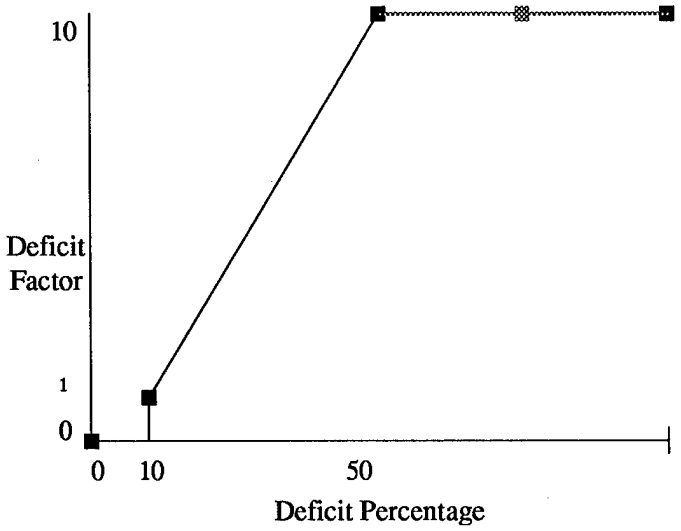

Figure 3-3. Deficit Factor Function

The weighted number of units added to decrease deficits is the metric. It is the sum of the new units added to the inventory through MFH construction or privatization projects, weighted by the deficit factor that reflects the severity of the deficit at a particular base. The evaluation measure is

$$AdjDeficit = \sum_{i}^{n} DeficitUnits_i * DeficitFactor_i \tag{3.9}$$

where $DeficitUnits_i$ is the number of units added to decrease the deficit in project i.

- **Minimize Deficient Housing by Fixing Worst First.** The Air Staff instituted housing facility assessments in 1995 to quantify the condition of housing units. Scores range from 0 to 100 with 100 being the worst. The metric is the average facility assessment score for all of the projects to be completed for a budget strategy. The formula is

$$\text{AvgFacScore} = \sum_{i=1}^{n} (\text{FacScore}_i * \text{cost}_i / \text{budget}) \qquad (3.10)$$

where FacScore_i is the facility assessment score for project i.

Single Dimension Value Functions. After the measures were developed, the range for each measure was established by asking AF/ILEH the lowest and highest score they would expect for a measure. Next, the value function (which converts a score for a measure into a unit-less value) was established by assessing AF/ILEH's value for any point over the range of each measure. Graphs of the functions and comments for each objective with an evaluation measure follow.

- **Minimize Investments in Units with a Large Percentage of Useful Life Remaining in the Structural and Utility Subsystems.** The piece-wise linear function shown in figure 3-4 is used for the value function. From 0% to 25% useful life remaining, the linear function returns a score of 1 to 0.9. Over this range, the subsystems are near the end of their life expectancy and a lot of value is placed on making investments in units that need required improvements. On the opposite end of

the spectrum from 100% to 75% useful life remaining, the linear value function returns a score of 0 to 0.1. In units where the subsystems are almost new, very little value is assigned for investing funds to improve or replace the unit.

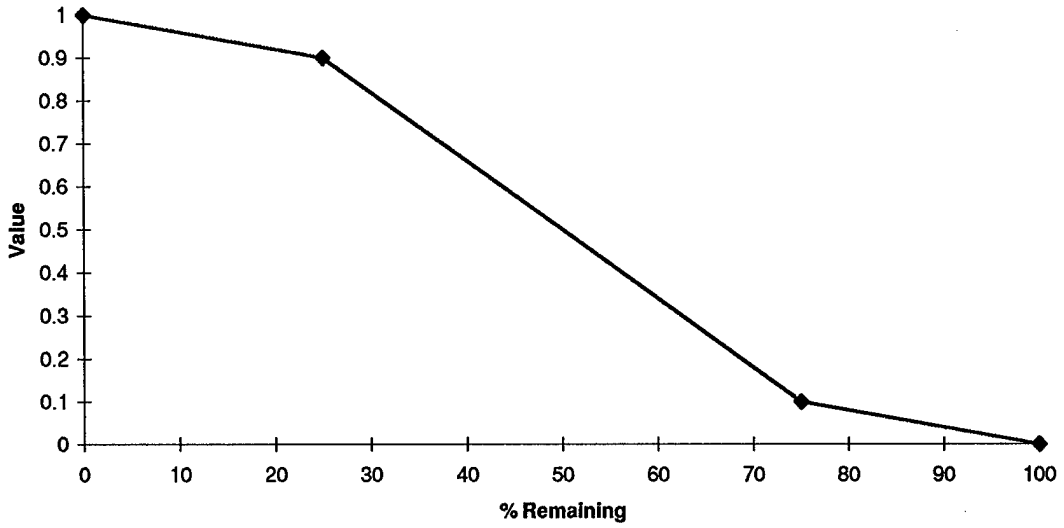

Figure 3-4. Value Function for Minimizing the Percentage of Useful Life Remaining

The value function is

$$\text{Value} = a + b * \text{Avg\%Remaining} \qquad (3.11)$$

where

a=1 and b= -0.004 if 0<Avg%Remaining<25

a=1.3 and b= -0.016 if 25<Avg%Remaining<75

a=0.4 and b= -0.004 if 75<Avg%Remaining<100

Avg%Remaining is the evaluation measure defined in (3.1)

- **Maximize the Number of Units Revitalized.** More value is obtained when more units are revitalized. The linear function shown in figure 3-5 returns a value from 0 to 1 over the range of 1500 to 3300 units.

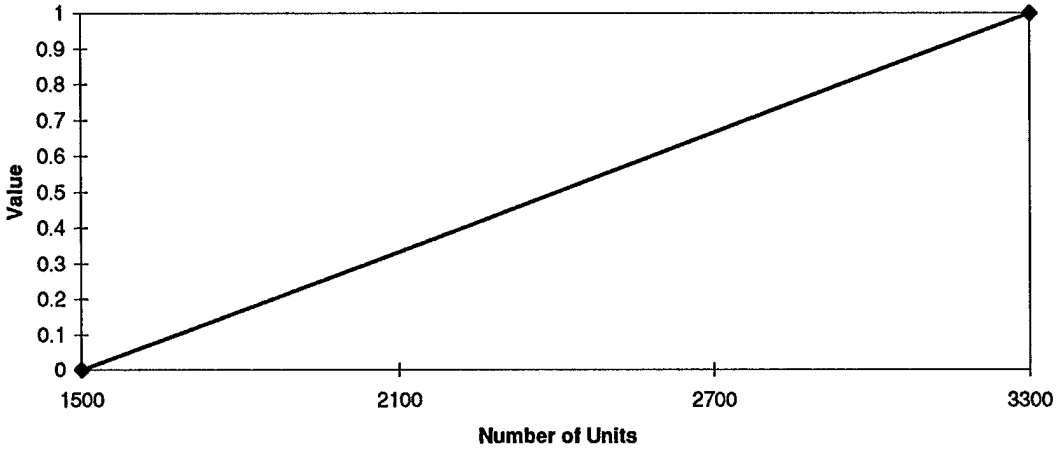

Figure 3-5. Value Function for Maximizing the Number of Units

The value function is

$$\text{Value} = -0.833 + 0.0005556 * \text{TotalUnits} \qquad (3.12)$$

where TotalUnits is the evaluation measure score defined in (3.2).

- **Maximize the Percentage of Surplus Units Reduced.** The linear function shown in figure 3-6 captures the value Air Staff places on the reduction of surplus units. No value is given if none of the surplus units included in projects are removed from the inventory, and maximum value is given to strategies that do not have surplus units in the projects, or those that remove 100% of the surplus units that are included in the projects.

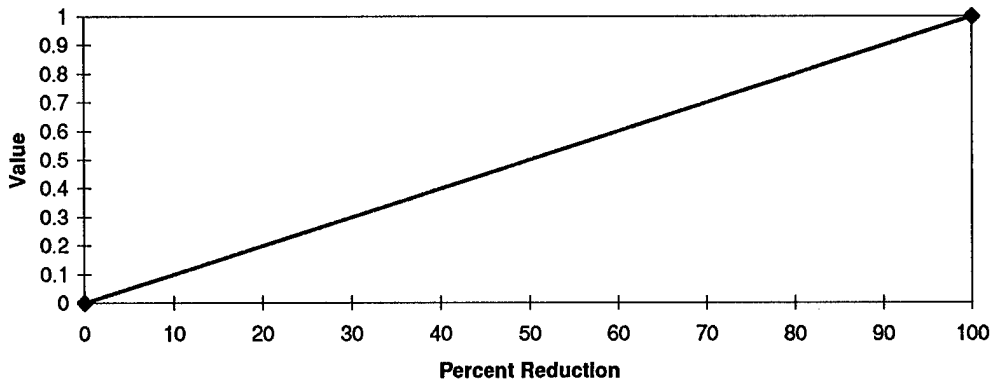

Figure 3-6. Value Function for Maximizing the % of Surplus Reduced

The value function is

$$\text{Value}=0.01*\%\text{SurplusReduced} \qquad (3.13)$$

where %SurplusReduced is the evaluation measure score defined in (3.3).

- **Execute the MFH Program in the First Year Funds are Available.** The value function shown in figure 3-7 is a piece-wise linear function ranging from 75% to 90%, and from 90% to 100% that returns the Air Staff's value for executing the program. The minimum execution rate is set at 75% to correspond with OSD's goal for executing the MFH program. Air Staff believes that the MAJCOM's can easily achieve the 90% level; therefore, the slope of the value function increases more rapidly from 90% up to 100% to entice the MAJCOMs to execute at a higher level.

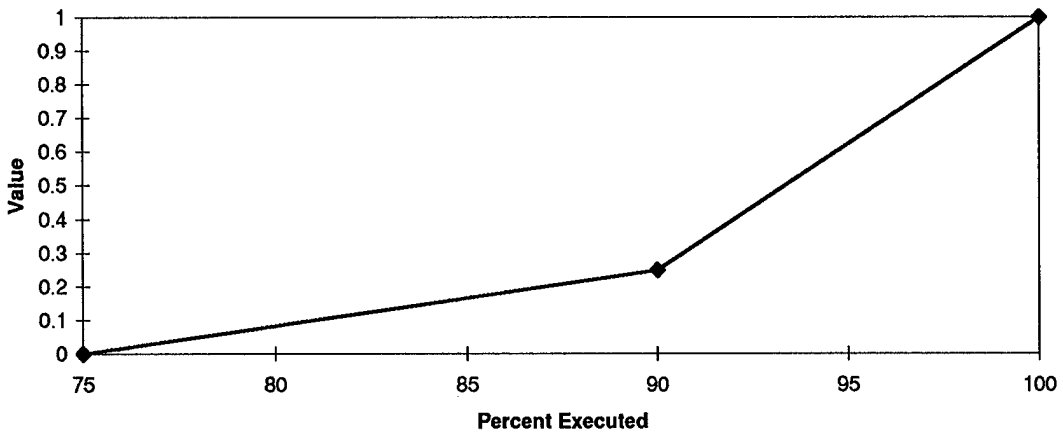

Figure 3-7. Value Function for Maximizing the Execution Rate

The value function is

$$Value=a+b*AvgExecutionRate \qquad (3.14)$$

where

AvgExecutionRate is the evaluation measure score defined in (3.4)

a=0 and b=0 if AvgExecutionRate<75

a=-1.25 and b=0.0167 if 75<AvgExecutionRate<90

a=-6.5 and b=0.075 if 75<Avg%Remaining<100

- **Maximize Quality of Housing at Bases with a High TDY Rate.** Figure 3-8 shows the linear function over the anticipated range from 4% to 10% that returns a value from 0 to 1. The range was set by considering the typical TDY rate, and adjusting it for the percent of accompanied personnel at a typical base. At the low end, Air Staff estimated that military personnel were TDY 6% of the time, and that 2/3 of the military were accompanied. A high TDY rate was estimated to be above 15%, with 2/3 of the personnel accompanied.

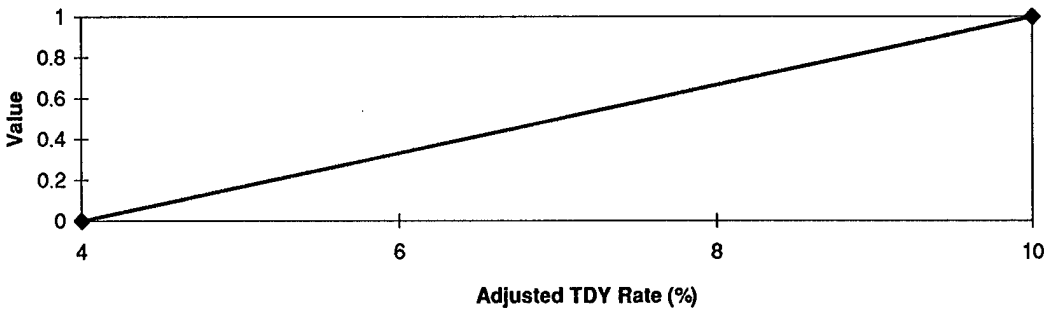

Figure 3-8. Value Function for Maximizing Quality of MFH for TDY Families

The value function is

$$\text{Value} = -0.6667 + 0.1667 * \text{AvgTDY\%} \qquad (3.15)$$

where AvgTDY% is the evaluation measure score defined in (3.5).

- **Maximize Quality of Junior Enlisted Housing.** Currently, the Air Staff values having a large percentage of the budget spent on revitalizing junior enlisted units. Junior enlisted occupy 75% of the MFH, so the expected budget for junior enlisted would be 75%. The range for the linear value function shown in figure 3-9 is set to a minimum of 75% to correspond to the expected amount. The maximum value is achieved when 95% of the budget goes toward junior enlisted units because some non-junior enlisted units often need immediate attention.

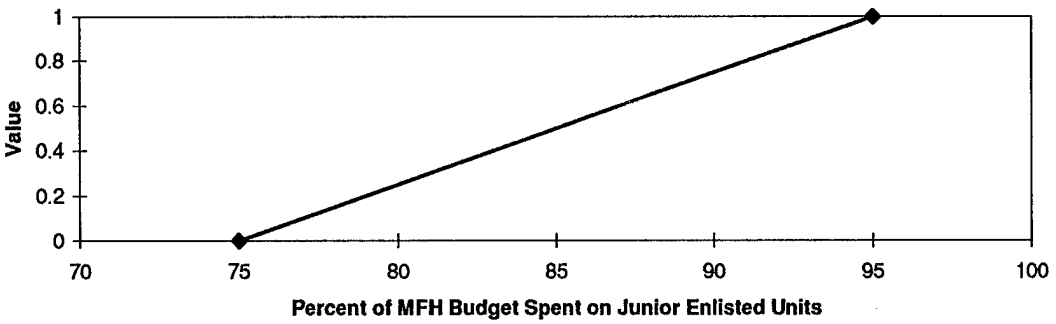

Figure 3-9. Value Function for Maximizing Quality of JNCO MFH

The value function is

$$\text{Value} = -3.75 + 0.05 * \%\text{JNCO} \qquad (3.16)$$

where %JNCO is the evaluation measure score defined in (3.6).

- **Minimize Deficit Housing.** The linear function shown in figure 3-10 returns a value from 0 to 1 over the range of 0 to 1250. The Air Staff believes that their would not be more than 125 units added in one year, and assuming that the units would be added at a base that has a deficit factor of 10 gives a maximum range of 1250.

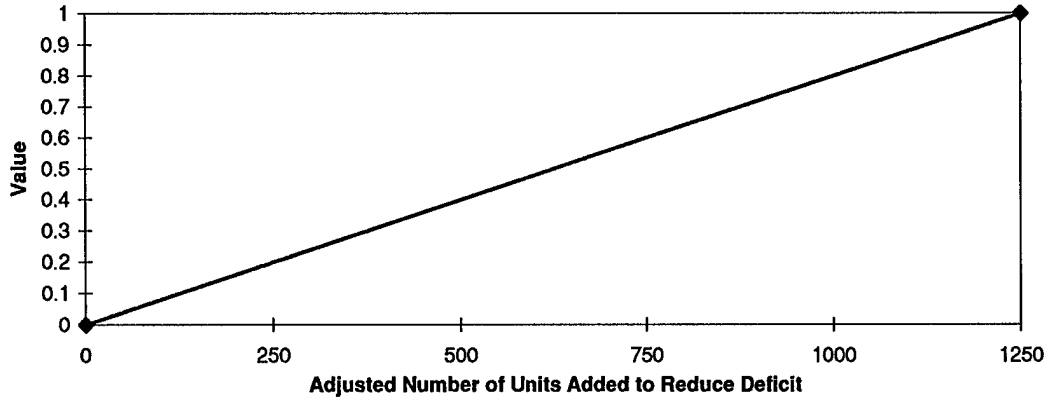

Figure 3-10. Value Function for Maximizing the Deficit Reduction

The value function is

$$\text{Value} = 0.002667 * \text{AdjDeficit} \qquad (3.17)$$

where AdjDeficit is the evaluation measure score defined in (3.9).

- **Minimize Deficient Housing by Fixing Worst First.** The facility assessment is used to determine the condition of MFH units, with scores ranging from 0 (best) to 100 (worst). Air Staff does not obtain any value if the average score for all projects in a strategy is under 70. Figure 3-11 shows the linear value function ranging from 70 to 100 that returns value scores from 0 to 1.

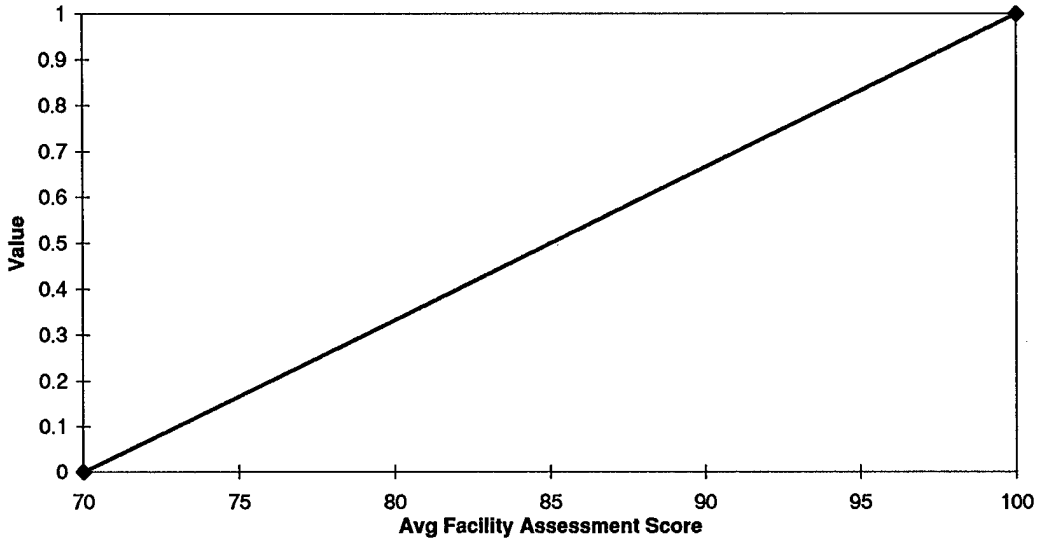

Figure 3-11. Value Function for Minimizing Deficient Housing

The value function is

$$\text{Value} = -2.333 + 0.03333 * \text{AvgFacScore} \qquad (3.18)$$

where AvgFacScore is the evaluation measure score defined in (3.10).

Weights. Weights establish the trade-offs between the evaluation measures. The relative importance of each evaluation measure was established by taking the decision maker's most important measure and comparing it one at a time with the remaining measures (Logical Decisions, 1997:152). As discussed in chapter 2, when decision makers establish the relative importance of the evaluation measures, it is important that they consider the range of each measure. To determine the weights for n measures, the ratio of importance between n-1 non-redundant pairs was established, and this, along with the requirement that the sum of the individual weights equal 1, provided the n equations to solve for the n weights. Table 3-2 summarizes the relative importance between the comparisons of the evaluation measures and the resulting weights, and is followed by an example on how to calculate the weights. The objectives hierarchy with the weights is shown in figure 3-12.

Table 3-2. Summary of Evaluation Measure Comparisons and Weights

Evaluation Measure	Strength of Preference for "Avg Cost of Unit" Measure Over other Evaluation Measures	Resulting Weight
Number of Units	W_1:W_1=1:1	W_1=.273
% of Surplus Reduced	W_1:W_2=1.5:1	W_2=.182
Execution Rate	W_1:W_3=1.5:1	W_3=.182
Fix Worst Units First	W_1:W_4=1.5:1	W_4=.182
Fund High TDY Bases	W_1:W_5=5:1	W_5=.055
% of Useful Life Remaining	W_1:W_6=5:1	W_6=.055
% of Budget for JNCO	W_1:W_7=5:1	W_7=.055
Lower Deficits	W_1:W_8=15:1	W_8=.018
	Total	1.00

Example: the weight for the number of units is

$1=W_1+W_2+W_3+W_4+W_5+W_6+W_7+W_8$ (sum of the weights must equal 1)

$1=W_1+W_1/1.5+W_1/1.5+W_1/1.5+W_1/5+W_1/5+W_1/5+W_1/15$ (substituting the W_n values)

$W_1=.273$

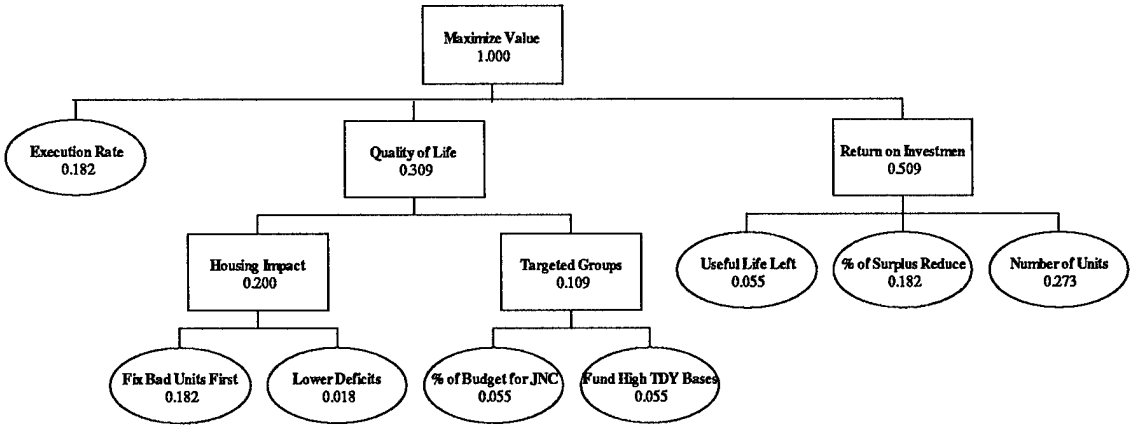

Figure 3-12. Objectives Hierarchy with Weights

The most important objective was found to be the maximize units revitalized objective. This reflects the problem addressed in chapter 1 where the budget for MFH does not meet the requirements. If a strategy can be found that increases the number of units revitalized, then the time required to eliminate the level one units will be decreased. Three objectives (execute the program, reduce the surplus, and reduce deficient housing) were found to be 1.5 times less important than the maximize units objective. Three other objectives (quality housing for high TDY bases, improve JNCO units, and minimize the percent of life remaining for utility and structural systems) are 5 times less important than

the maximize units objective. The decrease deficits objective is 15 times less important than the maximize units objective. The low weight doesn't mean that the Air Staff isn't concerned about housing shortages, rather it reflects the fact that deficits can also be decreased in most areas if the variable housing allowance is increased, so that existing housing in the local communities becomes affordable.

Overall Value Function. An additive value function is used to combine the outputs from the value functions and weights for each objective into an overall value score. Recall that to use the additive value function, there should be no uncertainty, and mutual preferential independence must hold. For this analysis the objectives in the top level of the objectives hierarchy were found to be mutually preferentially independent (see appendix B for details), and it is assumed that the lower level objectives are also mutually preferentially independent. It is also assumed that the information that supports the strategies is known for certain. Therefore, with the assumptions made, the two conditions for using the additive value function hold. The additive value function is simply the weighted average of the individual functions. Mathematically it is expressed as

$$v(x_1, x_2, \ldots, x_n) = \sum_{i=1}^{n} w_i v_i(x_i) \qquad (3.19)$$

where:

$v_i(x_i)$ is the value from the evaluation measure value function i;

v_i(worst possible x_i)=0, v_i(best possible x_i)=1;

the weights (w_i) are positive and sum to 1.

(Keeney and Raiffa, 1976:118-119)

The additive value function was used in both computer models to generate a value for each strategy. The overall value function for a strategy is

$$V(X_j) = \sum_{i=1}^{n} w_i v_i(x_i^j) \tag{3.20}$$

where

$V(X_j)$ is the overall value for strategy j

w_i is the weight for objective i

$v_i(x_i^j)$ is the value for the i^{th} objective for strategy j

n is the number of objectives with evaluation measures

Generating Strategies. To apply this model and assess how one strategy for allocating the budget would be better than another, the projects that a MAJCOM would undertake given a certain budget has to be known. Currently the MAJCOMs build an investment program based on their expected share of the budget (bogey). To limit the near infinite number of ways to split the budget, the existing bogey was used as a starting point, and each MAJCOM submitted six additional programs based on bogeys that were approximately 10 to 30 percent larger and smaller than their expected bogey. Table 3-3 shows the size of the bogeys the MAJCOMs used for building their programs that they submitted data for. The raw data from the four MAJCOMs that submitted data for the case study is shown in appendix C.

Table 3-3. MAJCOM Budget Sizes for Program Submittals

	MAJCOM's Bogeys						
MAJCOM	**-30%**	**-20%**	**-10%**	**Expected**	**+10%**	**+20%**	**+30%**
ACC	$28M	$32M	$36M	$40M	$44M	$48M	$52M
AFMC	$17M	$19M	$22M	$25M	$28M	$31M	$33M
AFSPC	$17M	$19M	$22M	$25M	$28M	$31M	$33M
AETC	$14M	$16M	$18M	$20M	$22M	$24M	$26M

Strategies were built by choosing different combinations of bogeys from the list of the seven bogeys each MAJCOM submitted. To find the feasible strategies, a program was written with the Mathcad software package to find the combinations where one and only one bogey is chosen from each MAJCOM, and the sum of the bogeys chosen must equal the total MFH investment budget (Mathcad, 1995:Ch 4). For the case study, the MFH investment budget was adjusted to reflect the four MAJCOM's share of the budget, which is $110M based on their expected bogeys. Details on the Mathcad program are provided in appendix D, and figure 3-13 shows a *portion* of the matrix listing the 87 feasible strategies for the case study (the full matrix is also in appendix D). Each row of the matrix is a strategy for which the sum of the MAJCOM's bogeys equals 110. Column 1 is the bogeys for Air Combat Command (ACC), column 2 is the bogeys for Air Force Materiel Command (AFMC), column 3 is the bogeys for Air Force Space Command (AFSPC), and column 4 is the bogeys for the Air Education and Training Command (AETC).

Strategy (Combo) =

	ACC	AFMC	AFSPC	AETC	
	1	2	3	4	
1	28	25	31	26	=110
2	28	25	33	24	
3	28	28	28	26	
4	28	31	25	26	
5	28	31	31	20	
6	28	31	33	18	
7	28	33	25	24	
8	28	33	31	18	
9	28	33	33	16	
10	32	19	33	26	
11	32	25	31	22	
12	32	25	33	20	
13	32	28	28	22	
14	32	31	25	22	
15	32	31	31	16	

There are a total of 87 feasible strategies in the strategy matrix. See appendix D for the complete set. Units are in millions of dollars

Figure 3-13. Feasible Strategies for Allocating MFH Investment Budget

Scoring and Ranking the Strategies

With the aid of an Excel spreadsheet, the MAJCOM data for each bogey was transformed into evaluation measure scores using the evaluation measure formulas presented earlier in this chapter (the spreadsheets are in appendix C). Next, the evaluation measure scores for the four bogeys that made up each strategy were added together to get a total evaluation measure score for each of the strategies (see appendix E).

Two software packages were used to structure the decision and rank the strategies; Logical Decisions (LD) and DPL. Both of the models are structured with additive value functions and deliver the same results, but each program has useful analysis tools that offer advantages over the other.

DPL Model. The DPL software package uses influence diagrams to model the decision. Influence diagrams are a combination of rectangles, rounded rectangles, ellipses, and arrows that represent different aspects of the decision (ADA, 1995:194). Rectangles are the decision nodes, which define a state for every possible outcome of the decision. In the earlier example for buying a car, the decision was which car to buy and there were three possible states, or choices. Rounded rectangles are value nodes, which contain constants or formulas to compute a constant. For the car example, value nodes would be used to contain the price of each car and the value functions that convert the price score to a value score. Arrows interconnecting the nodes represent relevance or sequence between two events. Ellipses are chance nodes that allow probabilities to condition the outcomes. For deterministic models, there are no chance nodes.

A simplified version of the influence diagram for this model is shown in figure 3-14. The decision section of the diagram contains the Which Strategy? decision node where the 87 possible strategies are defined. For each strategy, the evaluation measure scores are entered into the Score value nodes. The mathematical expressions for the single objective value functions are entered in the Convert Scores to Value nodes, which transforms the scores for each strategy into values. To get the overall total value for a strategy, the additive value function formula (24) is placed in the Total Value node, where the single objective weights and values are converted into an overall value for each strategy. The complete DPL model and details are presented in appendix F.

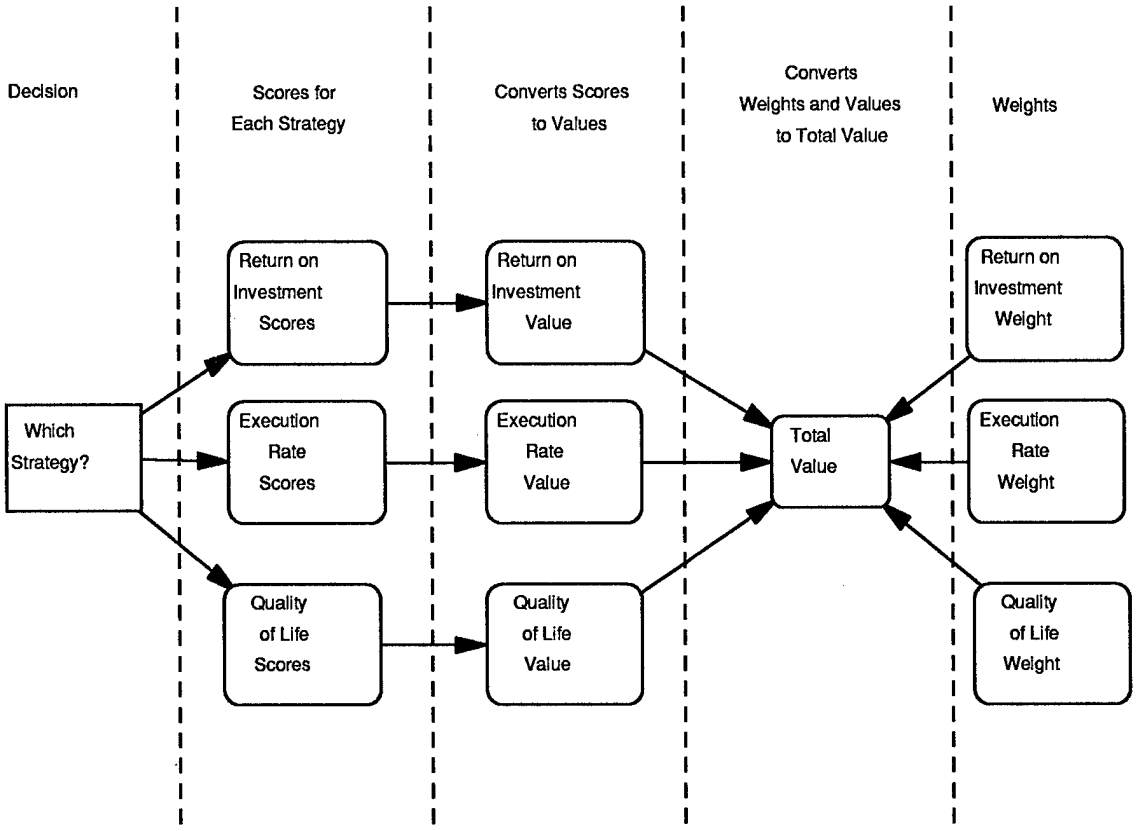

Figure 3-14. Simplified Influence Diagram for MFH Investment Budget Allocation

Logical Decisions. The Logical Decisions (LD) software package uses the objectives hierarchy to model the decision. The overall goal is subdivided into lower level objectives (the program labels them goals), and the last objective on a branch is labeled a measure to indicate that a measure directly defines that objective (Logical Decisions, 1997:Ch 1). Figure 3-15 shows the LD model built for this research.

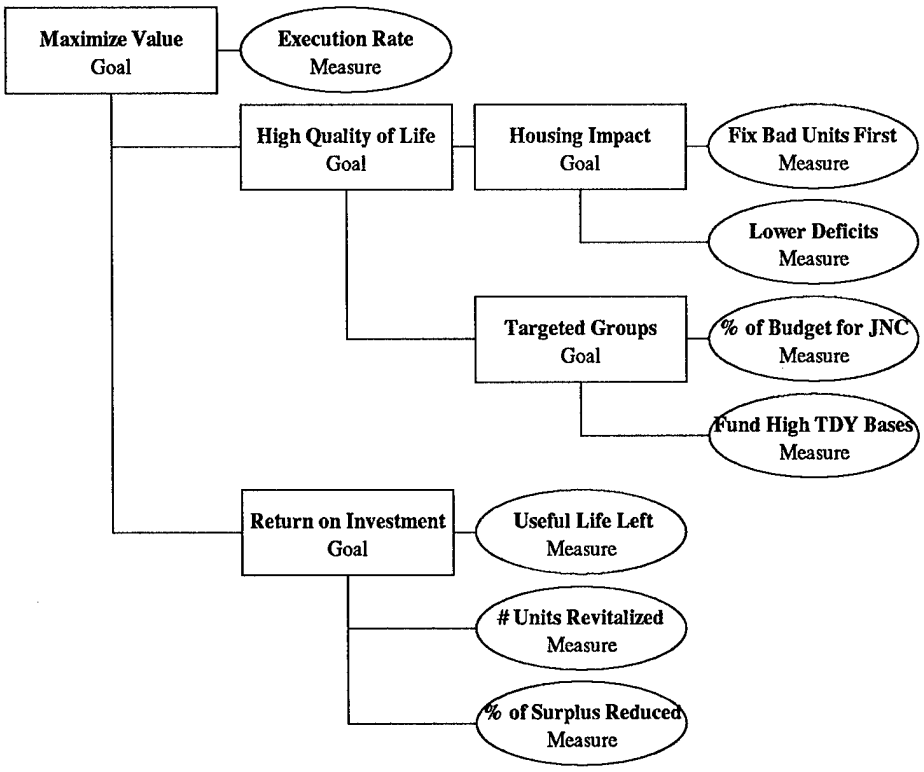

Figure 3-15. LD Model for Allocating MFH Investment Budget

LD differs from DPL in how the data is entered and in the mathematical formulations. LD has a spreadsheet format for entering scores for the strategies. The value functions are defined within the program; the user only provides the ranges and shape of the function. LD also offers heuristics for eliciting the decision maker's preferences (weights). Preference sets can be defined for multiple decision makers who cannot come to a consensus on what weights to use. This is a useful feature, because the decision maker(s) can see if their different perspectives will change the outcome. The details on the LD model are presented in appendix G.

Summary

The structure of the decision model was developed in this chapter along with the methodology used for developing strategies, and building the models. The decision maker's objectives hierarchy was the basis for developing the evaluation measures to rank the strategies. Strategies were developed by assessing the results of giving MAJCOMs larger and smaller bogeys, and multiattribute utility theory was used to quantify a strategy's value to the decision maker.

Chapter 4 : Analysis of Results

Introduction

The results from the case study are presented in this chapter along with an analysis of the findings. First, a sensitivity analysis of the weights was conducted to show how the deterministic rankings are affected by changes in the weights placed on the fundamental objectives. Next, a sensitivity analysis of the evaluation measures with subjective scores tests how sensitive the top five strategies are to the subjective scores. In addition to an analysis of the top strategies, an analysis is conducted on what differentiates a high value strategy from a low value strategy. Finally, the change in the allocated budget to the MAJCOMs for the top 10 and bottom 10 strategies was analyzed for trends that provide insight on which MAJCOMs tend to provide high valued projects.

Sensitivity Analysis on Weights

The models rank the strategies based on the value functions and weights that were derived from the decision maker's preferences. The objectives hierarchy in figure 4-1 shows the weights for each objective. Recall that the fundamental objectives are at the top level of the hierarchy, and the weights for the fundamental objectives sum up to one. The Air Staff's approximate weighting for the fundamental objectives is 20% for execution rate, 30% for quality of life, and 50% for return on investment.

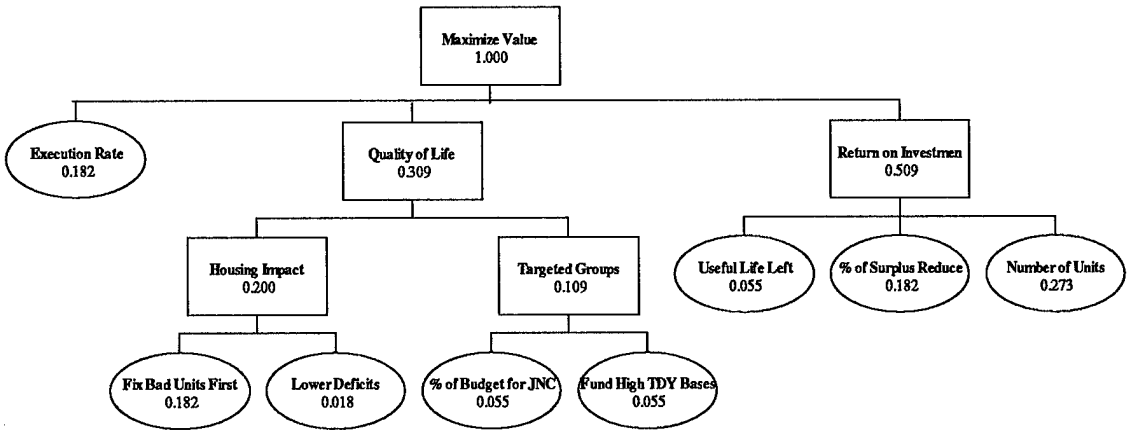

Figure 4-1. Objectives Hierarchy with Weights

To test the sensitivity of the weights on the outcome, the model was run with the weight for each one of the fundamental objectives 50% higher than the Air Staff's approximate weighting. The decision maker felt that a 50% swing above their weights would be sufficient to capture the extreme preferences that any stakeholder would have. When one of the weights is increased, a corresponding decrease must be made in the remaining weights to satisfy the constraint that the sum of the weights equal one. The decrease in the two remaining weights was based on the approximate proportions from the Air Staff's assigned weights. Table 4-1 summarizes the four sets of weights used in the model. The first set is the Air Staff's weights, and the remaining sets are named after the objective for which the weight increases.

Table 4-1. Weights for Sensitivity Analysis

	Weights on Fundamental Objectives		
Weight Set Emphasized	Execution Rate	Quality of Life	Return on Investment
Air Staff (ILEH)	18.2%	30.9%	50.9%
Execution Rate (EXE)	30%	25%	45%
Quality of Life (QUAL)	15%	45%	40%
Return on Investment (ROI)	10%	15%	75%

Figures 4-2 through 4-5 show the deterministic results for the four sets of weights. The length of each bar segment corresponds to the amount of value derived from one of the three fundamental objectives in the objectives hierarchy. This provides insight to the decision maker on how a strategy performs for each objective.

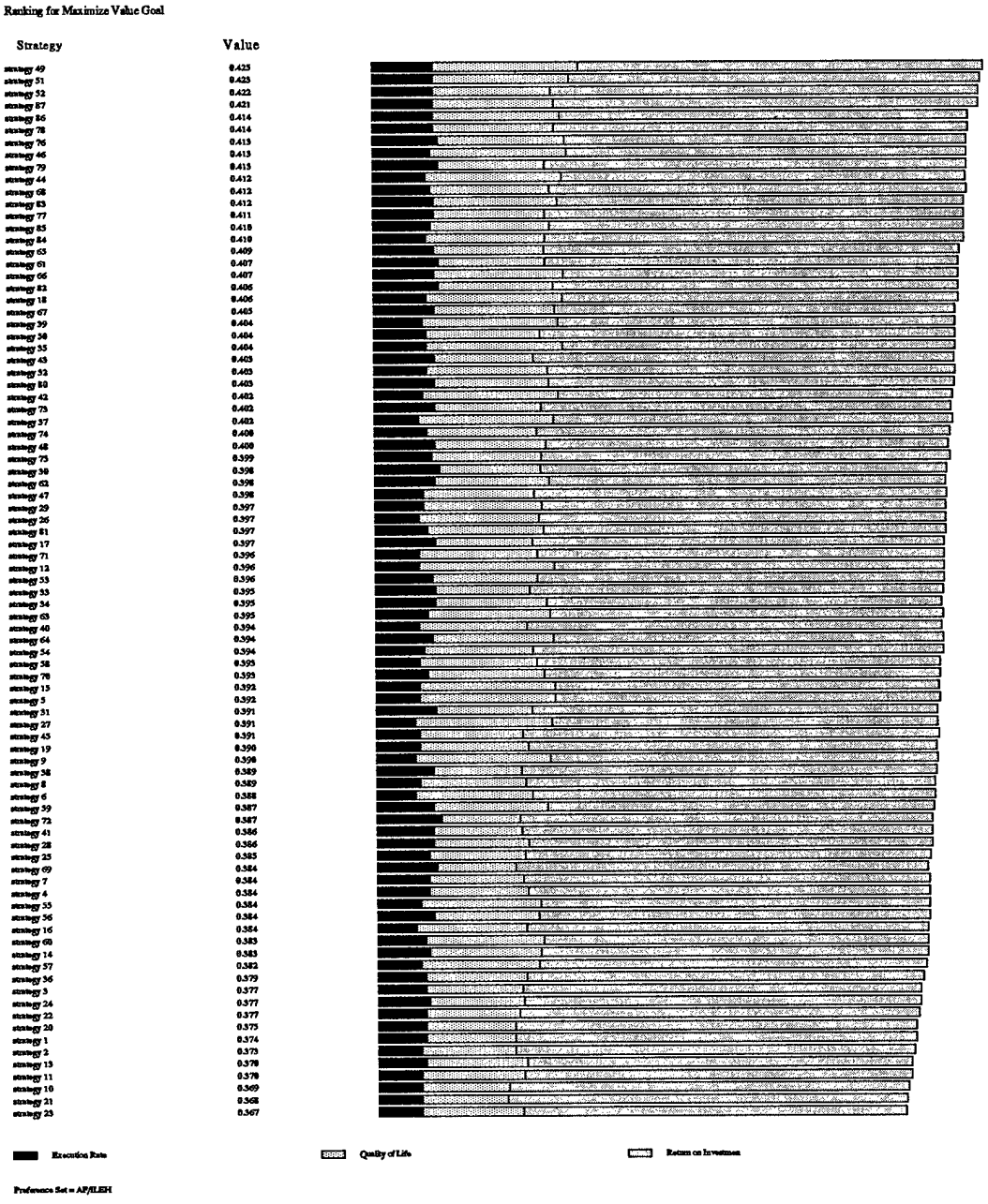

Figure 4-2. Deterministic Results for the ILEH Weight Set

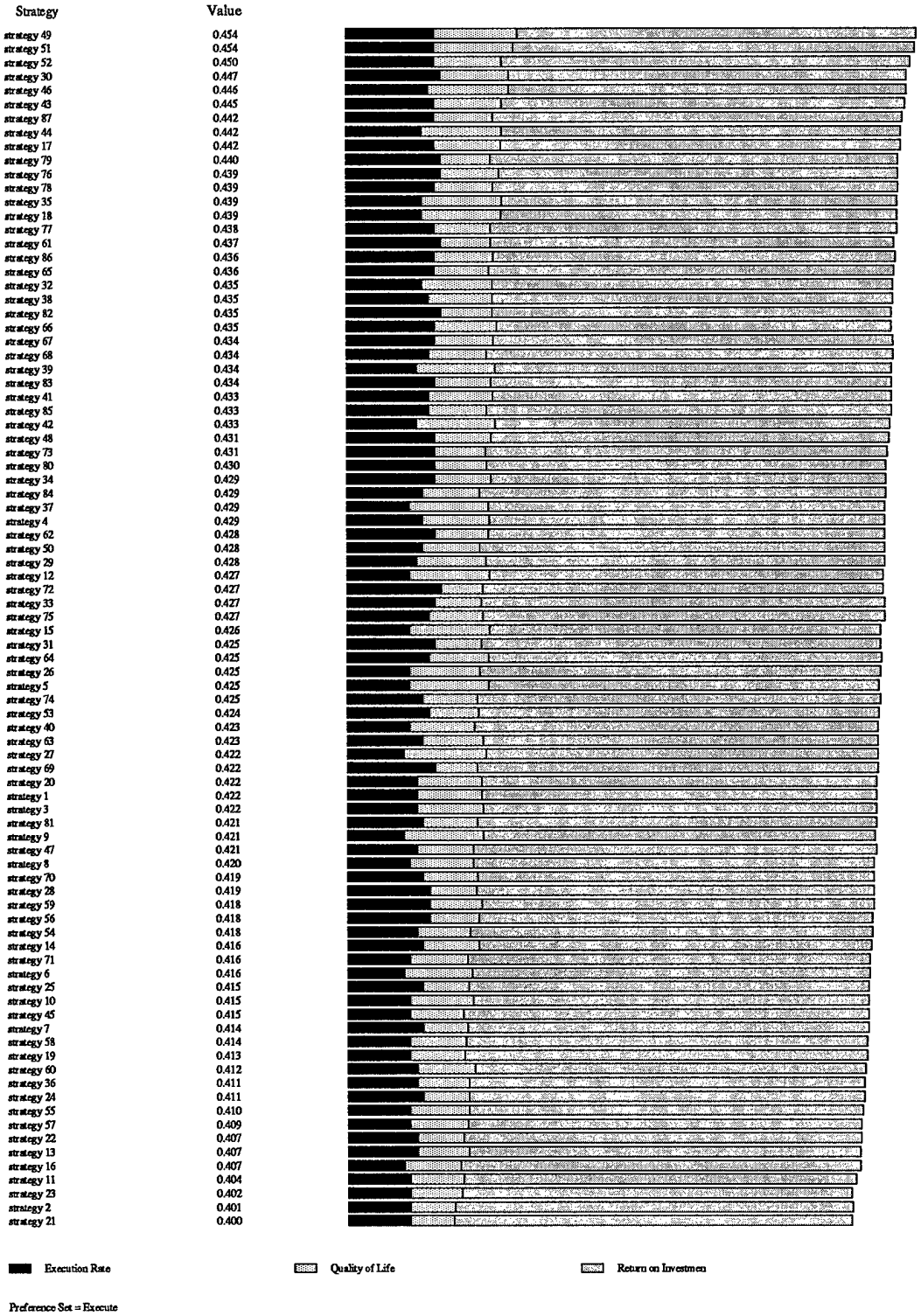

Figure 4-3. Deterministic Results for the EXE Weight Set

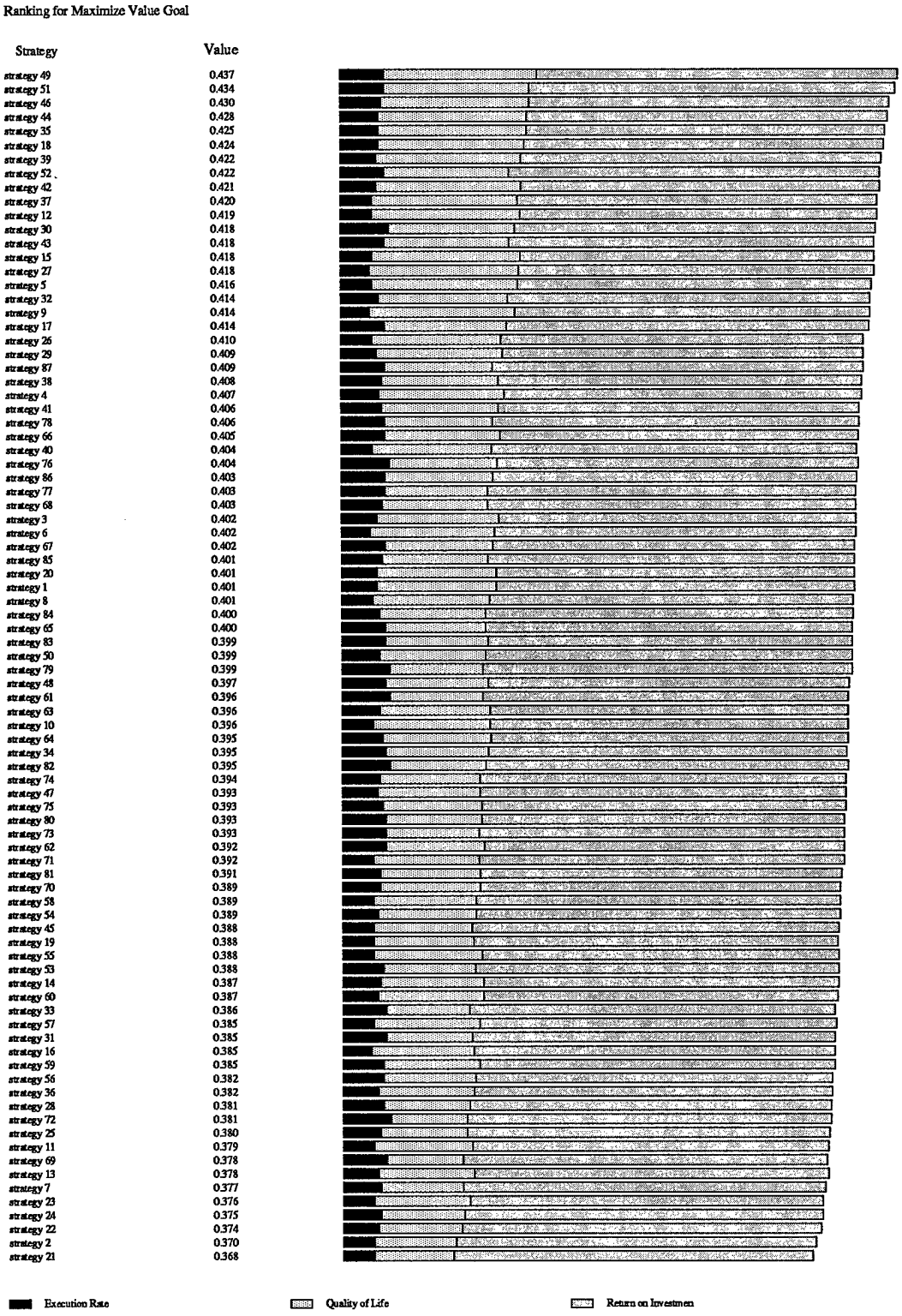

Figure 4-4. Deterministic Results for the QUAL Weight Set

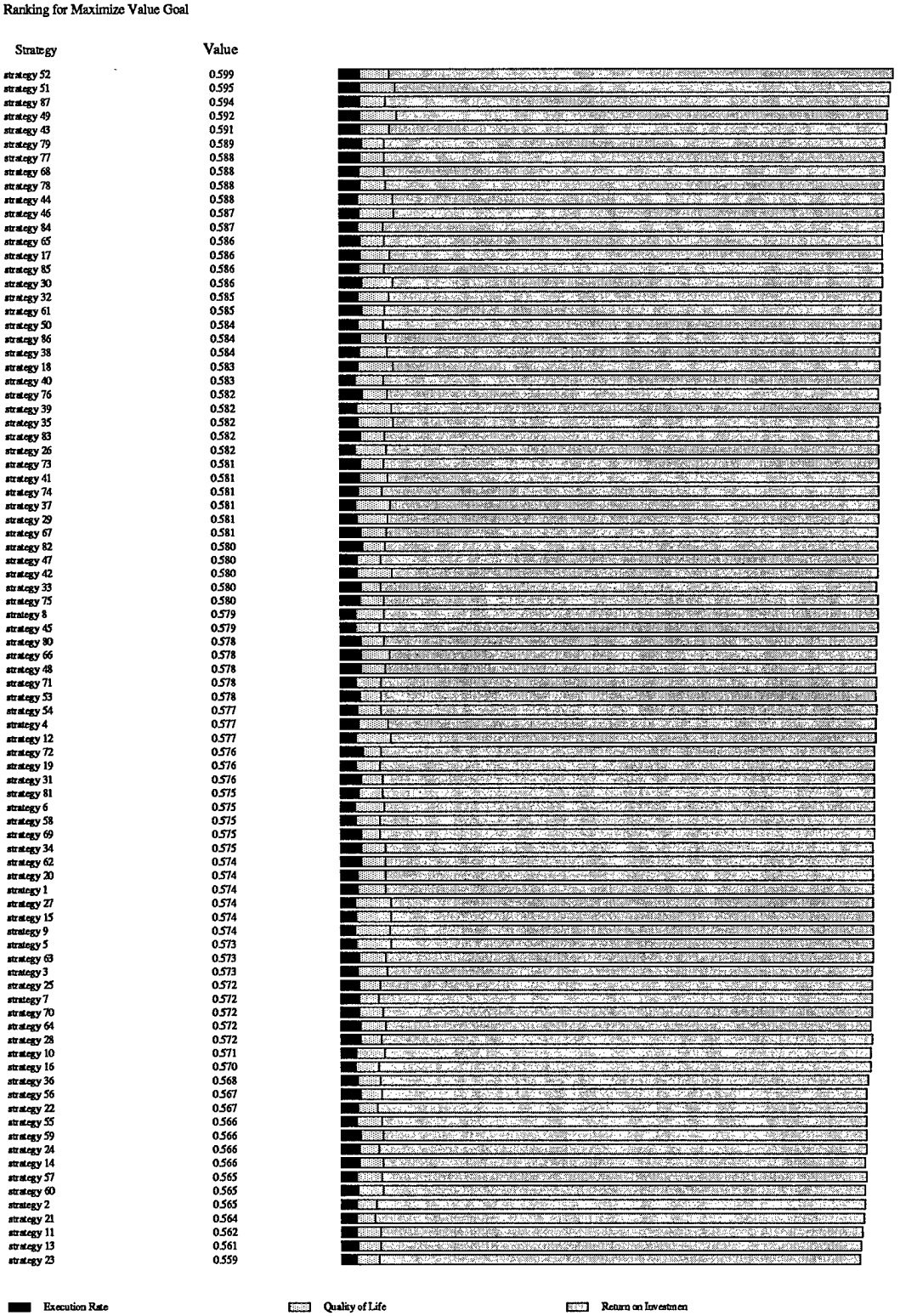

Figure 4-5. Deterministic Results for the ROI Weight Set

To show the effect the four weight sets have on where a strategy is ranked, the position of each strategy was plotted for the different weight sets. Figure 4-6 shows the results. The rank position with the most value is number 1, and the position with the least value is 87. Although there is movement in the ranked position for almost every strategy, the model shows that the strategies are fairly robust to changes in emphasis on weights, particularly with the best and worst strategies. The worst performing strategies remain poor choices for each weight set, and the best strategies tend to be within the top 10 positions for each weight set. Table 4-2 summarizes the rank positions for the top three strategies for each of the weight sets. Strategy 44 is included because it is the status quo strategy, which is the strategy that gives each MAJCOM their expected bogey. Strategy 49 is ranked number 1 for three of the weight sets, and strategy 51 is ranked number 2 for all four sets.

Table 4-2. Top 3 Strategies for Each Weight Set + Status Quo Strategy

	Strategy Rank for Each Weight Set			
Strategy	**ILEH**	**EXE**	**QUAL**	**ROI**
49	1	1	1	4
51	2	2	2	2
52	3	3	8	1
46	8	5	3	11
87	4	7	22	3
44	10	8	4	10

Strategy Rank Position for the Weight Sets

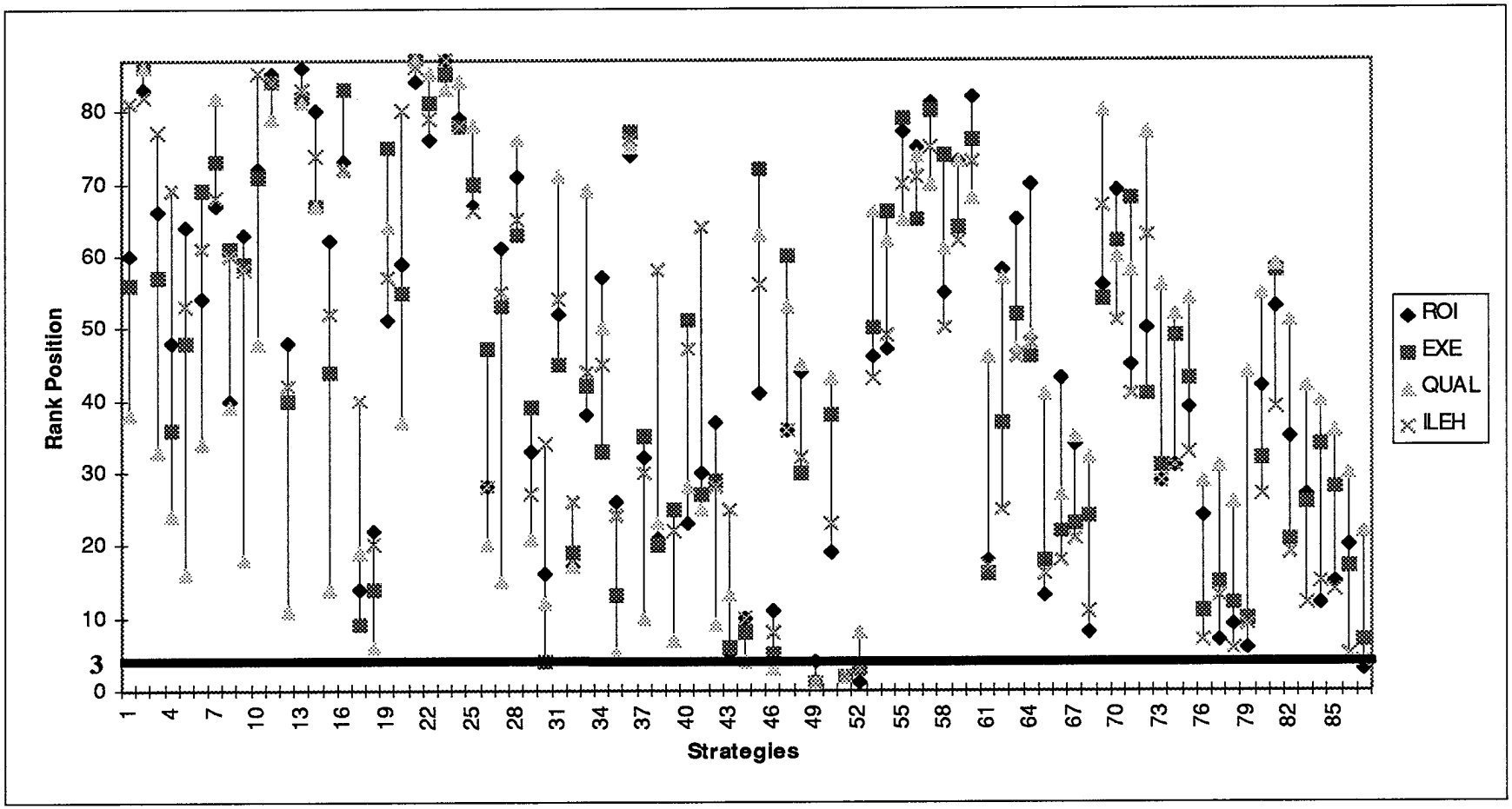

Figure 4-6. Change in Rank Position for the Four Weight Sets

In addition to testing the sensitivity to the weights for the fundamental objectives, sensitivity analysis was also done on the measurable objectives. The sensitivity analysis was done on the status quo strategy and on the five strategies that fall within the top three positions for any of the weight sets (see Table 4-2).

To test for sensitivity to changes in the weights, the relative ranking of the top strategies are plotted against the weight for each objective as the weight is varied from 0% to 100%. Figures 4-7 through 4-14 show the results of changing the weights for each objective. The solid vertical line in the figures is the weight assigned by the Air Staff, and the dashed vertical line is at the weight that would have to be placed on the measure if there is to be a change in the top ranked strategy.

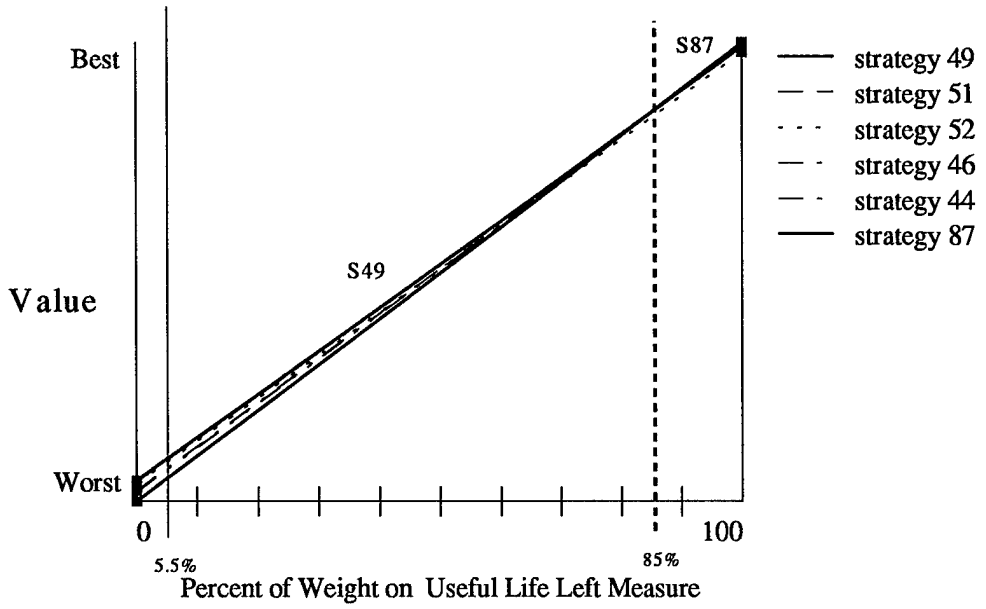

Figure 4-7. Sensitivity Analysis on Useful Life Remaining Weight

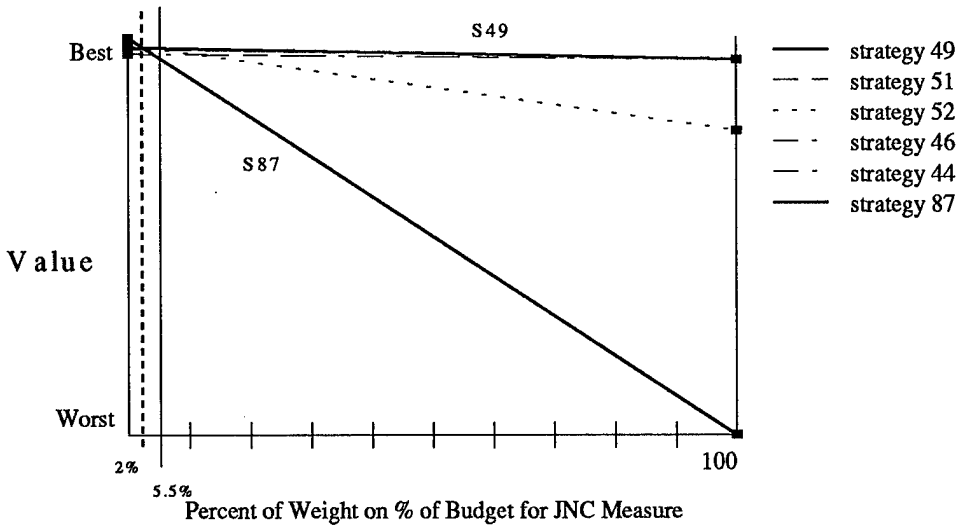

Figure 4-8. Sensitivity Analysis on % of Budget for JNCO Weight

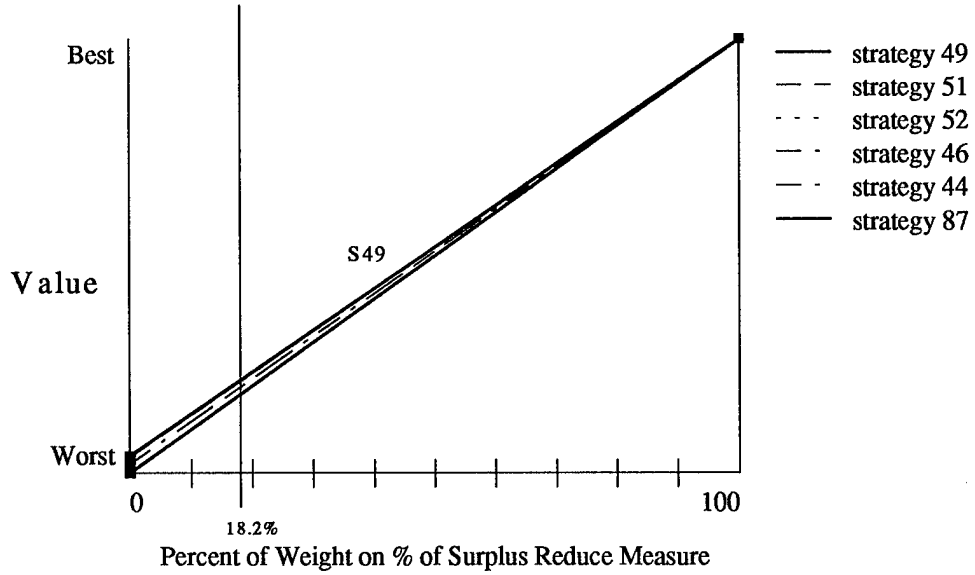

Figure 4-9. Sensitivity Analysis on % of Surplus Reduced Weight

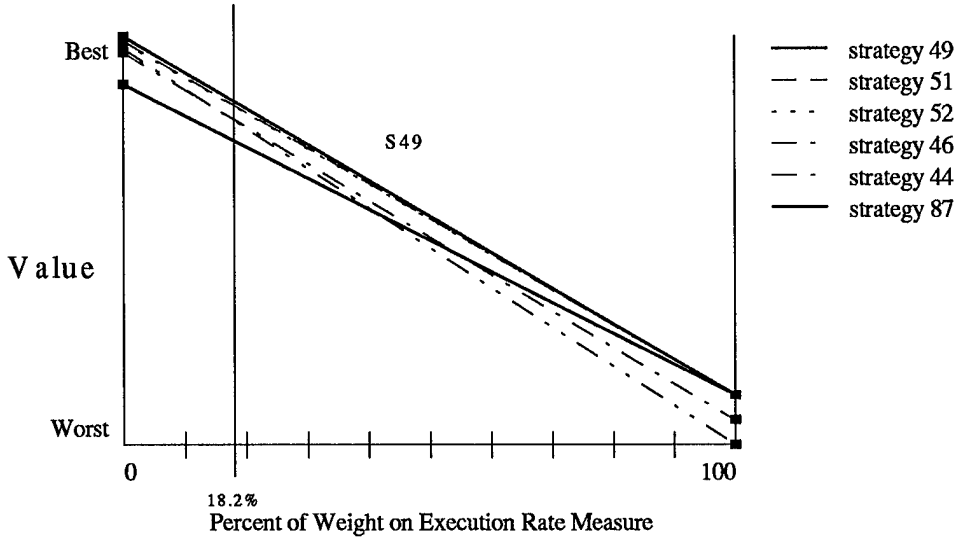

Figure 4-10. Sensitivity Analysis on Execution Rate Weight

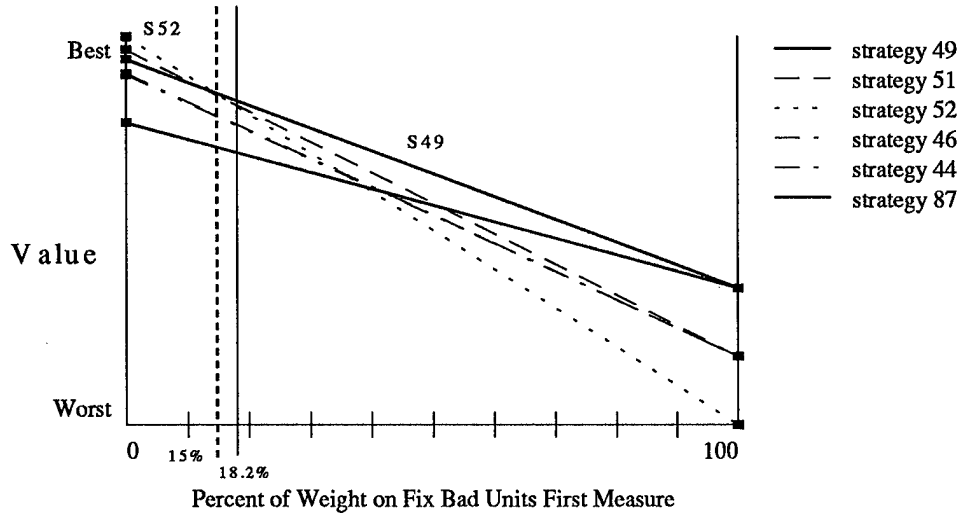

Figure 4-11. Sensitivity Analysis on Fix Worst First Weight

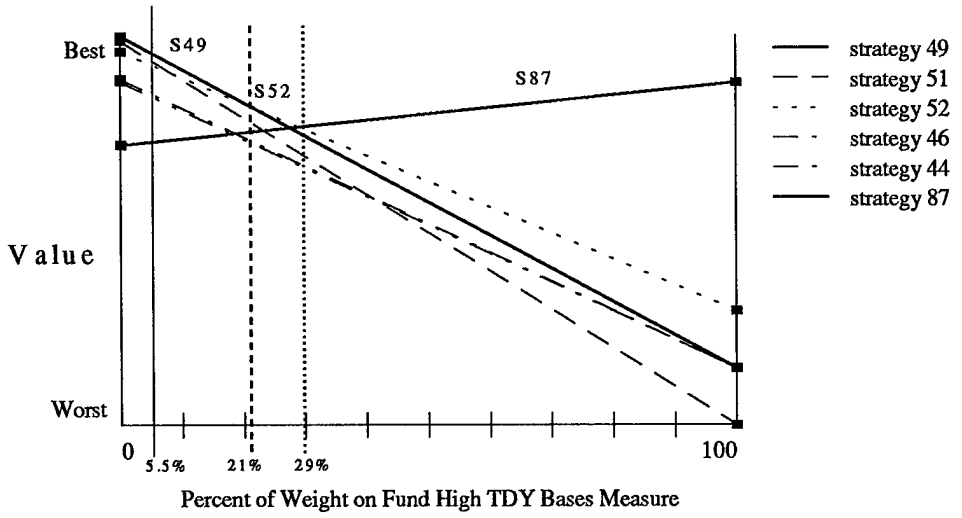

Figure 4-12. Sensitivity Analysis on TDY Weight

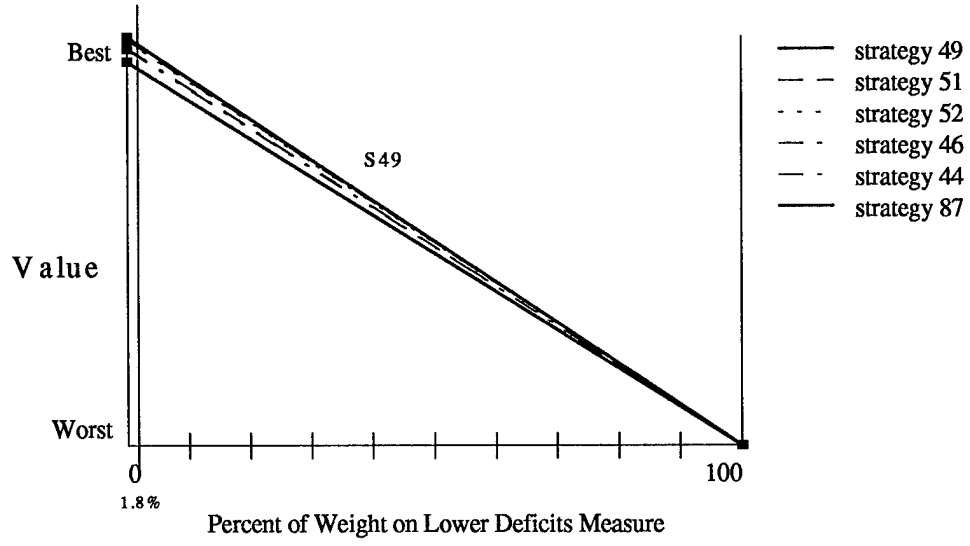

Figure 4-13. Sensitivity Analysis on Lowering Deficit Weight

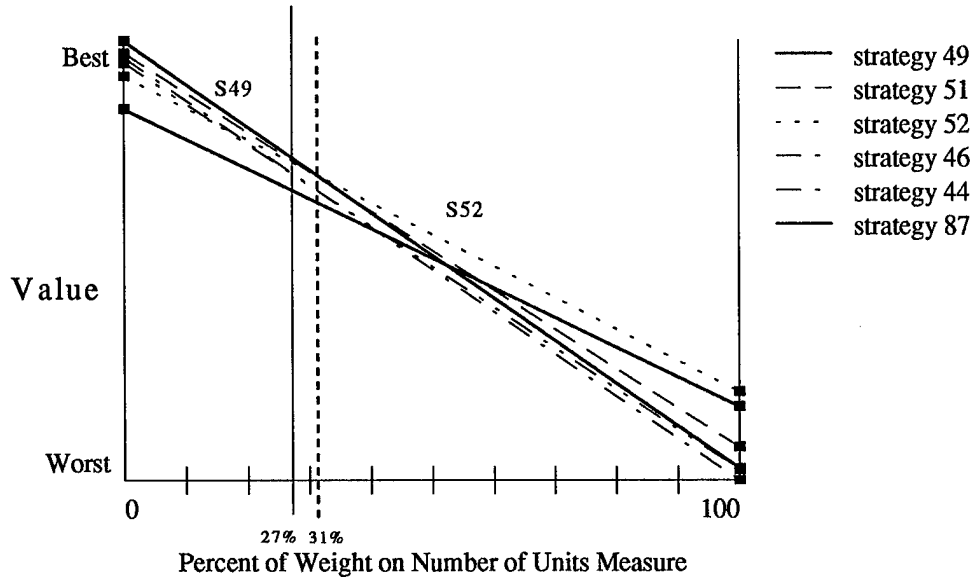

Figure 4-14. Sensitivity Analysis on Number of Units Weight

Table 4-3 summarizes the effects of changing the weights on the measurable objectives. Strategy 49 remains the top ranked strategy regardless of how much weight is put on reducing surplus, reducing the deficit, or the execution rate. If there is a small decrease in the weight placed on the % of budget for JNCO objective, then strategy 87 will rank first. Strategy 52 will be ranked first if there is a small decrease in the weight for worst first or a small increase in the number of units weight. For the TDY rate and useful life remaining objectives, there has to be a very large increase before strategy 49 is no longer ranked first. This shows that strategy 49 is insensitive to moderate changes in weights for five of the objectives, and the status quo strategy (#44) is never the top ranked strategy.

Table 4-3. Summary of Sensitivity Analysis on Weights

Measure	Nominal Weight	Minimum Weight Change to Change Top Strategy	New Top Ranked Strategy
Surplus Reduction	.18	n/a	No Change
Deficit Reduction	.02	n/a	No Change
Execution Rate	.18	n/a	No Change
% of Budget for JNCO	.06	-.03	87
Fix Worst Units First	.18	-.03	52
Number of Units	.27	+.04	52
TDY Rate	.05	+15/+.23	52/87
Useful Life of Subsystems Remaining	.06	+.80	87

Sensitivity Analysis on the Scores

A deterministic analysis implies that all information is known with certainty. That is a fairly good assumption for this analysis because all of the measures, except for the worst first and the useful life remaining, are supported by objective data. The scores for the worst first and the useful life remaining measures are derived from the facility assessment. The facility assessment criteria (see appendix A) provides guidelines for determining the condition of a unit, but the score is dependent on the assessor's judgment.

A sensitivity analysis on the subjective scores allows the decision maker to see the outcome if the subjective data is varied. If the analysis shows that the ranking of the strategies is highly sensitive to the evaluation measure scores, additional work can be done to verify the accuracy or consistency of the data. To see if the top ranked strategies are sensitive to the worst first and useful life remaining scores, a sensitivity analysis was done

using a tornado diagram with DPL. The tornado diagram allows for the nominal scores to be adjusted up or down, and then shows if there is a change in the top ranked strategy over the range specified (ADA, 1995:474-481). Each of the top five strategies were compared to the status quo strategy to see if the change in scores would alter the overall value enough to cause the status quo strategy to be ranked higher.

To determine what range of scores to use, it was assumed that the MAJCOMs who received less than their expected bogeys for a given strategy understated their facility assessment scores by 10 for the worst first score, and overstated their score by 10 for the useful life remaining measure. Conversely, the MAJCOMs who received more than their expected bogeys for a given strategy were assumed to have overstated their facility assessment scores for worst first by 10, and understated their useful life remaining scores by 10. This would give a total spread of 20 between a high and low MAJCOM. The decision maker felt that this range between MAJCOMs would be the maximum variance.

The sensitivity analysis is being compared to the status quo strategy, so only the portion of increase/decrease from the expected bogey is used for adjusting the scores. If a MAJCOM systematically inflates/deflates their scores, then every strategy will have inflated/deflated values because every MAJCOM has a bogey for every strategy. Using the status quo strategy as a basis, the affect on the rank order is from the incremental increases/decreases from the expected bogey. The formula is

$$\Delta score = (\Delta Bogey / budget) * 20 \qquad (4.1)$$

where

$\Delta score$ is the change in the evaluation measure score used in the sensitivity analysis

$\Delta Bogey$ is the change in the bogey compared to the expected bogey

budget is the size of the total MFH budget

For example, if the top ranked strategy gives MAJCOM Y $12M less than their expected bogey, the high and low adjustments to the score for the worst first measure would be 12/110 *20=2.2. Table 4-4 summarizes the size of the ranges used for the two measures for the sensitivity analysis.

Table 4-4. Range for the Sensitivity Analysis on Worst First and % Remaining

Top 5	Change from Bogey ($M)				Delta	Worst First Score			%Remaining Score		
Strategies	ACC	AFMC	AFSPC	AETC	Score	Low	Nominal	High	Low	Nominal	High
49	0	6	-6	0	1.1	78.9	80	81.1	14.6	15.7	16.8
51	0	8	-8	0	1.5	77.5	79.0	80.5	14	15.5	17
52	0	8	-6	-2	1.5	76.5	78	79.5	15.8	17.3	18.8
87	12	0	-6	-6	2.2	77.8	80	82.2	12.3	14.5	16.7
86	12	0	-8	-4	2.2	78.8	81	83.3	11.9	14.1	16.3

The tornado diagram in figure 4-15 shows the results from comparing the top five strategies to the status quo strategy. The vertical lines in the diagram show the values for the nominal scores, and the rectangles show the range of the overall value as the score is varied from the nominal. The rectangle is shaded if there is a change in the top ranked strategy. The results show that of the top five strategies, only strategy 86 and 87 change enough to vault the status quo strategy ahead of it. Thus, three of the top five strategies are insensitive to the subjective scores compared to the status quo strategy.

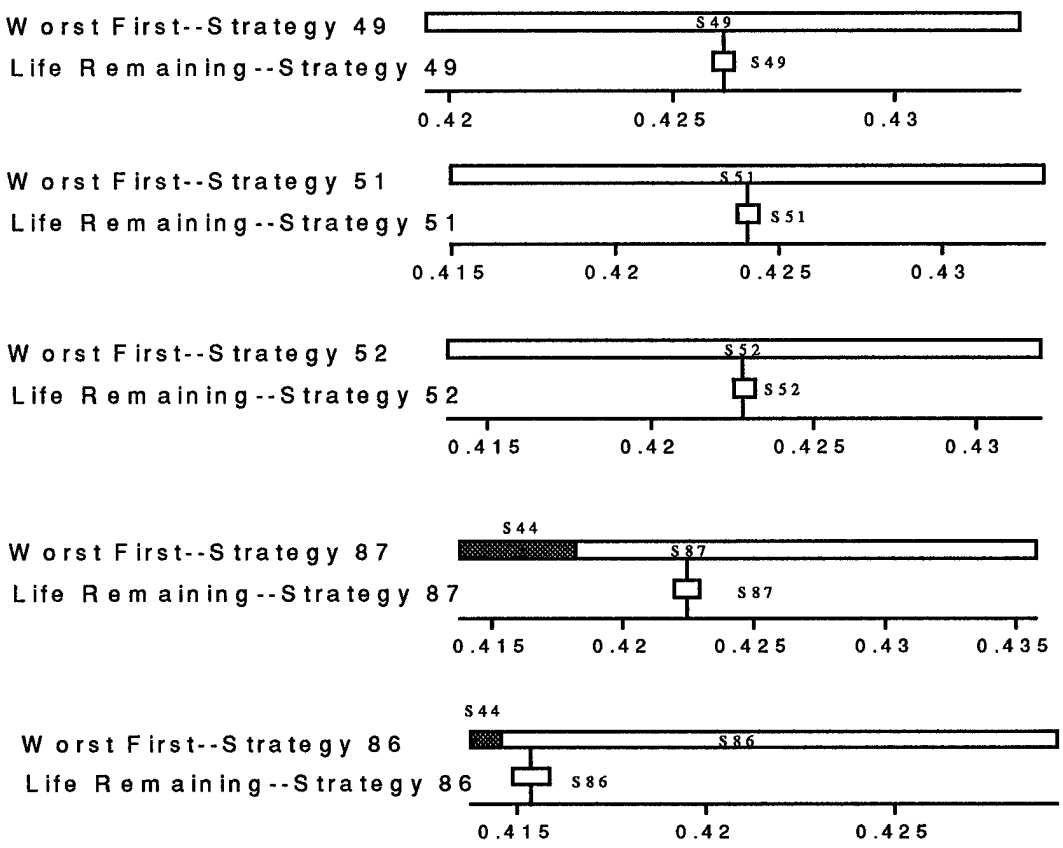

Figure 4-15. Sensitivity Analysis on Worst First and Useful Life Remaining Scores

A look at the change in the MAJCOM's bogeys for the top five strategies in table 4-4 shows that the top three strategies increase AFMC's bogey, and the next two strategies increase ACC's bogey. To see if these two groups of strategies could switch rank positions if the subjective scores are overstated, a sensitivity analysis was done on strategies 86 and 87 vs. strategy 49. The ranges used for the scores are the same as those listed in table 4-4. Figure 4-16 shows that changing the worst first score for strategy 86 will not change the outcome of strategy 49 being the top ranked. However, if the worst first score for strategy 87 is increased, or the worst first score for strategy 49 is decreased, then strategy 87 becomes the highest ranked strategy. This shows that the rank ordering

amongst the top ranked strategies is sensitive to the worst first score. Changing the useful life remaining score on any of the strategies has no effect on the rank ordering.

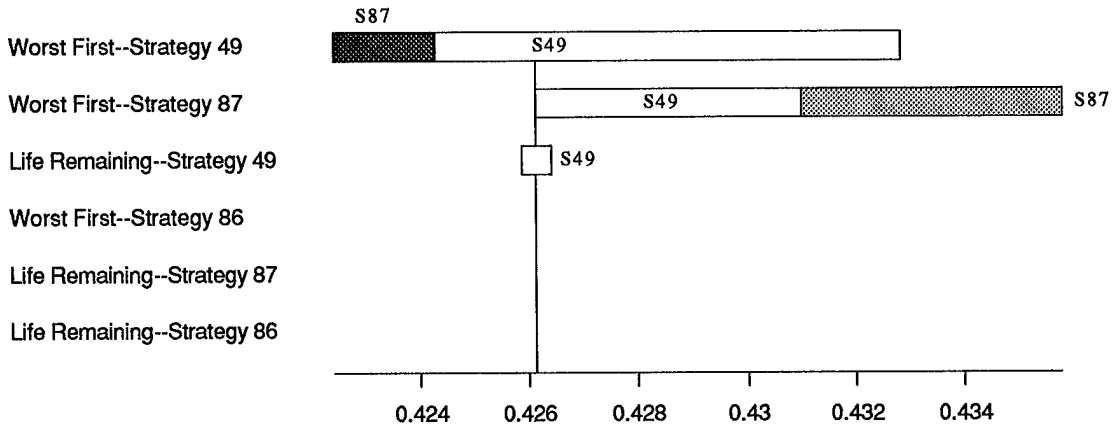

Figure 4-16. Sensitivity Analysis on Worst First and Useful Life Remaining Scores for Strategy 86 and 87 vs. Strategy 49

Differences Between High and Low Ranked Strategies

To give a clearer indication of where the differences lie between a high and low ranked strategy, the overall value for the top 10 and bottom 10 strategies are shown in figure 4-17. It is clear that there is small but discernible trend for top ranked strategies to provide more value for the execution rate and quality of life objectives.

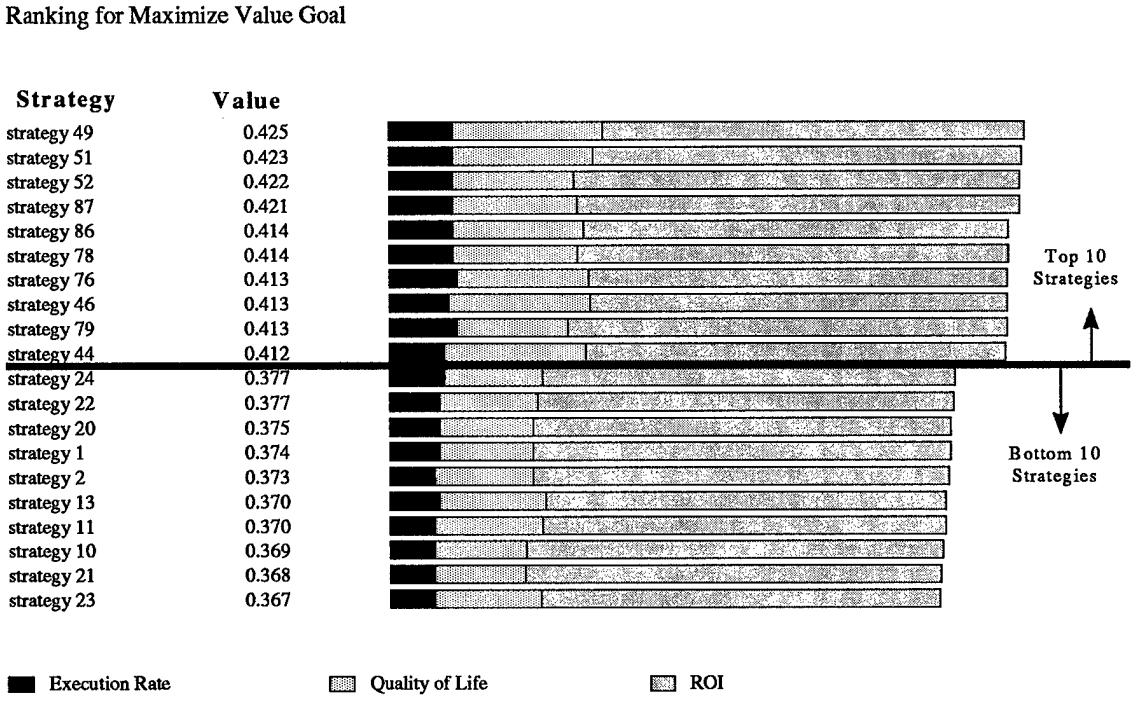

Figure 4-17. Comparison of Top 10 and Bottom 10 Strategies for Overall Value

To further investigate the differences in the two groups, figure 4-18 and 4-19 show the values for the sub-objectives under the quality of life and ROI fundamental objectives. Note that the value is normalized to reflect the total value obtained for the sub-objectives that fall under the fundamental objective. For example, in figure 4-17 the total overall value for a strategy is between 0 and 1, and in figure 4-18 the total value for a the quality

of life is between 0 and 1. To compare the value shown for the quality of life objective in figure 4-18 to the over all value shown in figure 4-17, the quality of life value is multiplied by the weight placed on the quality of life objective (0.31).

There are four illustrative points that are discernible from the figure 4-18:

- The top strategies have higher values for worst first.
- Values for the TDY rate are nearly the same across all strategies.
- None of the strategies reduced deficits, so there is no value for deficit reduction.
- The % of budget for JNCO units value is significant, but it does not distinguish the top strategies from the bottom strategies. Five of the top ten strategies do not have any value for the % of budget for JNCO units, but the top three strategies have a fairly large % of budget for JNCO units value.

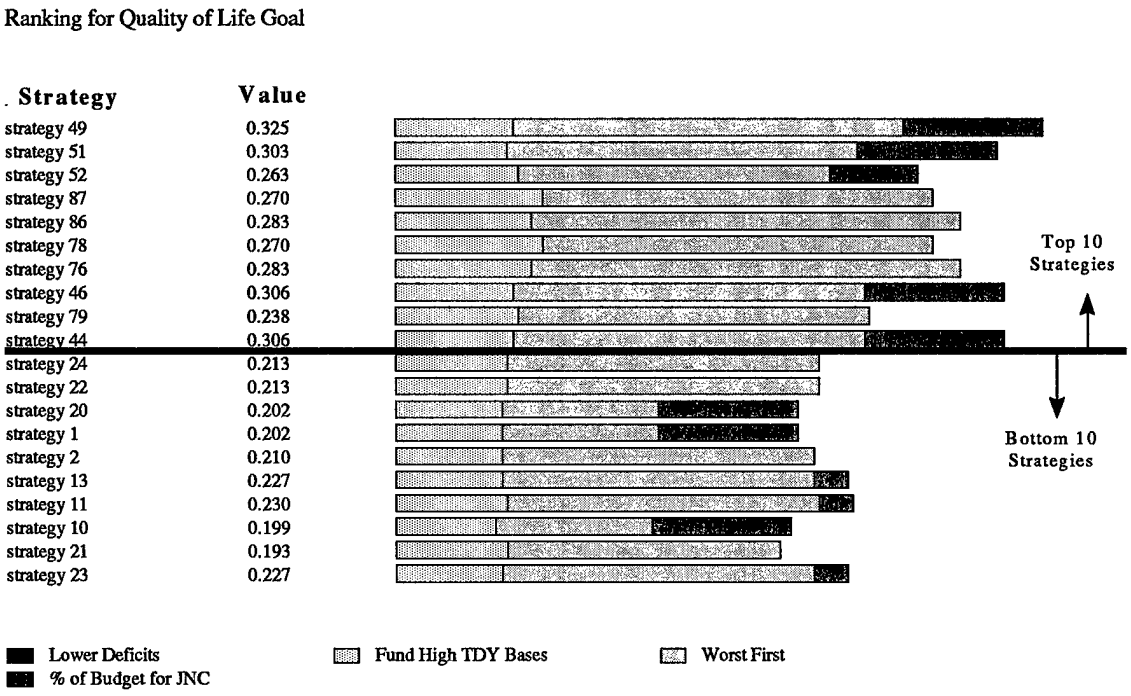

Figure 4-18. Comparison of Top 10 and Bottom 10 Strategies on Quality of Life

Figure 4-19 shows that there is essentially no difference between the high and low strategies for the value obtained from the surplus reduced and the useful life remaining measures. For this case study none of the MAJCOMs were renovating surplus units, so each strategy receives the maximum score for that objective. The small variance in the useful life remaining value indicates that all of the projects are remarkably similar in the state of deterioration of the housing units, or that the value function for the measure is not robust to variations in the score. The top strategies do provide more value for the number of units objective.

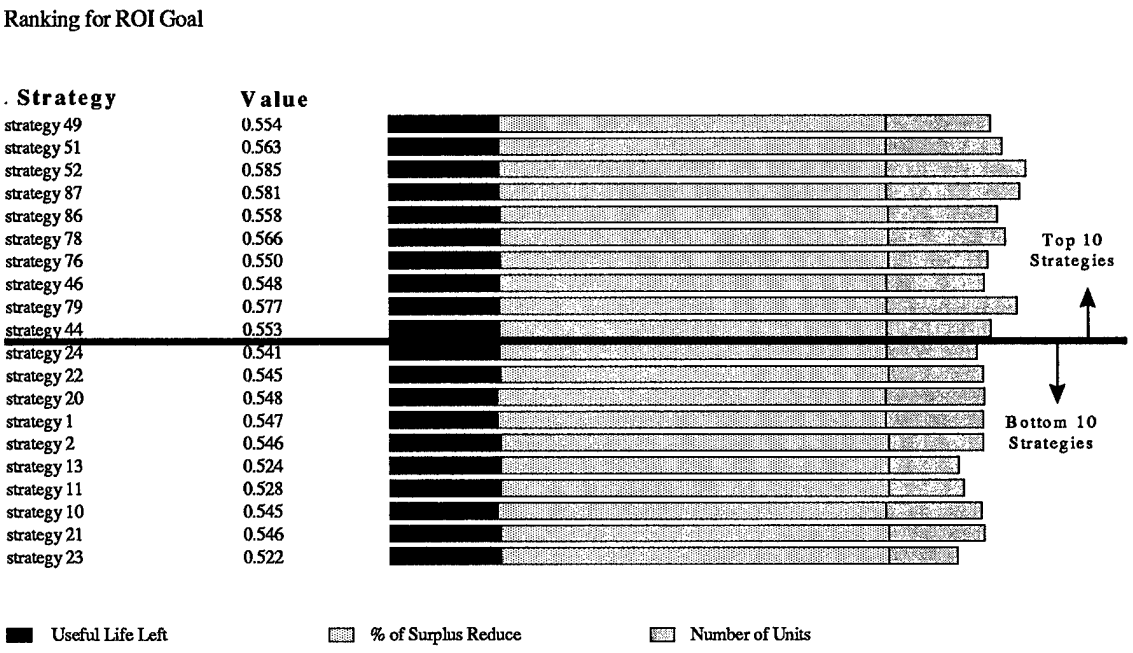

Figure 4-19. Comparison of Top 10 and Bottom 10 Strategies on ROI

Trends on Changes in MAJCOM's Bogeys

To investigate if the model can provide insight on whether there are one or MAJCOMs with projects that tend to provide either much higher or lower value to the

Air Staff, the top 10 strategies and bottom 10 strategies were broken down by the change in the MAJCOM's bogeys. Figure 4-20 shows the top and bottom strategies along with the change in the expected bogey for each MAJCOM. Strategy 49 for example, does not change ACC's or AETC's expected bogey, but AFMC gains $6M at AFSPC's expense.

Ranking for Maximize Value Goal

Change in MAJCOM's Bogey ($M)

Strategy	ACC	AFMC	AFSPC	AETC
49	0	+6	-6	0
51	0	+8	-8	0
52	0	+8	-6	-2
87	+12	0	-6	-6
86	+12	0	-8	-4
78	+8	+6	-8	-6
76	+8	0	-8	0
46	0	+3	-3	0
79	+12	-8	-8	+4
44	0	0	0	0
24	-4	-3	+3	+4
22	-4	-6	+6	+4
20	-4	-8	+6	+6
1	-12	0	+6	+6
2	-12	0	+8	+4
13	-8	+3	+3	-2
11	-8	0	+6	+2
10	-8	-6	+8	+6
21	-4	-8	+8	+4
23	-4	-6	+8	+2

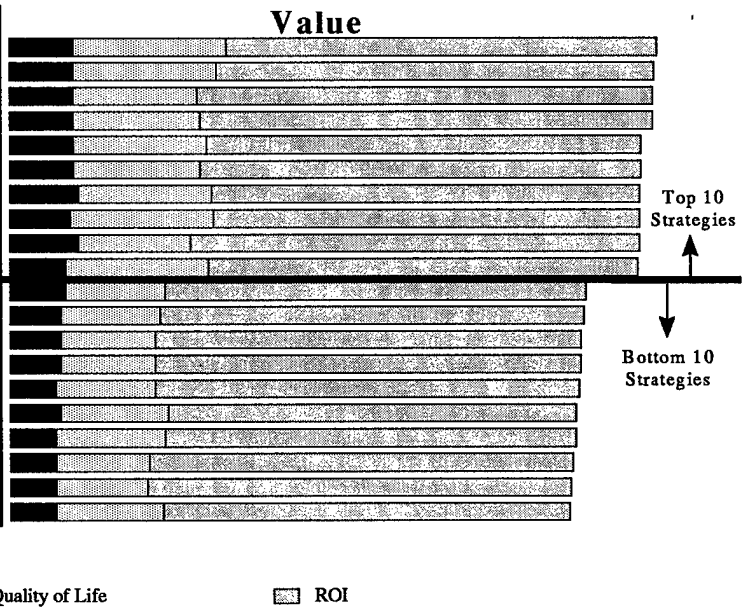

Figure 4-20. Change in the MAJCOM's Bogeys for the Top and Bottom Strategies

There are three trends that are evident in figure 4-20:

- AFSPC would receive $6M--$8M less for nine of the top 10 strategies and would gain $3M--$8M in each of the bottom 10 strategies.
- ACC loses $4M--$12M in each of the bottom 10 strategies.
- AETC gains $2M--$6M in nine of the bottom 10 strategies.

The trends for AFSPC suggest that the projects that AFSPC submits for their high and low bogeys produce less value than the other MAJCOM's projects. Generally, if a

strategy allocates more of the budget to AFSPC, the strategy generates less value. The converse holds as well. The trend for ACC suggests that if the strategy allocates less of the budget to ACC, the projects that ACC has to cut from their program are high valued projects. AETC's budget allocation gain in all of the bottom strategies suggest that the additional projects that AETC adds to their program when they have a larger budget provide less value than the projects that ACC or AFMC would submit if they had that share of the budget.

To further analyze these trends, the evaluation measure scores for each of the MAJCOM's bogeys were normalized to show what the total scores would be if the entire budget achieved the marginal rate of return that is inherent to the bogey being analyzed. The formula used to normalize the scores for a bogey is

$$NormScore_i = BogeyScore_i * budget / bogey \qquad (4.2)$$

where

NormScore$_i$ is the normalized score for the following measures: number of units, worst first, useful life remaining, and TDY rate scores

BogeyScore$_i$ is the evaluation measure scores for each of the MAJCOM's bogeys

budget is the total MFH budget

bogey is the size of the bogey for which the scores are being normalized

Table 4-5 shows the results for the top two and bottom two bogeys for each of the MAJCOMs.

Recall that the four most heavily weighted measures are the number of units (27%), surplus reduced (18%), worst first (18%), and the execution rate (18%). The execution rate is based on the prior years performance and will not change with the size of

the bogey. None of the MAJCOMs revitalized surplus units, so that measure does not help in explaining trends. Looking at the trend in the number of units and the worst first score as the MAJCOM's bogeys get larger, helps to explain why ACC and AFMC gain budget share at the expense of AFSPC and AETC. For both ACC and AFMC, the marginal rate of return increases for the number of units and the worst first scores, and for AFSPC and AETC, the marginal rate of return decreases. For example, looking at AFSPC's number of units and worst first scores when they receive $17M shows that the marginal rate of return that they receive with the projects they invest in would revitalize 867 units with an average worst first score of 84. When AFSPC receives $33M, their marginal rate of return drops and the number of units revitalized is 757 with an average worst first score of 79. Decreasing rates of return, and the fact that AFSPC's execution rate score is low, explains why the top strategies give smaller bogeys to AFSPC.

Table 4-5. Normalized Evaluation Measure Scores

	Size of Bogey ($M)	Cost	Amount for Junior Enlisted Units	% of Budget for JNCO	Number of Units Score	Worst First Score	Useful Life Remaining	Execution Rate	TDY Rate
ACC=28	28	27,986,111	21,191,144	75.7	845	80	18	95	6.6
ACC=32	32	32,016,666	25,222,000	78.8	853	79	19	95	6.7
ACC=48	48	47,953,333	31,368,666	65.4	843	81	17	95	7.1
ACC=52	52	52,032,142	35,447,476	68.1	878	81	20	95	7.0
AFMC=17	17	17,000,000	5,000,000	29.4	599	77	11	91	4.7
AFMC=19	19	19,000,000	7,000,000	36.8	599	77	11	91	4.7
AFMC=31	31	31,000,000	19,000,000	61.3	668	78	15	91	5.6
AFMC=33	33	33,000,000	20,745,000	62.9	709	77	14	91	5.3
AFSPC=17	17	17,000,000	17,000,000	100.0	867	84	1	61	8.4
AFSPC=19	19	19,000,000	19,000,000	100.0	839	83	2	61	8.2
AFSPC=31	31	31,000,000	31,000,000	100.0	763	79	6	61	7.3
AFSPC=33	33	33,000,000	33,000,000	100.0	757	79	6	61	7.2
AETC=14	14	14,000,000	6,500,000	46.4	1,014	79	11	100	4.2
AETC=16	16	16,000,000	16,000,000	100.0	736	82	8	100	3.0
AETC=24	24	24,000,000	14,380,952	59.9	894	74	20	100	3.4
AETC=26	26	26,000,000	26,000,000	100.0	897	60	37	100	3.3

Summary

The results were analyzed in this chapter to determine the deterministic ranking of the strategies and how the they would be affected by changes in the weights and scores. In addition, the differences between the top 10 strategies and the bottom 10 strategies were examined to see what measures distinguish the top strategies from the bottom strategies, and what trends are evident in the changes in the MAJCOM's bogeys.

The analysis shows that strategy 49 provides the most value. Strategy 49's top rank position is insensitive to changes in the weights, but it is sensitive to the worst first scores. The status quo strategy is ranked 10^{th}, and achieves its highest ranking of 4^{th} with an increased emphasis on the weight for the quality of life objective.

An analysis of the top 10 strategies and the bottom 10 strategies shows that the key distinguishing measures between the top 10 ranked strategies and bottom 10 ranked strategies are the execution rate, number of units, and the fix worst first scores. In addition, the analysis revealed trends in the changes in the MAJCOM bogeys for the high and low sets of strategies. The top 10 strategies generally provide ACC and AFMC with a higher bogey at the expense of AFSPC and AETC.

Chapter 5 : Conclusions and Recommendations

Conclusions

The decision analysis models effectively rank the strategies. Compared to the status quo strategy (#44), the top strategies provide more value to the Air Staff as shown in Table 5-1. Generally the top strategies as a group revitalize more units, fix units that are in worse condition, provide more funds to bases with high TDY rates, and can expect to be executed faster. The only measure where the status quo strategy scores as high as all of the top strategies is the percent allocated to JNCO units.

Table 5-1. Comparison Between Top Ranked and Status Quo Strategies

Strategy	Value	Number of Units	Worst First	Useful Life Left	Execute Rate	% for JNCO	TDY Rate	Surplus Reduc	Deficit Reduc
49	0.425	802	80	15.7	89	83	6	100	0
51	0.423	816	79	15.5	89	83	5.9	100	0
52	0.422	850	78	17.3	89	80	6.1	100	0
87	0.421	841	80	14.5	89	67	6.5	100	0
86	0.414	808	81	14.1	89	74	6.3	100	0
44	0.412	801	79	15.3	87	83	6	100	0

The models also clearly show where the trade-offs are being made. For example, in table 5-1 strategy 52 revitalizes 850 units compared to only 802 units for the top strategy (#49), but the units are not in as bad condition for strategy 52, and there is a lower percentage of the budget going towards JNCO units. This is useful information for the decision maker to consider when deciding which strategy to use.

There is a large difference between the top 10 strategies and the bottom 10 strategies, but the difference between any one of the adjacent strategies is small. The

ranking amongst the top strategies are insensitive to the weights placed on the measures, but are sensitive to the scores of the subjective measures. A decision maker using this model would have to insure that there is consistency in the subjective facility assessment scores.

The objectives hierarchy, along with the weights placed on the measurable objectives, communicate the Air Staff's values in clear, unambiguous terms. Knowing the Air Staff's values will enable the MAJCOMs and bases to concentrate on developing housing programs that provide the maximum value possible. MAJCOMs and bases will have an incentive to build programs that provide high value because the MAJCOM most successful at building a value generating program will get a larger share of the budget.

Finally, the evaluation measures provide metrics to show the effectiveness of the Air Staff's MFH investment strategy. The Air Staff can use the model to demonstrate to OSD, Congress, or other interested parties, why the budget was allocated the way it was, and how the strategy is accomplishing the MFH goals. The strategy becomes transparent, is objectively chosen, and is readily defensible.

Recommendations

Sensitivity analysis shows that the ranking of the top strategies is sensitive to the subjective scores; therefore, it is recommended that the Air Staff use the model to identify the top performing strategies and then chose the one from amongst the top group that offers the best trade-offs. The model should not take the decision makers place, rather it

should be used to provide insight on the strategies so that the decision maker can make a better decision.

Another possible use for the model is providing feedback to the MAJCOMs on how their program compares to the other MAJCOMs. This benchmarking will show the MAJCOMs how to improve their programs to be more competitive for funds. This could be carried a step further by having the MAJCOMs submit there bogeys early in the program cycle, and then allowing them to improve their bogeys once they see how the model ranks the strategies. This iterative step will increase the competition for funds, and could provide a stronger MFH investment program that optimizes the value for the limited funds that are available.

There was a large amount of data required for the case study, and including all of the MAJCOMs in an analysis would require much more data. For example, with the four MAJCOMs submitting seven bogeys, there were $7^4 = 2401$ possible strategies to consider. If ten MAJCOMs each submitted seven bogeys, there would be 7^{10}=282M+ possible strategies to consider. Not all of these strategies would be feasible, but if even a small percentage of them were feasible, the task of ranking them would be overwhelming. To keep the data set manageable, the number of bogeys that each MAJCOM submits projects for should be reduced from seven to three.

Limitations

The following limitations apply:

- There is no uncertainty built into the model. The data provided by the MAJCOMs on the individual projects is assumed to be known with certainty.

- The model is static in that it is built using the current decision maker's values, objectives, and preferences. As these change over time, the model will require maintenance to keep it current.

Recommendations for Future Research

The deterministic analysis shows very little differentiation amongst the strategies for the TDY rate and the useful life remaining measures. This suggests that there really is not much of a difference between the strategies for that measure. Future work on the model should look at the measures that provide similar values for all strategies and determine if the measure is valid, is sensitive enough, or if the objective is already being met by all of the MAJCOMs.

Adding uncertainty to the model could more accurately reflect the decision scenario. Some of the data that includes uncertainty is the subjective data from the facility assessments, the size of the MFH investment budget, and the actual costs for projects.

Further work on the model to investigate user friendly methods to incorporate a change in the total budget available would allow the Air Staff to show the effects of changes in the Air Force MFH budget. This could be a powerful tool for advocating an increase in funding from Congress or OSD if the model shows that an increase would have a big impact on the value obtained.

Summary

The models developed through this research provide the Air Staff with a method to analyze the relative value of budget allocation strategies. The value is based on the Air Staff's objectives hierarchy, which was developed using value focused thinking techniques. Multiattribute utility theory is used to convert the scores from the eight measures that quantify the objectives in the objectives hierarchy, into an overall value for each strategy.

The models provide useful analysis tools to the decision maker. A deterministic analysis ranks the strategies and shows how the overall value for an strategy is broken down into the component value scores for each objective. Tornado diagrams allow a sensitivity analysis to be done on the scores, and sensitivity graphs show the effect of changing the weights.

The value focused thinking techniques used to develop the value hierarchy aid the decision maker in identifying their key values. The hierarchy will be a valuable tool for communicating to the MAJCOMs and their bases exactly what the Air Staff wants to accomplish with the MFH investment program.

Appendix A : Housing Facility Assessment

Tables, figures, and equations in this appendix are taken from the Family Housing Facility Assessment Criteria (Murphy, 1996:Attch 1).

The criteria used to assess housing units is shown in figure A-1. The expected life cycle is used to score the utility subsystems and the structural components. Room standards and amenities are rated against the standards presented in the Air Force Family Housing Guide.

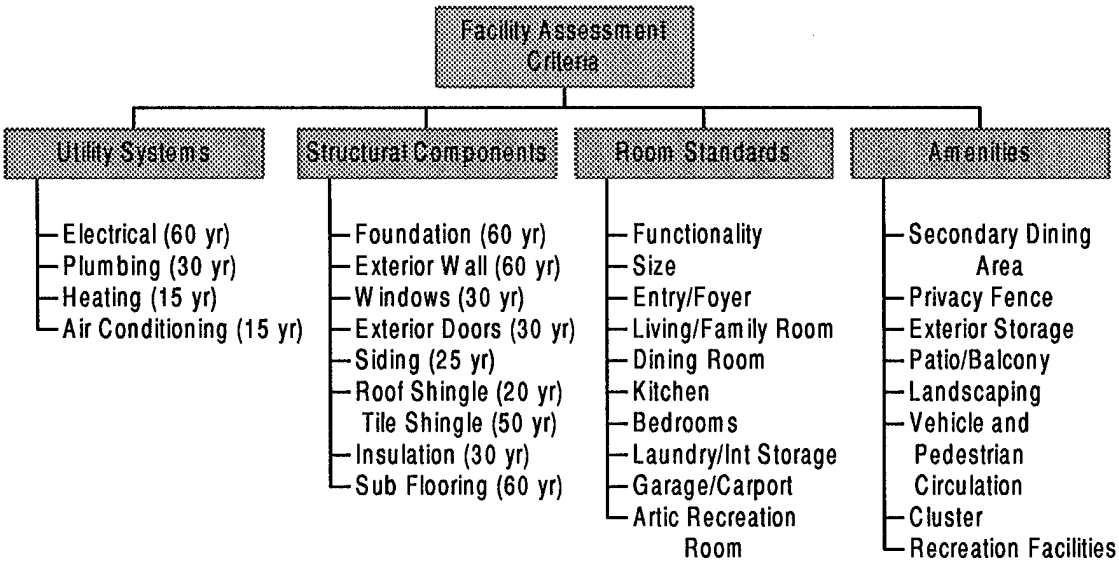

Figure A-1. Facility Assessment Criteria

The facility assessment rating system is shown in Table A-1. The assessment score is

$$\text{Score} = \sum_{i=1}^{4} (\text{Weight}_i * \text{Rating No.}_i)$$

where Weight_i is the weight of the ith criteria, and Rating No._i is the average of the rating score of the ith criteria. Units that score above 70 are rated level one, units scoring between 30 and 70 are rated level two, and units below 30 are rated level three.

Table A-1. Facility Assessment Rating System

Category	Utility Systems		Structural Components		Room Standards		Amenities	
Weight	2.5		3		3		1.5	
	% of Useful Life Remaining	Rating No.	% of Useful Life Remaining	Rating No.	No. of Inadequacy	Rating No.	No. of Amenities Lacking	Rating No.
					(1)/(2)			
	0/Fail	10	0/Fail	10	11/10	10	9	10
	10	9	10	9	10/9	9	8	9
	20	8	20	8	9/8	8	7	8
	30	7	30	7	8/7	7	6	7
	40	6	40	6	7/6	6	5	6
	50	5	50	5	6/5	5	4	5
	60	4	60	4	5/4	4	3	4
	70	3	70	3	4/3	3	2	3
	80	2	80	2	3/2	2	1	2
	90	1	90	1	2&1/1	1	-	1
	100	0	100	0	0	0	0	0

Notes: (1) Applies to bases eligible for arctic recreation room.
(2) Applies to bases ineligible for arctic recreation room.

Table A-2 shows an example of how the rating system is used.

Table A-2. Facility Assessment Example

Category	Utility Systems		Structural Components		Room Standards		Amenities	
Weight	2.5		3		3		1.5	
	% of Useful Life Remaining	Rating No.	% of Useful Life Remaining	Rating No.	No. of Inadequacy	Rating No.	No. of Amenities Lacking	Rating No.
Utility Systems*								
Electrical	10	9						
Plumbing	20	8						
Heating	30	7						
Average		8						
Structural Components*								
Roof			50	5				
Windows			60	4				
Siding			70	3				
Average				4				
Room Standards					7	7		
Amenities							4	5

Score=(2.5*8)+(3.0*4)+(3.0*7)+(1.5*5)=60.5

Level=2

* This is a simplified example, only a portion of the subsystems are shown.

Appendix B : Establishing Mutual Preferential Independence (MPI)

To establish MPI, the decision maker's preferences for a level of one objective are assessed to see if they are independent of the levels of the other objectives. MPI for this problem was only assessed at the top level of the value hierarchy due to the difficulties in assessing MPI for a large set of measures. To completely assess an entire hierarchy, n! assessments are needed, where n is the number of objectives. At the top level of the hierarchy, there are only three objectives; therefore, six assessments are needed. MPI was found to hold for the top level, and because each branch of the value hierarchy was decomposed into independent objectives, MPI is assumed to hold for the remaining objectives.

The six assessments used to establish MPI are

1. For any level of Quality of Life, do you prefer a high Return on Investment?
   Answer: Yes

2. For any level of Quality of Life, do you prefer a high Execution Rate?
   Answer: Yes

3. For any level of Return on Investment, do you prefer a high Quality of Life?
   Answer: Yes

4. For any level of Return on Investment, do you prefer a high Execution Rate?
   Answer: Yes

5. For any level of Execution Rate, do you prefer a high Quality of Life?
   Answer: Yes

6. For any level of Execution Rate, do you prefer a high Return on Investment?
   Answer: Yes

Appendix C : MAJCOM Raw Data and Evaluation Measure Scores

This appendix contains the raw data obtained from the MAJCOMs and the evaluation measure scores. The spreadsheets that follow are organized by MAJCOM and bogeys. The first half of each page contains the raw data, and the second half contains the functions for the evaluation measures that take the raw data as inputs, and return a evaluation measure score.

With the exception of the TDY rates, the MAJCOMs collected the data following the instructions in Table C-1. The raw data for the TDY rate was obtained from AFPC/DPWRC, DSN 487-2184. The TDY rate data follows the spreadsheets for the MAJCOM data.

Table C-1 Instructions to MAJCOMs for Submitting Data

Item	Comments	References
Alternatives	The alternatives are budgets that bracket the FY98 Program size. Develop a hypothetical program for each alternative.	
MAJCOM Execution Rates	Supply the execution rates as indicated.	AF/ILEH Memo, 11 Jul 97, Incentive Scoring Rules
Projects	Identify the base that is receiving the project.	
Block/Type	Subdivide the projects into the same blocks and types used in the Housing Facility Assessment.	AF/CEH Memo, 17 Jun 96, Family Housing Facility Assessments, attachment 1
Cost	Subdivide the project cost into the corresponding blocks/types.	
Number of Units	Number of units either revitalized or added.	

Number of JNCO units in project	For the purpose of categorizing housing, JNCO is considered to be E-1 through E-6	
Facility Assessment Score	Provide the facility assessment scores for each separate block and for each type of unit within the blocks of housing in a project.	AF/CEH Memo, 17 Jun 96, Family Housing Facility Assessments, attachment 1
Average Facility Assessment Utility and Structural Score	Find the average life expectancy remaining for: (Elec+Plumbing+Heating+Air Conditioning+ Windows+Ext Doors+Siding+Shingles or Tiles+Insulation)/9. Do this for each separate block and for each type of unit within the blocks of housing in a project.	AF/CEH Memo, 17 Jun 96, Family Housing Facility Assessments, attachment 1
Number of Surplus Units in Project	Count a unit as surplus if it falls into a surplus category as described in para 2.1.2 and Fig 2.2.6 of AF Family Housing Guide. If the project size is larger than existing surplus, enter the existing surplus.	AF Family Housing Guide, Dec 95
Number of Surplus Units Reduced	The number of surplus units in the project that are converted to non-surplus units or demolished and not replaced.	
Number of Deficit Units Reduced	Any unit being converted or added to the inventory that decreases a deficit category as described in para 2.1.2 and Fig 2.2.6 of AF Family Housing Guide.	AF Family Housing Guide, Dec 95
Total Number of Units Required	Number of MFH units requied on a base.	HMA
Total Number of Units in Inventory	Size of existing inventory on a base.	
Area Cost Factor	Self Explanatory	
Percent Accompanied	The percentage of accompanied military personnel at a base.	HMA

MAJCOM	BASE	# of Military	Total Days TDY	Military Days	TDY Rate
AETC	COLUMBUS	1160	24345	417600	5.83%
AFMC	EDWARDS	1569	50157	564840	
ACC	EDWARDS	159	3209	57240	
AETC	EDWARDS	16	194	5760	
AFSPCMD	EDWARDS	16	250	5760	
		1760	53810	633600	8.49%
ACC	EGLIN	1833	96751	659880	
AFMC	EGLIN	1820	51787	655200	
AETC	EGLIN	17	463	6120	
		3670	149001	1321200	11.28%
AETC	KEESLER	1715	39471	617400	
AFMC	KEESLER	307	25569	110520	
		2022	65040	727920	8.94%
AFMC	KIRTLAND	723	18421	260280	
AETC	KIRTLAND	381	6746	137160	
ACC	KIRTLAND	46	1681	16560	
		1150	26848	414000	6.49%
AETC	LACKLAND	1757	39965	632520	6.32%
ACC	LAJES	370	9678	133200	
AMC	LAJES	38	918	13680	
		408	10596	146880	7.21%
AETC	LUKE	2056	61399	740160	
ACC	LUKE	127	9425	45720	
		2183	70824	785880	9.01%
AFSPCMD	MALMSTROM	1294	48501	465840	
ACC	MALMSTROM	28	270	10080	
		1322	48771	475920	10.25%
ACC	MINOT	1506	60485	542160	
AFSPCMD	MINOT	412	18201	148320	
AETC	MINOT	2	37	720	
		1920	78723	691200	11.39%
AFMC	MXWELL GUNTER AN	233	5923	83880	

AETC	MXWELL GUNTER AN	44	289	15840	
		277	6212	99720	6.23%
ACC	OFFUTT	2476	115949	891360	
AFSPCMD	OFFUTT	81	773	29160	
AFMC	OFFUTT	22	273	7920	
AMC	OFFUTT	20	337	7200	
AETC	OFFUTT	8	155	2880	
		2607	117487	938520	12.52%
ACC	SEYMOUR JOHNSON	2956	156734	1064160	
AETC	SEYMOUR JOHNSON	12	460	4320	
AMC	SEYMOUR JOHNSON	1	36	360	
		2969	157230	1068840	14.71%
AETC	SHEPPARD	1386	31306	498960	6.27%
AETC	TYNDALL	1641	40957	590760	
ACC	TYNDALL	350	8814	126000	
AFMC	TYNDALL	30	1278	10800	
		2021	51049	727560	7.02%
AFSPCMD	VANDENBERG	736	39455	264960	
AFMC	VANDENBERG	60	1020	21600	
AETC	VANDENBERG	41	462	14760	
		837	40937	301320	13.59%
ACC	WHITEMAN	1544	42289	555840	
AETC	WHITEMAN	14	373	5040	
AFMC	WHITEMAN	6	155	2160	
		1564	42817	563040	7.60%
AFMC	WRIGHT PATTERSON	2940	72231	1058400	
AETC	WRIGHT PATTERSON	241	3367	86760	
AMC	WRIGHT PATTERSON	17	369	6120	
ACC	WRIGHT PATTERSON	15	446	5400	
		3213	76413	1156680	6.61%

Table C-3. Data From ACC and Evaluation Measure Scores

MAJCOM: ACC

AF Housing Budget= 110,000,000

Alternative Budgets

Alt 1	28,000,000
Alt 2	32,000,000
Alt 3	36,000,000
Alt 4	40,000,000
Alt 5	44,000,000
Alt 6	48,000,000
Alt 7	52,000,000

Execution Rate

% of FY97 Program Awarded by 31 Mar 97	% of FY96 Program Not Awarded by 30 Sep 96	% of FY95 Program Not Awarded by 30 Sep 96
100.00	27.00	0
Command Rate=		95

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 1	Bogey =28,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	8,515,000	65	65.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	9,671,111	64	64.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		27,986,111	204	152.00			0	0	0.00					

Alt 1 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		8,515,000	8,515,000	72	5.99	2.76	0.00	0	0	0.06	0	0	7.32	0.56
Offutt AFB		9,671,111	9,671,111	63	6.86	1.12	0.00	0	0	0.05	0	0	8.32	0.76
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	27,986,111	21,191,444	215	20.26	4.47	0.00	0				0	24.07	1.69

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 2	Bogey =32,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	11,790,000	90	90.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	10,426,667	69	69.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		32,016,666	234	182.00			0	0	0.00					

Alt 2 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		11,790,000	11,790,000	99	8.30	3.83	0.00	0	0	0.06	0	0	10.14	0.77
Offutt AFB		10,426,667	10,426,667	68	7.39	1.20	0.00	0	0	0.05	0	0	8.97	0.82
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	32,016,666	25,222,000	248	23.10	5.62	0.00	0				0	27.53	1.96

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 3	Bogey =36,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	12,576,000	96	96.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	10,880,000	72	72.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
	W/O-3A	2,720,000	18	18.00	78.00	12.70	0	0	0.00					
		13,600,000	90	90.00			0	0	0.00					
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		35,975,999	261	209.00			0	0	0.00					

Alt 3 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		12,576,000	12,576,000	106	8.85	4.08	0.00	0	0	0.06	0	0	10.82	0.82
Offutt AFB		10,880,000	10,880,000	71	7.71	1.26	0.00	0	0	0.05	0	0	11.70	1.07
		2,720,000	2,720,000	18	1.93	0.31								
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	35,975,999	29,181,333	275	25.90	6.24	0.00	0				0	30.94	2.26

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 4	Bogey =40,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	10,480,000	80	80.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	10,275,555	68	68.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
	W/O-3A	2,720,000	18	18.00	78.00	12.70	0	0	0.00					
		12,995,555	86	86.00			0	0	0.00					
Whiteman AFB	E/C-1	192,857	2	2.00	72.70	47.10	0	0	0.00	1296	1126	1.05	69.00	7.6
	E/C-2	2,121,429	22	22.00	72.70	47.10	0	0	0.00					
	E/C-3	1,157,143	12	12.00	72.70	47.10	0	0	0.00					
	E/C-4	3,278,571	34	34.00	72.70	47.10	0	0	0.00					
		6,750,000	70	70.00			0	0	0.00					
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		40,025,555	311	259.00			0	0	0.00					

Alt 4 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		10,480,000	10,480,000	88	7.37	3.40	0.00	0	0	0.06	0	0	9.01	0.68
Offutt AFB		10,275,555	10,275,555	67	7.29	1.19	0.00	0	0	0.05	0	0	11.18	1.02
		2,720,000	2,720,000	18	1.93	0.31								
Whiteman		192,857	192,857	2	0.13	0.08	0.00	0	0	0.13	2	0	5.80	0.32
		2,121,429	2,121,429	23	1.40	0.91								
		1,157,143	1,157,143	13	0.76	0.50								
		3,278,571	3,278,571	36	2.17	1.40								
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	40,025,555	33,230,889	327	28.46	8.38	0.00	0				0	34.42	2.40

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 5	Bogey =44,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	11,790,000	90	90.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	10,880,000	72	72.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
	W/O-3A	2,720,000	18	18.00	78.00	12.70	0	0	0.00					
		13,600,000	90	90.00			0	0	0.00					
Sey-John	3/D	1,210,000	11	11.00	88.00	11.30	0	0	0.00	1702	1690	0.86	53.00	14.71
	3/E	7,700,000	70	0.00	88.00	11.30	0	0	0.00					
		8,910,000	81	11.00			0	0	0.00					
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
(9,800,000)	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		44,099,999	336	214.00			0	0	0.00					

Alt 5 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		11,790,000	11,790,000	99	8.30	3.83	0.00	0	0	0.06	0	0	10.14	0.77
Offutt AFB		10,880,000	10,880,000	71	7.71	1.26	0.00	0	0	0.05	0	0	11.70	1.07
		2,720,000	2,720,000	18	1.93	0.31								
Sey-John		1,210,000	1,210,000	9	0.97	0.12	0.00	0	0	0.01	0	0	7.66	0.63
		7,700,000	0	60	6.16	0.79								
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	44,099,999	29,605,333	338	32.48	6.90	0.00	0				0	37.93	2.84

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 6	Bogey =48,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	13,100,000	100	100.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	11,333,333	75	75.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
	W/O-3A	2,720,000	18	18.00	78.00	12.70	0	0	0.00					
		14,053,333	93	93.00			0	0	0.00					
Sey-John AFB	3/D	1,210,000	11	11.00	88.00	11.30	0	0	0.00	1702	1690	0.86	53.00	14.71
	3/E	8,690,000	79	0.00	88.00	11.30	0	0	0.00					
	3/F	1,100,000	10	0.00	88.00	11.30	0	0	0.00					
		11,000,000	100	11.00			0	0	0.00					
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		47,953,333	368	227.00			0	0	0.00					

Alt 6 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB		13,100,000	13,100,000	110	9.22	4.25	0.00	0	0	0.06	0	0	11.27	0.85
Offutt AFB		11,333,333	11,333,333	74	8.04	1.31	0.00	0	0	0.05	0	0	12.09	1.10
		2,720,000	2,720,000	18	1.93	0.31								
Sey-John		1,210,000	1,210,000	9	0.97	0.12	0.00	0	0	0.01	0	0	9.46	0.78
		8,690,000	0	68	6.95	0.89								
		1,100,000	0	9	0.88	0.11								
Lajes AB		3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
		1,568,000	1,176,000	13	1.23	0.00								
		2,090,667	0	17	1.49	0.24								
		3,136,000	0	26	2.41	0.35								
	Totals	47,953,333	31,368,666	368	35.39	7.59	0.00	0				0	41.24	3.11

Table C-3. Data From ACC and Evaluation Measure Scores

ACC		Alternative 7	Bogey =52,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Minot AFB	1A/3DA	13,100,000	100	100.00	77.40	35.70	0	0	0.00	2592	2447	1.10	63.00	11.39
Offutt AFB	W/O-2	10,880,000	72	72.00	78.00	12.70	0	0	0.00	2750	2604	0.98	69.00	12.52
	W/O-3A	2,720,000	18	18.00	78.00	12.70	0	0	0.00					
		13,600,000	90	90.00			0	0	0.00					
Sey-John AFB	3/D	1,210,000	11	11.00	88.00	11.30	0	0	0.00	1702	1690	0.86	53.00	14.71
	3/E	8,690,000	79	0.00	88.00	11.30	0	0	0.00					
	3/F	1,100,000	10	0.00	88.00	11.30	0	0	0.00					
		11,000,000	100	11.00			0	0	0.00					
Whiteman AFB	E/C-1	192,857	2	2.00	72.70	47.10	0	0	0.00	1296	1126	1.05	69.00	7.6
	E/C-3	1,060,714	11	11.00	72.70	47.10	0	0	0.00					
	E/C-4	3,278,571	34	34.00	72.70	47.10	0	0	0.00					
		4,532,143	47	47.00			0	0	0.00					
Lajes AB	6/M	3,005,333	23	14.00	83.20	0.00	0	0	0.00	485	455	1.08	58.00	7.21
	6/N	1,568,000	12	9.00	86.20	0.00	0	0	0.00					
	3/G	2,090,667	16	0.00	78.60	12.40	0	0	0.00					
	3/H	3,136,000	24	0.00	84.60	12.40	0	0	0.00					
		9,800,000	75	23.00			0	0	0.00					
		52,032,142	412	271.00			0	0	0.00					

Table C-3. Data From ACC and Evaluation Measure Scores

Alt 7 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Minot AFB	13,100,000	13,100,000	110	9.22	4.25	0.00	0	0	0.06	0	0	11.27	0.85
Offutt AFB	10,880,000	10,880,000	71	7.71	1.26	0.00	0	0	0.05	0	0	11.70	1.07
	2,720,000	2,720,000	18	1.93	0.31								
Sey-John	1,210,000	1,210,000	9	0.97	0.12	0.00	0	0	0.01	0	0	9.46	0.78
	8,690,000	0	68	6.95	0.89								
	1,100,000	0	9	0.88	0.11								
Whiteman	192,857	192,857	2	0.13	0.08	0.00	0	0	0.13	2	0	3.90	0.22
	1,060,714	1,060,714	12	0.70	0.45								
	3,278,571	3,278,571	36	2.17	1.40								
Lajes AB	3,005,333	1,829,333	25	2.27	0.00	0.00	0	0	0.06	0	0	8.43	0.37
	1,568,000	1,176,000	13	1.23	0.00								
	2,090,667	0	17	1.49	0.24								
	3,136,000	0	26	2.41	0.35								
Totals	52,032,142	35,447,476	415	38.06	9.48	0.00	0				0	44.75	3.29

Table C-4. Data From AFMC and Evaluation Measure Scores

MAJCOM: AFMC

Housing Budget= 110,000,000

Alternative Budgets	
Alt 1	17,000,000
Alt 2	19,000,000
Alt 3	22,000,000
Alt 4	25,000,000
Alt 5	28,000,000
Alt 6	31,000,000
Alt 7	33,000,000

Execution Rate

% of FY97 Program Awarded by 31 Mar 97	% of FY96 Program Not Awarded by 30 Sep 96	% of FY95 Program Not Awarded by 30 Sep 96
100.00	0.00	23
Command Rate=		90.8

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 1	Bogey =17,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	250,000	1	1	75.00	13.00	48	48	0	2410.00	1,989	1.21	61.00	8.49
	2/I	4,490,000	19	19	82.00	13.00	20	20	0					
	2/J	260,000	1	1	69.00	13.00	0	0	0					
		5,000,000	21	21			68	68	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
		17,000,000	91	21			118	118	0					

Alt 1 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	250,000	250,000	1	0.17	0.03	68	68	0	0.17	2	0.00	4.13	0.24
	4,490,000	4,490,000	23	3.35	0.53								
	260,000	260,000	1	0.16	0.03								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Totals	17,000,000	5,000,000	92.61	11.89	1.70	118	118				0.00	14.03	0.72

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 2	Bogey =19,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	250,000	1	1	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
	2/I	6,490,000	28	28	82.00	13.00	27	27	0					
	2/J	260,000	1	1	69.00	13.00	0	0	0					
		7,000,000	30	30			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
		19,000,000	100	30			119	119	0					

Alt 2 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland		2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
		4,300,000	0	19	2.85	0.23								
Edwards		250,000	250,000	1	0.17	0.03	69	69	0	0.17	2	0.00	5.78	0.33
		6,490,000	6,490,000	34	4.84	0.77								
		260,000	260,000	1	0.16	0.03								
Wright-Patt		1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
		2,180,000	0	15	1.57	0.30								
		2,300,000	0	15	1.53	0.31								
	Totals	19,000,000	7,000,000	103.5	13.38	1.94	119	119				0.00	15.68	0.81

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 3	Bogey =22,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	750,000	3	3	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
	2/I	8,470,000	33	33	82.00	13.00	27	27	0					
	2/J	780,000	3	3	69.00	13.00	0	0	0					
		10,000,000	39	39			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
		22,000,000	109	39			119	119	0					

Alt 3 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	750,000	750,000	4	0.51	0.09	69	69	0	0.17	2	0.00	8.25	0.47
	8,470,000	8,470,000	40	6.31	1.00								
	780,000	780,000	4	0.49	0.09								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Totals	22,000,000	10,000,000	114.39	15.52	2.29	119	119				0.00	18.16	0.96

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 4	Bogey =25,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	250,000	1	1	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
	2/I	6,490,000	28	28	82.00	13.00	27	27	0					
	2/J	260,000	1	1	69.00	13.00	0	0	0					
		7,000,000	30	30			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
Eglin	2/A2	4,160,000	40	40	79.00	24.00	0	0	0	5057.00	1,892	0.86	69.00	11.28
	2/A3	1,840,000	16	16	78.00	24.00	0	0	0					
		6,000,000	56	56			0	0	0					
		25,000,000	156	86			119	119	0					

Alt 4 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	250,000	250,000	1	0.17	0.03	69	69	0	0.17	2	0.00	5.78	0.33
	6,490,000	6,490,000	34	4.84	0.77								
	260,000	260,000	1	0.16	0.03								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Eglin	4,160,000	4,160,000	34	2.99	0.91	0	0	0	0.63	10	0.00	4.95	0.42
	1,840,000	1,840,000	14	1.30	0.40								
Totals	25,000,000	13,000,000	151.66	17.67	3.25	119	119				0.00	20.64	1.24

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 5	Bogey =28,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	750,000	3	3	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
	2/I	8,470,000	33	33	82.00	13.00	27	27	0					
	2/J	780,000	3	3	69.00	13.00	0	0	0					
		10,000,000	39	39			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
Eglin	2/A2	4,160,000	40	40	79.00	24.00	0	0	0	5057.00	1,892	0.86	69.00	11.28
	2/A3	1,840,000	16	16	78.00	24.00	0	0	0					
		6,000,000	56	56			0	0	0					
		28,000,000	165	95			119	119	0					

Alt 5 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	750,000	750,000	4	0.51	0.09	69	69	0	0.17	2	0.00	8.25	0.47
	8,470,000	8,470,000	40	6.31	1.00								
	780,000	780,000	4	0.49	0.09								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Eglin	4,160,000	4,160,000	34	2.99	0.91	0	0	0	0.63	10	0.00	4.95	0.42
	1,840,000	1,840,000	14	1.30	0.40								
Totals	28,000,000	16,000,000	162.55	19.81	3.60	119	119				0.00	23.11	1.38

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 6	Bogey =31,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
6,400,000	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	750,000	3	3	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
10,000,000	2/I	8,470,000	33	33	82.00	13.00	27	27	0					
	2/J	780,000	3	3	69.00	13.00	0	0	0					
		10,000,000	39	39			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
5,600,000	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
Eglin	2/A2	5,900,000	56	56	79.00	24.00	0	0	0	5057.00	1,892	0.86	69.00	11.28
9,000,000	2/A3	3,100,000	30	30	78.00	24.00	0	0	0					
		9,000,000	86	86			0	0	0					
		31,000,000	195	125			119	119	0					

Alt 6 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	750,000	750,000	4	0.51	0.09	69	69	0	0.17	2	0.00	8.25	0.47
	8,470,000	8,470,000	40	6.31	1.00								
	780,000	780,000	4	0.49	0.09								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Eglin	5,900,000	5,900,000	48	4.24	1.29	0	0	0	0.63	10	0.00	7.43	0.64
	3,100,000	3,100,000	26	2.20	0.68								
Totals	31,000,000	19,000,000	188.35	21.95	4.26	119	119				0.00	25.59	1.59

Table C-4. Data From AFMC and Evaluation Measure Scores

AFMC		Alternative 7	Bogey =33,000,000											
Projects	Block/ Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kirtland	3/C	2,100,000	10	0	73.00	6.00	0	0	0	3747.00	2,035	0.96	73.00	6.49
6,400,000	3/E	4,300,000	20		73.00	6.00	0	0	0					
		6,400,000	30	0			0	0	0					
Edwards	2/A	750,000	3	3	75.00	13.00	42	42	0	2410.00	1,989	1.21	61.00	8.49
10,000,000	2/I	8,470,000	33	33	82.00	13.00	27	27	0					
	2/J	780,000	3	3	69.00	13.00	0	0	0					
		10,000,000	39	39			69	69	0					
Wright-Patt	4/Z	1,120,000	8	0	85.00	15.00	50	50	0	5422.00	2,359	0.96	62.00	6.61
5,600,000	4/B	2,180,000	16	0	79.00	15.00	0	0	0					
	4/G	2,300,000	16	0	73.00	15.00	0	0	0					
		5,600,000	40	0			50	50	0					
Eglin	2/A2	3,900,000	38	38	79.00	24.00	0	0	0	5057.00	1,892	0.86	69.00	11.28
6,000,000	2/A3	2,100,000	20	20	78.00	24.00	0	0	0					
		6,000,000	58	58			0	0	0					
Brooks	1	3,400,000	40	37	73.00	16.00	0	0	0	986.00	170	0.82	57.00	7.96
5,000,000	2	1,600,000	19	19	71.00	16.00	0	0	0					
		5,000,000	59	56			0	0	0					
		33,000,000	226	153			119	119	0					

Table C-4. Data From AFMC and Evaluation Measure Scores

Alt 7 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Kirtland	2,100,000	0	10	1.39	0.11	0	0	0	0.46	8	0.00	5.28	0.28
	4,300,000	0	19	2.85	0.23								
Edwards	750,000	750,000	4	0.51	0.09	69	69	0	0.17	2	0.00	8.25	0.47
	8,470,000	8,470,000	40	6.31	1.00								
	780,000	780,000	4	0.49	0.09								
Wright-Patt	1,120,000	0	8	0.87	0.15	50	50	0	0.56	10	0.00	4.62	0.21
	2,180,000	0	15	1.57	0.30								
	2,300,000	0	15	1.53	0.31								
Eglin	3,900,000	3,900,000	33	2.80	0.85	0	0	0	0.63	10	0.00	4.95	0.42
	2,100,000	2,100,000	17	1.49	0.46								
Brooks	3,400,000	3,145,000	33	2.26	0.49	0	0	0	0.83	10	0.00	4.13	0.21
	1,600,000	1,600,000	16	1.03	0.23								
Totals	33,000,000	20,745,000	212.65	23.10	4.33	119	119				0.00	27.24	1.59

Table C-5. Data From AETC and Evaluation Measure Scores

AJCOM: AETC

Total Housing Budget= 110,000,000

Alternative Bogeys	
Alt 1	14,000,000
Alt 2	16,000,000
Alt 3	18,000,000
Alt 4	20,000,000
Alt 5	22,000,000
Alt 6	24,000,000
Alt 7	26,000,000

% of FY97 Program Awarded by 31 Mar 97	% of FY96 Program Not Awarded by 30 Sep 96	% of FY95 Program Not Awarded by 30 Sep 96
100.00	0.00	0

Command Rate= 100

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 1	Bogey =14,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Tyndall	B/1-4	6,500,000	52	52	89.50	3.00	0	0	0	1490.00	1069	0.92	54.00	7.02
Maxwell	8/OO-RR	7,500,000	92	0	70.00	18.00	0	0	0	1870.00	957	0.88	72.00	6.23
	Totals	14,000,000	144	52			0	0	0					

Alt 1 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Tyndall		6,500,000	6,500,000	48	5.29	0.18	0	0	0	28.26	5.107383	0.00	5.91	0.22
Maxwell		7,500,000	0	81	4.77	1.23	0	0	0	48.82	9.735294	0.00	6.82	0.31
	Totals	14,000,000	6,500,000	128.8	10.06	1.40	0	0				0.00	12.73	0.53

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 2	Bogey =16,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Columbus	Mag/A, B	9,000,000	72	72	83.00	15.00	0	0	0	818.00	806	0.84	61.00	5.83
Lackland	3/C,D, G-J	7,000,000	54	54	80.00	0.00	0	0	0	1258.00	724	0.87	38.00	6.32
	Totals	16,000,000	126	126			0	0	0					

Alt 2 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Columbus	9,000,000	9,000,000	60	6.79	1.23	0	0	0	1.47	0	0.00	8.18	0.29
Lackland	7,000,000	7,000,000	47	5.09	0.00	0	0	0	42.45	8.300874	0.00	6.36	0.15
Totals	16,000,000	16,000,000	107.46	11.88	1.23	0	0				0.00	14.55	0.44

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 3	Bogey =18,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Keesler	S. PH JNCO	10,000,000	80	80	72.00	23.00	0	0	0	1931.00	1951	0.89	37.00	8.94
Luke	2/Cape hart	8,000,000	94	60	73.00	29.00	0	0	0	984.00	874	1.00	61.00	9.01
	Totals	18,000,000	174	140			0	0	0					

Alt 3 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Keesler		10,000,000	10,000,000	71	6.55	2.09	0	0	0	-1.04	0	0.00	9.09	0.30
Luke		8,000,000	5,106,383	94	5.31	2.11	0	0	0	11.18	1.265244	0.00	7.27	0.40
	Totals	18,000,000	15,106,383	165.2	11.85	4.20	0	0				0.00	16.36	0.70

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 4	Bogey =20,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Sheppard	3/A-F	7,000,000	52	52	71.00	33.00	0	0	0	1507.00	1287	0.90	30.00	6.27
Tyndall	A/6-10	7,000,000	56	56	86.00	8.00	0	0	0	1490.00	1069	0.92	54.00	7.02
Maxwell	2/DD,EE,HH	6,000,000	50	50	89.00	1.00	0	0	0	1870.00	957	0.88	72.00	6.23
	Totals	20,000,000	158	158			0	0	0					

Alt 4 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Sheppard		7,000,000	7,000,000	47	4.52	2.10	0	0	0	14.60	2.034672	0.00	6.36	0.12
Tyndall		7,000,000	7,000,000	52	5.47	0.51	0	0	0	28.26	5.107383	0.00	6.36	0.24
Maxwell		6,000,000	6,000,000	44	4.85	0.05	0	0	0	48.82	9.735294	0.00	5.45	0.24
	Totals	20,000,000	20,000,000	142	14.85	2.66	0	0	0			0.00	18.18	0.61

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 5	Bogey =22,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Columbus	Cap/G-K	12,000,000	96	48	80.50	26.00	0	0	0	818.00	806	0.84	61.00	5.83
Lackland	2/AA-FF	10,000,000	77	77	71.00	0.00	0	0	0	1258.00	724	0.87	38.00	6.32
	Totals	22,000,000	173	125			0	0	0					

Alt 5 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Columbus		12,000,000	6,000,000	81	8.78	2.84	0	0	0	1.47	0	0.00	10.91	0.39
Lackland		10,000,000	10,000,000	67	6.45	0.00	0	0	0	42.45	8.300874	0.00	9.09	0.22
	Totals	22,000,000	16,000,000	147.63	15.24	2.84	0	0				0.00	20.00	0.61

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 6	Bogey =24,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Keesler	S.Hars JNCO	10,000,000	80	80	76.00	14.00	40	40	0	1931.00	1951	0.89	37.00	8.94
Sheppard	3/A-F	8,000,000	60	20	71.00	33.00	0	0	0	1507.00	1287	0.90	30.00	6.27
Luke	3-Apr	6,000,000	70	20	73.00	14.00	10	10	0	984.00	874	1.00	61.00	9.01
	Totals	24,000,000	210	120			50	50	0					

Alt 6 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Keesler		10,000,000	10,000,000	71	6.91	1.27	40	40	0	-1.04	0	0.00	9.09	0.30
Sheppard		8,000,000	2,666,667	54	5.16	2.40	0	0	0	14.60	2.034672	0.00	7.27	0.14
Luke		6,000,000	1,714,286	70	3.98	0.76	10	10	0	11.18	1.265244	0.00	5.45	0.30
	Totals	24,000,000	14,380,952	195	16.05	4.44	50	50	0			0.00	21.82	0.74

Table C-5. Data From AETC and Evaluation Measure Scores

AETC		Alternative 7	Bogey =26,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Kessler	OakP/JNCO	26,000,000	238	238	60.00	37.00	30	30	0	1931.00	1951	0.89	37.00	8.94

Alt 7 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Keesler	26,000,000	26,000,000	212	14.18	8.75	30	30	0	-1.04	0	0.00	23.64	0.78

Table C-6. Data From AFSPC

MAJCOM: AFSPC

Total Housing Budget= 110,000,000

% of FY97 Program Awarded by 31 Mar 97	% of FY96 Program Not Awarded by 30 Sep 96	% of FY95 Program Not Awarded by 30 Sep 96
64.00	14.00	0

Alternative Budgets

Alt 1	17,000,000
Alt 2	19,000,000
Alt 3	22,000,000
Alt 4	25,000,000
Alt 5	28,000,000
Alt 6	31,000,000
Alt 7	33,000,000

Command Rate= 61.2

Table C-6. Data From AFSPC

AFSPC		Alternative 1	Bogey =17,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107			0	0	0					

Alt 1 Scores		Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg		2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
		9,759,000	9,759,000	78	7.54	0.10								
		5,217,000	5,217,000	39	4.03	0.05								
	Totals	17,000,000	17,000,000	134	12.99	0.17	0	0				0.00	9.46	1.30

Table C-6. Data From AFSPC

AFSPC		Alternative 2	Bogey =19,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	2,000,000	10	10	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		19,000,000	117	117			0	0	0					

Alt 2 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	2,000,000	2,000,000	12	1.33	0.20	0	0	0	0.03	0	0.00	1.11	0.11
Totals	19,000,000	19,000,000	145	14.32	0.38	0	0				0.00	10.57	1.41

Table C-6. Data From AFSPC

AFSPC		Alternative 3	Bogey =22,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	5,000,000	24	24	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		22,000,000	131	131			0	0	0					

Alt 3 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	5,000,000	5,000,000	28	3.32	0.51	0	0	0	0.03	0	0.00	2.78	0.27
Totals	22,000,000	22,000,000	162	16.31	0.68	0	0				0.00	12.24	1.57

Table C-6. Data From AFSPC

AFSPC		Alternative 4	Bogey =25,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	8,000,000	40	40	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		25,000,000	147	147			0	0	0					

Alt 4 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	8,000,000	8,000,000	46	5.31	0.82	0	0	0	0.03	0	0.00	4.45	0.42
Totals	25,000,000	25,000,000	180	18.30	0.99	0	0				0.00	13.91	1.73

Table C-6. Data From AFSPC

AFSPC		Alternative 5		Bogey =28,000,000										
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	11,000,000	55	55	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		28,000,000	162	162			0	0	0					

Alt 5 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	11,000,000	11,000,000	64	7.30	1.12	0	0	0	0.03	0	0.00	6.12	0.58
Totals	28,000,000	28,000,000	198	20.29	1.29	0	0	0	0.03	0	0.00	15.58	1.89

Table C-6. Data From AFSPC

AFSPC		Alternative 6	Bogey =31,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	14,000,000	70	70	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		31,000,000	177	177			0	0	0					

Alt 6 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	14,000,000	14,000,000	81	9.29	1.43	0	0	0	0.03	0	0.00	7.79	0.74
Totals	31,000,000	31,000,000	215	22.28	1.60	0	0				0.00	17.25	2.05

Table C-6. Data From AFSPC

AFSPC		Alternative 7	Bogey =33,000,000											
Projects	Block/Type	Cost	Units Revitalized or Added	JNCO units in Project	Facility Assessment Score	% of Useful Life Remaining	Surplus Units in Project	Surplus Units Reduced	Deficit Units Reduced	Units Required	Units in Inventory	Area Cost Factor	% Accmp	TDY Rate
Vandenberg	1/1	2,024,000	14	14	77.00	1.11	0	0	0	2077.00	2076	1.25	62.00	13.59
	1/2	9,759,000	62	62	85.00	1.11								
	1/3	5,217,000	31	31	85.00	1.11								
		17,000,000	107	107										
Malmstrom	1/A	16,000,000	80	80	73.00	11.22	0	0	0	1451.00	1406	1.16	57.00	10.25
		33,000,000	187	187			0	0	0					

Alt 7 Scores	Cost	Amount for JNCO Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Unis Reduced	Deficit Units Reduced	Existing % Deficit	Deficit Factor	Deficit Score	Execution Rate	TDY Rate
Vandenberg	2,024,000	2,024,000	18	1.42	0.02	0	0	0	0.00	0	0.00	9.46	1.30
	9,759,000	9,759,000	78	7.54	0.10								
	5,217,000	5,217,000	39	4.03	0.05								
Malmstrom	16,000,000	16,000,000	93	10.62	1.63	0	0	0	0.03	0	0.00	8.90	0.85
Totals	33,000,000	33,000,000	227	23.61	1.80	0	0				0.00	18.36	2.15

Appendix D : Mathcad Program for Developing Strategies

The matrix ***combo*** is the size of the programs in Millions that each MAJCOM is submitting data for. ACC is col 1, AFMC is col 2, AFSPC is col 3, and AETC is col 4.

$$Combo := \begin{bmatrix} 28 & 17 & 17 & 14 \\ 32 & 19 & 19 & 16 \\ 36 & 22 & 22 & 18 \\ 40 & 25 & 25 & 20 \\ 44 & 28 & 28 & 22 \\ 48 & 31 & 31 & 24 \\ 52 & 33 & 33 & 26 \end{bmatrix}$$

The function Strategy(A) is a program that takes a matrix for the argument, and returns a matrix for the result. Four nested for loops index the rows of the input matrix, and an if statement tests to see if the four elements passed to it are equal to the budget amount (110M). If they are, the element contents are stored in a row of the output matrix.

```
Strategy(A) := | x ← 1
               | for a ∈ 1..7
               |   for b ∈ 1..7
               |     for c ∈ 1..7
               |       for d ∈ 1..7
               |         if A_{a,1} + A_{b,2} + A_{c,3} + A_{d,4} = 110
               |           | B_{x,1} ← A_{a,1}
               |           | B_{x,2} ← A_{b,2}
               |           | B_{x,3} ← A_{c,3}
               |           | B_{x,4} ← A_{d,4}
               |           | x ← x + 1
               | B
```

The matrix ***Strategy*** contains the possible combinations for allocating a $110M budget when the following constraints are applied:

- each MAJCOM must have one and only one bogey.
- the total of the 4 bogeys must equal the budget, which is 110M.

There are 87 strategies that equal 110M, so each strategy must be scored to see which provides the highest value. The matrix *Strategy* is shown on the next page. Due to the length of the matrix, it is broken into three parts.

Strategy (Combo) =

	1	2	3	4
1	28	25	31	26
2	28	25	33	24
3	28	28	28	26
4	28	31	25	26
5	28	31	31	20
6	28	31	33	18
7	28	33	25	24
8	28	33	31	18
9	28	33	33	16
10	32	19	33	26
11	32	25	31	22
12	32	25	33	20
13	32	28	28	22
14	32	31	25	22
15	32	31	31	16
16	32	31	33	14
17	32	33	19	26
18	32	33	25	20
19	32	33	31	14
20	36	17	31	26
21	36	17	33	24
22	36	19	31	24
23	36	19	33	22
24	36	22	28	24
25	36	25	25	24
26	36	25	31	18
27	36	25	33	16
28	36	28	22	24
29	36	28	28	18

Strategy (Combo) =

	1	2	3	4
30	36	31	17	26
31	36	31	19	24
32	36	31	25	18
33	36	33	17	24
34	36	33	19	22
35	36	33	25	16
36	40	17	31	22
37	40	17	33	20
38	40	19	25	26
39	40	19	31	20
40	40	19	33	18
41	40	22	22	26
42	40	22	28	20
43	40	25	19	26
44	40	25	25	20
45	40	25	31	14
46	40	28	22	20
47	40	28	28	14
48	40	31	17	22
49	40	31	19	20
50	40	31	25	14
51	40	33	17	20
52	40	33	19	18
53	44	17	25	24
54	44	17	31	18
55	44	17	33	16
56	44	19	25	22
57	44	19	31	16
58	44	19	33	14

Strategy (Combo) =

	1	2	3	4
59	44	22	22	22
60	44	22	28	16
61	44	25	17	24
62	44	25	19	22
63	44	25	25	16
64	44	28	22	16
65	44	31	17	18
66	44	31	19	16
67	44	33	17	16
68	44	33	19	14
69	48	17	19	26
70	48	17	25	20
71	48	17	31	14
72	48	19	17	26
73	48	19	19	24
74	48	19	25	18
75	48	22	22	18
76	48	25	17	20
77	48	25	19	18
78	48	31	17	14
79	52	17	17	24
80	52	17	19	22
81	52	17	25	16
82	52	19	17	22
83	52	19	19	20
84	52	19	25	14
85	52	22	22	14
86	52	25	17	16
87	52	25	19	14

Appendix E : Evaluation Measure Totals for Each Strategy

The evaluation measure totals for each of the MAJCOM's bogeys are shown in table E-1. The bogeys are assembled into strategies, and the 87 combinations of bogeys that make up the strategies are shown in table E-2.

Table E-1. Evaluation Measure Totals for the MAJCOM's Bogeys

Summary of Totals for MAJCOM Bogeys										
	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #1	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,986,111	91,191,144	794	74	18.1	149.0	149	0	86	5.8
	% JNCO =	82.91				%Reduced=	100.00			

Strategy #2	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,986,111	81,572,096	789	78	14.0	169.0	169	0	85	5.8
	% JNCO =	74.17				%Reduced=	100.00			

Strategy #3	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,986,111	91,191,144	788	75	18.1	149.0	149	0	86	5.7
	% JNCO =	82.91				%Reduced=	100.00			

Strategy #4	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,986,111	91,191,144	795	75	18.5	149.0	149	0	87	5.8
	% JNCO =	82.91				%Reduced=	100.00			

Strategy #5	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	109,986,111	91,191,144	760	79	13.0	119.0	119	0	85	5.9
	% JNCO =	82.91				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #6	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,986,111	88,297,527	795	78	14.7	119.0	119	0	84	6.1
	% JNCO =	80.28				%Reduced=	100.00			

Strategy #7	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,986,111	81,317,096	803	78	14.2	169.0	169	0	87	5.8
	% JNCO =	73.93				%Reduced=	100.00			

Strategy #8	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,986,111	88,042,527	808	77	14.6	119.0	119	0	85	6.0
	% JNCO =	80.05				%Reduced=	100.00			

Strategy #9	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=28	27,986,111	21,191,144	215	20	4.47	0.00	0.00	0	24	1.69
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	109,986,111	90,936,144	762	79	11.8	119.0	119	0	84	5.9
	% JNCO =	82.68				%Reduced=	100.00			

Strategy #10	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	110,016,666	91,222,000	791	74	18.1	149.0	149	0	85	5.7
	% JNCO =	82.92				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #11	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,016,666	85,222,000	763	78	13.3	119.0	119	0	85	5.9
	% JNCO =	77.46				%Reduced=	100.00			

Strategy #12	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,016,666	91,222,000	769	79	13.3	119.0	119	0	85	6.0
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #13	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,016,666	85,222,000	757	78	13.4	119.0	119	0	86	5.8
	% JNCO =	77.46				%Reduced=	100.00			

Strategy #14	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,016,666	85,222,000	764	79	13.7	119.0	119	0	87	5.9
	% JNCO =	77.46				%Reduced=	100.00			

Strategy #15	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,016,666	91,222,000	758	79	12.7	119.0	119	0	85	6.0
	% JNCO =	82.92				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #16	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,016,666	83,722,000	792	79	13.1	119.0	119	0	84	6.2
	% JNCO =	76.10				%Reduced=	100.00			

Strategy #17	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	110,016,666	90,967,000	818	75	19.1	149.0	149	0	89	5.7
	% JNCO =	82.68				%Reduced=	100.00			

Strategy #18	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,016,666	90,967,000	783	79	13.6	119.0	119	0	87	5.9
	% JNCO =	82.68				%Reduced=	100.00			

Strategy #19	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=32	32,016,666	25,222,000	248	23.1	5.62	0.00	0	0	27.53	1.96
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,016,666	83,467,000	805	79	13.0	119.0	119	0	85	6.1
	% JNCO =	75.87				%Reduced=	100.00			

Strategy #20	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,975,999	91,181,333	795	74	18.3	148.0	148	0	86	5.8
	% JNCO =	82.91				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #21	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	790	77	14.2	168.0	168	0	85	5.9
	% JNCO =	74.16				%Reduced=	100.00			

Strategy #22	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	789	78	14.2	169.0	169	0	86	5.9
	% JNCO =	74.16				%Reduced=	100.00			

Strategy #23	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	109,975,999	85,181,333	754	78	12.8	119.0	119	0	85	5.8
	% JNCO =	77.45				%Reduced=	100.00			

Strategy #24	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	782	78	14.3	169.0	169	0	87	5.9
	% JNCO =	74.16				%Reduced=	100.00			

Strategy #25	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	802	78	14.9	169.0	169	0	87	6.0
	% JNCO =	74.16				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #26	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,975,999	88,287,716	807	78	15.3	119.0	119	0	85	6.3
	% JNCO =	80.28				%Reduced=	100.00			

Strategy #27	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	109,975,999	91,181,333	761	79	12.5	119.0	119	0	84	6.1
	% JNCO =	82.91				%Reduced=	100.00			

Strategy #28	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	795	78	15.0	169.0	169	0	88	6.0
	% JNCO =	74.16				%Reduced=	100.00			

Strategy #29	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,975,999	88,287,716	801	78	15.3	119.0	119	0	86	6.2
	% JNCO =	80.28				%Reduced=	100.00			

Strategy #30	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,975,999	91,181,333	809	75	19.4	149.0	149	0	90	5.9
	% JNCO =	82.91				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #31	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,562,285	803	78	15.3	169.0	169	0	89	6.0
	% JNCO =	74.16				%Reduced=	100.00			

Strategy #32	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,975,999	88,287,716	808	78	15.7	119.0	119	0	87	6.3
	% JNCO =	80.28				%Reduced=	100.00			

Strategy #33	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,975,999	81,307,285	817	78	15.2	169.0	169	0	89	5.9
	% JNCO =	73.93				%Reduced=	100.00			

Strategy #34	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	109,975,999	84,926,333	781	79	13.8	119.0	119	0	89	5.9
	% JNCO =	77.22				%Reduced=	100.00			

Strategy #35	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=36	35,975,999	29,181,333	275	25.9	6.24	0.00	0	0	30.94	2.26
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	109,975,999	90,926,333	775	79	12.8	119.0	119	0	87	6.0
	% JNCO =	82.68				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #36	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,025,555	85,230,889	783	78	14.5	118.0	118	0	86	5.8
	% JNCO =	77.46				%Reduced=	100.00			

Strategy #37	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	789	79	14.5	118.0	118	0	85	5.9
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #38	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	110,025,555	91,230,889	823	74	20.1	149.0	149	0	88	5.7
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #39	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	788	79	14.6	119.0	119	0	86	5.9
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #40	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	110,025,555	88,337,272	823	77	16.3	119.0	119	0	85	6.1
	% JNCO =	80.29				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #41	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	110,025,555	91,230,889	815	74	20.1	149.0	149	0	88	5.7
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #42	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	781	79	14.6	119.0	119	0	86	5.9
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #43	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	110,025,555	91,230,889	836	75	20.8	149.0	149	0	89	5.8
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #44	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	801	79	15.3	119.0	119	0	87	6.0
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #45	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,025,555	83,730,889	823	78	14.6	119.0	119	0	85	6.2
	% JNCO =	76.10				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #46	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	794	79	15.3	119.0	119	0	88	6.0
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #47	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,025,555	83,730,889	817	79	14.7	119.0	119	0	86	6.2
	% JNCO =	76.10				%Reduced=	100.00			

Strategy #48	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,025,555	85,230,889	797	79	15.7	119.0	119	0	89	5.9
	% JNCO =	77.46				%Reduced=	100.00			

Strategy #49	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	91,230,889	802	80	15.7	119.0	119	0	89	6.0
	% JNCO =	82.92				%Reduced=	100.00			

Strategy #50	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,025,555	83,730,889	824	79	15.0	119.0	119	0	87	6.3
	% JNCO =	76.10				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #51	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,025,555	90,975,889	816	79	15.5	119.0	119	0	89	5.9
	% JNCO =	82.69				%Reduced=	100.00			

Strategy #52	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=40	40,025,555	33,230,889	327	28.46	8.38	0.00	0	0	34.42	2.40
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	110,025,555	88,082,272	850	78	17.3	119.0	119	0	89	6.1
	% JNCO =	80.06				%Reduced=	100.00			

Strategy #53	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	110,099,999	73,986,285	806	79	14.0	168.0	168	0	88	6.0
	% JNCO =	67.20				%Reduced=	100.00			

Strategy #54	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	110,099,999	80,711,716	811	79	14.4	118.0	118	0	86	6.3
	% JNCO =	73.31				%Reduced=	100.00			

Strategy #55	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	765	80	11.6	118.0	118	0	85	6.2
	% JNCO =	75.94				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #56	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,099,999	77,605,333	770	79	12.7	119.0	119	0	88	6.0
	% JNCO =	70.49				%Reduced=	100.00			

Strategy #57	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	764	80	11.7	119.0	119	0	85	6.1
	% JNCO =	75.94				%Reduced=	100.00			

Strategy #58	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=33	33,000,000	33,000,000	227	23.61	1.80	0.00	0	0	18.36	2.15
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,099,999	76,105,333	798	80	12.0	119.0	119	0	85	6.3
	% JNCO =	69.12				%Reduced=	100.00			

Strategy #59	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,099,999	77,605,333	762	80	12.7	119.0	119	0	88	6.0
	% JNCO =	70.49				%Reduced=	100.00			

Strategy #60	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=28	28,000,000	28,000,000	198	20.29	1.29	0.00	0	0	15.58	1.89
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	757	80	11.7	119.0	119	0	86	6.1
	% JNCO =	75.94				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #61	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	110,099,999	73,986,285	819	79	14.8	169.0	169	0	90	6.1
	% JNCO =	67.20				%Reduced=	100.00			

Strategy #62	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,099,999	77,605,333	783	80	13.4	119.0	119	0	89	6.1
	% JNCO =	70.49				%Reduced=	100.00			

Strategy #63	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	777	80	12.4	119.0	119	0	87	6.3
	% JNCO =	75.94				%Reduced=	100.00			

Strategy #64	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=28	28,000,000	16,000,000	163	19.81	3.60	119.00	119	0	23.11	1.38
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	770	80	12.4	119.0	119	0	88	6.2
	% JNCO =	75.94				%Reduced=	100.00			

Strategy #65	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	110,099,999	80,711,716	825	79	15.5	119.0	119	0	89	6.4
	% JNCO =	73.31				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #66	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,605,333	778	81	12.8	119.0	119	0	89	6.3
	% JNCO =	75.94				%Reduced=	100.00			

Strategy #67	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,099,999	83,350,333	792	80	12.6	119.0	119	0	89	6.2
	% JNCO =	75.70				%Reduced=	100.00			

Strategy #68	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=44	44,099,999	29,605,333	338	32.48	6.90	0.00	0	0	37.93	2.84
AFMC=33	33,000,000	20,745,000	213	23.1	4.33	119.00	119	0	27.24	1.59
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,099,999	75,850,333	825	80	13.0	119.0	119	0	88	6.4
	% JNCO =	68.89				%Reduced=	100.00			

Strategy #69	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,953,333	81,368,666	818	76	18.4	148.0	148	0	89	6.0
	% JNCO =	74.00				%Reduced=	100.00			

Strategy #70	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	109,953,333	81,368,666	783	80	12.9	118.0	118	0	87	6.2
	% JNCO =	74.00				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #71	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=31	31,000,000	31,000,000	215	22.28	1.60	0.00	0	0	17.25	2.05
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	109,953,333	73,868,666	805	80	12.3	118.0	118	0	85	6.4
	% JNCO =	67.18				%Reduced=	100.00			

Strategy #72	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=26	26,000,000	26,000,000	212	14.18	8.75	30.00	30	0	23.64	0.78
Totals	109,953,333	81,368,666	818	76	18.5	149.0	149	0	90	6.0
	% JNCO =	74.00				%Reduced=	100.00			

Strategy #73	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	109,953,333	71,749,618	812	79	14.4	169.0	169	0	89	6.1
	% JNCO =	65.25				%Reduced=	100.00			

Strategy #74	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,953,333	78,475,049	817	79	14.7	119.0	119	0	87	6.4
	% JNCO =	71.37				%Reduced=	100.00			

Strategy #75	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,953,333	78,475,049	809	79	14.8	119.0	119	0	88	6.3
	% JNCO =	71.37				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #76	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	109,953,333	81,368,666	796	81	13.7	119.0	119	0	90	6.3
	% JNCO =	74.00				%Reduced=	100.00			

Strategy #77	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=18	18,000,000	15,106,383	165	11.85	4.20	0.00	0	0	16.36	0.70
Totals	109,953,333	78,475,049	830	79	15.4	119.0	119	0	89	6.5
	% JNCO =	71.37				%Reduced=	100.00			

Strategy #78	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=48	47,953,333	31,368,666	368	35.39	7.59	0.00	0	0	41.24	3.11
AFMC=31	31,000,000	19,000,000	188	21.95	4.26	119.00	119	0	25.59	1.59
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	109,953,333	73,868,666	819	80	13.4	119.0	119	0	89	6.5
	% JNCO =	67.18				%Reduced=	100.00			

Strategy #79	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=24	24,000,000	14,380,952	195	16.05	4.44	50.00	50	0	21.82	0.74
Totals	110,032,142	71,828,428	837	79	15.8	168.0	168	0	90	6.1
	% JNCO =	65.28				%Reduced=	100.00			

Strategy #80	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,032,142	75,447,476	801	80	14.4	118.0	118	0	89	6.0
	% JNCO =	68.57				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #81	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=17	17,000,000	5,000,000	93	11.89	1.70	118.00	118	0	14.03	0.72
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,032,142	81,447,476	795	80	13.4	118.0	118	0	87	6.2
	% JNCO =	74.02				%Reduced=	100.00			

Strategy #82	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=22	22,000,000	16,000,000	148	15.24	2.84	0.00	0	0	20	0.61
Totals	110,032,142	75,447,476	801	80	14.4	119.0	119	0	90	6.0
	% JNCO =	68.57				%Reduced=	100.00			

Strategy #83	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=20	20,000,000	20,000,000	142	14.85	2.66	0.00	0	0	18.18	0.61
Totals	110,032,142	81,447,476	806	81	14.5	119.0	119	0	89	6.1
	% JNCO =	74.02				%Reduced=	100.00			

Strategy #84	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=19	19,000,000	7,000,000	104	13.38	1.94	119.00	119	0	15.68	0.81
AFSPC=25	25,000,000	25,000,000	180	18.3	0.99	0.00	0	0	13.91	1.73
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,032,142	73,947,476	828	80	13.8	119.0	119	0	87	6.4
	% JNCO =	67.21				%Reduced=	100.00			

Strategy #85	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=22	22,000,000	10,000,000	114	15.52	2.29	119.00	119	0	18.16	0.96
AFSPC=22	22,000,000	22,000,000	162	16.31	0.68	0.00	0	0	12.24	1.57
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,032,142	73,947,476	820	80	13.9	119.0	119	0	88	6.4
	% JNCO =	67.21				%Reduced=	100.00			

Table E-2. Evaluation Measure Totals for Each Strategy

Strategy #86	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=17	17,000,000	17,000,000	134	12.99	0.17	0.00	0	0	9.46	1.30
AETC=16	16,000,000	16,000,000	107	11.88	1.23	0.00	0	0	14.55	0.44
Totals	110,032,142	81,447,476	808	81	14.1	119.0	119	0	89	6.3
	% JNCO =	74.02				%Reduced=	100.00			

Strategy #87	Cost	Amount for Junior Enlisted Units	Number of Units Score	Deficient Housing Score	Useful Life Remaining	Surplus Units in Projects	Surplus Units Reduced	Weighted Deficit Score	Execution Rate	TDY Rate
ACC=52	52,032,142	35,447,476	415	38.06	9.48	0.00	0	0	44.75	3.29
AFMC=25	25,000,000	13,000,000	152	17.67	3.25	119.00	119	0	20.64	1.24
AFSPC=19	19,000,000	19,000,000	145	14.32	0.38	0.00	0	0	10.57	1.41
AETC=14	14,000,000	6,500,000	129	10.06	1.40	0.00	0	0	12.73	0.53
Totals	110,032,142	73,947,476	841	80	14.5	119.0	119	0	89	6.5
	% JNCO =	67.21				%Reduced=	100.00			

Appendix F : DPL Model

Figure F-1 shows the DPL influence diagram for this model. The decision block Which Strategy? defines the states for each strategy. The first column of eight value nodes (rounded rectangles) contains the scores derived from the raw data, one node for each measurable objective. The second column of eight value nodes takes the scores as inputs and converts them into values. The value function formulas are contained in these nodes. The last column of eight value nodes contains the weights assigned to each of the measurable objectives. The additive value function is in the Total Value node. The input for the additive value function is the weight and value for each objective.

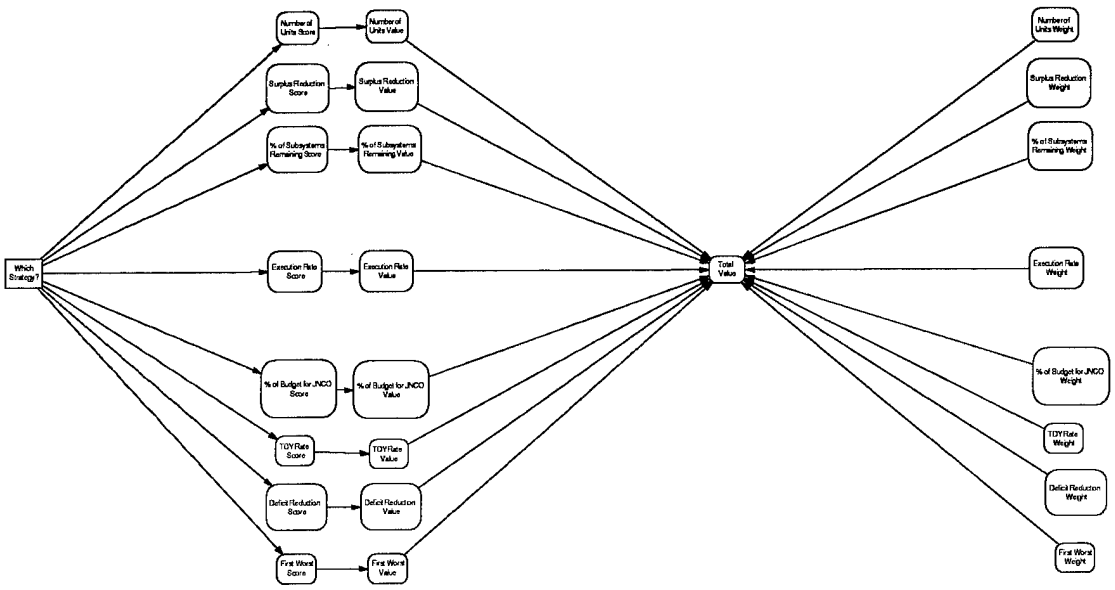

Figure F-1. DPL Influence Diagram

Decision: Which Strategy?

The Which Strategy? node is the only decision node in the model. A state is defined within this node for each of the strategies that are being considered. For this analysis, the top five strategies and the status quo strategy were being analyzed; therefore, a total of six states were defined.

Value: Avg Cost/Unit Score

The average cost score for each of the six strategies is entered in this node.

Value: Surplus Reduction Score

The surplus reduction score for each of the six strategies is entered in this node.

Value: % of Subsystems Remaining Score

The percent of useful life remaining for the utility and structural subsystems score for each of the six strategies is entered in this node.

Value: Execution Rate Score

The execution rate score for each of the six strategies is entered in this node.

Value: % of Budget for JNCO Score

The percent of the budget for JNCO units score for each of the six strategies is entered in this node.

Value: TDY Rate Score

The TDY rate score for each of the six strategies is entered in this node.

Value: Deficit Reduction Score

The deficit reduction score for each of the six strategies is entered in this node.

Value: Worst First Score

The fix the worst units first score for each of the six strategies is entered in this node.

Value: Avg Cost/Unit Value

This node contains the average cost value function.

@if(Avg_Cost_Unit_Score<75000,1,@if(Avg_Cost_Unit_Score<165000,1.83333-.00001111*Avg_Cost_Unit_Score,0))

Value: Surplus Reduction Value

This node contains the surplus reduction value function.

.01*Surplus_Reduction_Score

Value: % of Subsystems Remaining Value

This node contains the percent of useful life remaining for structural and utility subsystems value function. @if(N_of_Subsystems_Remaining_Score<25,1-.004*N_of_Subsystems_Remaining_Score,@if(N_of_Subsystems_Remaining_Score<75,1.3-.016*N_of_Subsystems_Remaining_Score,.4-.004*N_of_Subsystems_Remaining_Score))

Value: Execution Rate Value

This node contains the execution rate value function.

@if(Execution_Rate_Score<75,0,@if(Execution_Rate_Score<90,-1.25+.01667*Execution_Rate_Score,-6.5+.075*Execution_Rate_Score))

Value: % of Budget for JNCO Value

This node contains the percent of budget for JNCO units value function.

@if(N_of_Budget_for_JNCO_Score<75,0,@if(N_of_Budget_for_JNCO_Score<95,-3.75+.05*N_of_Budget_for_JNCO_Score,1))

Value: TDY Rate Value

This node contains the TDY rate value function.

@if(TDY_Rate_Score<4,0,@if(TDY_Rate_Score<10,-.6667+.1667*TDY_Rate_Score,1))

Value: Deficit Reduction Score

This node contains the TDY rate value function.

@if(Deficit_Reduction_Score<375,.002667*Deficit_Reduction_Score,1)

Value: Worst First Score

This node contains the fix worst units first value function. @if(Worst _First _Score<70,0,-2.333+.03333* Worst_First _Score)

Value: Total Value

This node contains the additive value function for calculating the overall value of a strategy.

Avg_Cost_Unit_Value*Avg_Cost_Unit_Weight+Deficit_Reduction_Value*Deficit_Reduction_Weight+Execution_Rate_Value*Execution_Rate_Weight+ Worst_First_ Value* Worst_First_Weight+N_of_Budget_for_JNCO_Value*N_of_Budget_for_JNCO_Weight+N_of_Subsystems_Remaining_Value*N_of_Subsystems_Remaining_Weight+Surplus_Reduction_Value*Surplus_Reduction_Weight+TDY_Rate_Value*TDY_Rate_Weight

Value: Avg Cost/Unit Weight

Weight assigned to the minimize the average cost per unit objective.

Value: Surplus Reduction Weight

Weight assigned to the maximize the percent of surplus units reduced objective.

Value: % of Subsystems Remaining Weight

Weight assigned to the minimize the percent of useful life remaining in the utility and structural subsystems objective.

Value: Execution Rate Weight

Weight assigned to the maximize the execution rate objective.

Value: % of Budget for JNCO Weight

Weight assigned to the maximize the percent of budget spent on JNCO units objective.

Value: TDY Rate Weight

Weight assigned to the maximize the budget spent at high TDY rate bases objective.

Value: Deficit Reduction Weight

Weight assigned to the maximize the deficit reduction objective.

Value: Worst First Weight

Weight assigned to the fix the worst units first objective.

Appendix G : Logical Decisions Model

Logical Decisions is a software package that ranks alternatives using decision analysis techniques. Four types of objects are used to structure a decision (Logical Decisions, 1997:15):

- Alternatives; the objects that are to be ranked.
- Measures; the variables that quantify the alternatives.
- Goals; goals hold the measures or lower level goals. They are not directly quantified, rather the value for a goal is inferred from the values assigned to the measures under the goal.
- Preference Sets; they contain the decision maker's judgments for converting the measures into values, and the weights for trading off the measures under a goal.

Logical Decisions organizes the goals and measures in a way that resembles the value hierarchy. Figure G-1 shows the hierarchy with the assigned weights. The higher level objectives are in the rectangular boxes, and the measurable objectives are in ovals. The weights assigned to the measurable objectives are shown along with the effective weights for the objectives above each measurable objective. Value functions are defined for each measurable objective, and scores for the measurable objectives are entered for each alternative. Table G-1 shows the parameters for each of the value functions.

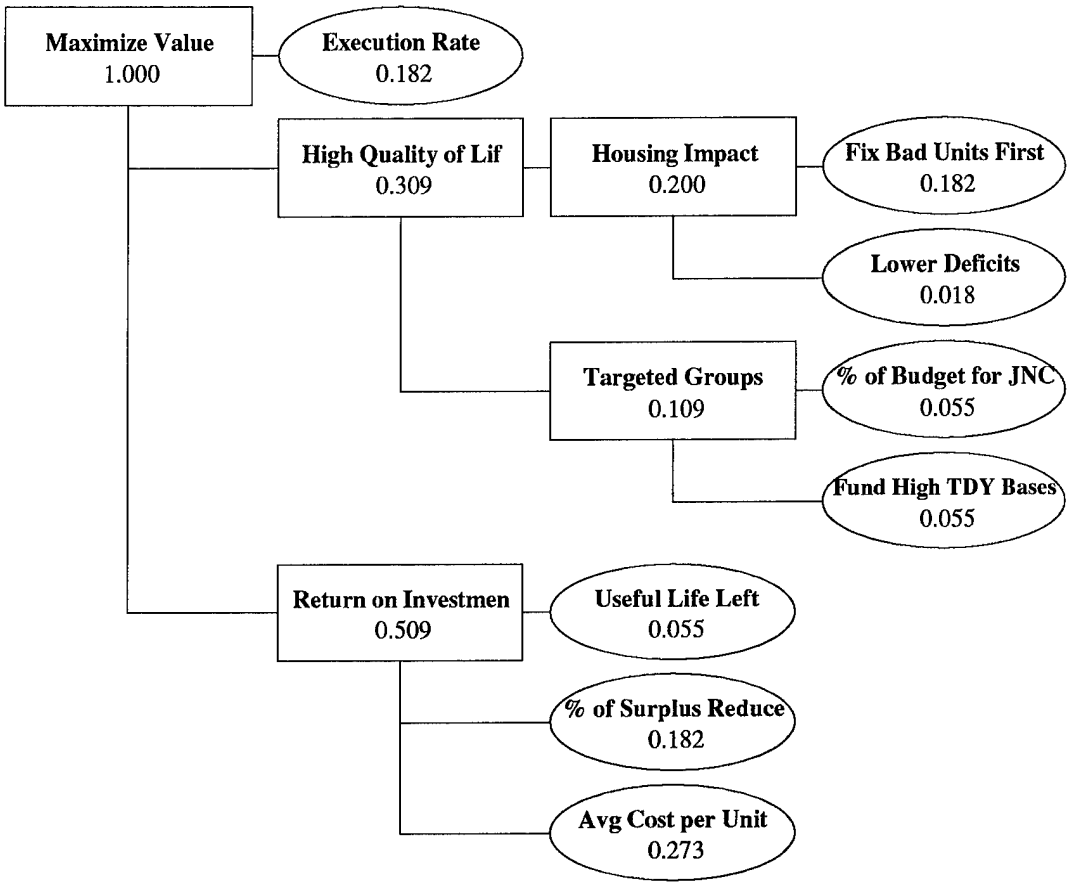

Figure G-1. Logical Decisions Hierarchy and Weights

Table G-1. Parameters for the Value Functions

Range		Midpoint		SUF Parameters		
Minimum	Maximum	Level	Utility	a	b	c
Useful Life Left						
0	25	12.5	0.95	1	-0.004	0
25	75	50	0.5	1.3	-0.016	0
75	100	87.5	0.05	0.4	-0.004	0
% of Budget for JNC						
75	95	85	0.5	-3.75	0.05	0
50	75	62.5	0	0	0	0
% of Surplus Reduce						
100	110	105	1	1	-5.551e-17	0
0	100	50	0.5	0	0.01	0
Avg Cost per Unit						
7.5e+04	1.65e+05	1.2e+05	0.5	1.833	-1.111e-05	0
Execution Rate						
90	100	95	0.625	-6.5	0.075	0
75	90	82.5	0.125	-1.25	0.01667	0
Fix Bad Units First						
70	100	85	0.5	-2.333	0.03333	0
Fund High TDY Bases						
4	10	7	0.5	-0.6667	0.1667	0
Lower Deficits						
0	375	187.5	0.5	0	0.002667	0

SUF Parameters: if $c = 0$, $U(x) = a + bx$

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Vita

Capt. Timothy G. Imdieke was born in Sauk Centre, Minnesota in 1962. After graduating from Belgrade High School, Capt. Imdieke attended basic training at Lackland AFB, Texas in 1982. During his initial assignment as a weather maintenance technician at Zweibrucken AB, Germany, Capt. Imdieke married his beautiful wife, Sally Buckentine. Their first son arrived before leaving Germany, and their second son followed two years later during a tour at Holloman AFB, New Mexico. A special duty assignment to work on the Solar Optical and Observing Network at Hickam AFB, Hawaii was the next tour of duty, and it was there that Capt. Imdieke was selected for the Airman Education and Commissioning Program. He attended the Ohio State University where he graduated Magna Cum Laude with a Bachelor of Science degree in Civil Engineering, and was awarded a regular commission after graduating with highest honors from Officer Training School at Maxwell AFB, Alabama in November 1993. His follow-on tour was to Luke AFB, where Capt. Imdieke worked as a civil engineer. In 1996, Capt. Imdieke applied and was accepted to the Air Force Institute of Technology to obtain a Master of Science degree in Engineering and Environmental Management. His follow-on assignment is to the environmental management division at Wright-Patterson AFB, OH.

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Allocating resources is a difficult task when resources fall considerably short of the requirements, and there are many different opinions on what requirements should have priority. The Air Staff Housing Division must decide how to allocate a $250M/year budget to best achieve the Air Force goals for military family housing. The decision is complex because requirements are much larger than the available resources, and there are many conflicting objectives to consider. This research uses value-focused thinking and multiattribute utility theory to develop a decision analysis model to assist the decision maker in selecting a budget strategy. A deterministic analysis (using Logical Decisions software package) on the data submitted from four Major Commands (MAJCOMs) demonstrates the model's capabilities by ranking 87 budget strategies based on how well they meet the decision maker's objectives. The model allows for sensitivity analysis to display the effects of changes in the decision maker's preferences and changes in the input data. Overall, the model provides a set of tools that can help the Air Staff make a better decision that is quantifiable, transparent, and defensible. It also provides metrics to evaluate how effective the military family housing investment program is in meeting Air Force goals.

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