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AN ANALYSIS OF THE AIR FORCE WORKING CAPITAL FUND'S PERFORMANCE
AND THE PRICING STRATEGY OF THE MATERIEL SUPPORT DIVISION

THESIS

Lisa M. Stanley, Second Lieutenant, USAF

AFIT/GCA/ENV/03-09

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY**

Wright-Patterson Air Force Base, Ohio

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AFIT/GCA/ENV/03-09

AN ANALYSIS OF THE AIR FORCE WORKING CAPITAL FUND'S
PERFORMANCE AND THE PRICING STRATEGY OF THE MATERIEL SUPPORT
DIVISION

THESIS

Presented to the Faculty

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Cost Analysis

Lisa M. Stanley, BS

Second Lieutenant, USAF

March 2003

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Lisa M. Stanley

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Abstract

The Air Force Working Capital Fund (AFWCF), a revolving fund established to create a more business-like environment between the Air Force and its customers, is comprised of several divisions providing depot level repairs, supplies and inventory, information technology solutions and transportation services to military customers. Since its establishment, the AFWCF has been the source of much criticism due to its inability to meet its primary goal of operating on a break-even basis. Ideally, the Fund will generate enough revenue from the sale of goods or services to cover its expenses and break-even. Instead, there is either a surplus that must be reintroduced into the AFWCF or, as most often the case, a deficit occurs. Due to regulatory requirements, the Fund must recoup these lost monies in a subsequent year. This profoundly affects the ability to accurately build the budget and reach the break-even point. This research analyzes the past performance of the AFWCF and identifies which areas are key drivers in preventing the AFWCF from meeting this goal. Lastly, the pricing strategy of the Materiel Support Division was evaluated based on commercial best practices to determine if its pricing schema lends itself to meeting the goals of the AFWCF.

AN ANALYSIS OF THE PRICING STRATEGY EMPLOYED BY AN AIR FORCE WORKING CAPITAL FUND ORGANIZATION

I. Introduction

Background

Since its inception, the Department of Defense (DOD) has struggled to keep costs under control and within budget constraints. Throughout its existence, many attempts have been made to alter the DOD's operating environment. Most recently, Acquisition Reform and Earned Value Management have impacted Defense communities with positive results. However, these most recent reform initiatives have failed to largely influence one area of the DOD in particular, the Defense Working Capital Fund (DWCF).

The DWCF is the direct result of the dissolution of the Defense Business Operations Fund (DBOF). DBOF, a revolving fund account that sells unique goods and services, was established in 1991 by combining the nine industrial and stock funds that had been established as early as the mid-1800s. The goals of DBOF were to fully recover costs (break-even over time), reduce inventory levels and support costs, consolidate similar operations, and provide visibility of total costs (FMRS, Chapter 80-6). Prior to the realignment of these funds, each account was separately managed. Subsequent to the stand-up of DBOF, the funds were centrally managed by the Office of the Secretary of Defense (Comptroller). Later, the "DOD devolved the responsibility for cash management to the military services and DOD Components" (GAO, 1997: 2) and created the Defense Working Capital Fund. The premise behind this change was to create a more business-like environment and instill stronger buyer-seller relationships between its customers and Fund divisions. Soon after the change to the DWCF, the Under Secretary

of Defense (Comptroller) formed the four initial working capital funds as we know them today: Army, Navy, Air Force and Defense-wide (the Defense Commissary Agency was added in 1999). This further dissemination of responsibility provided a means of allowing each of the services management control of all financial and functional facets of their Funds.

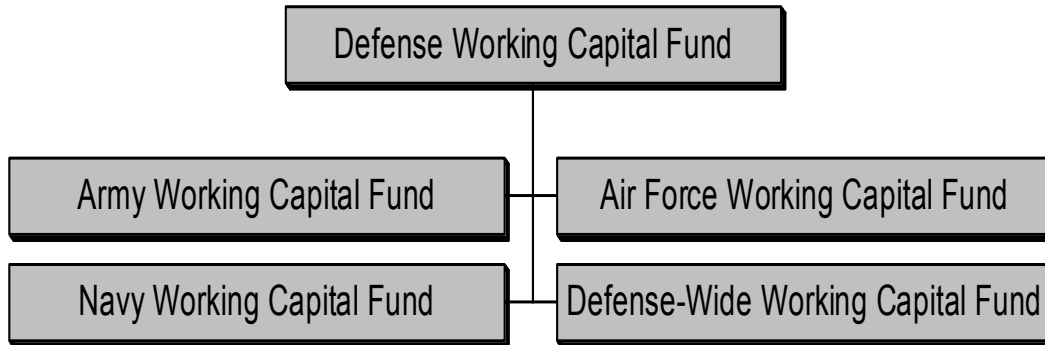


Figure 1. DWCF Organization

While all of DBOF's goals are significant, it is the relationship between how the costs are fully recovered and how the DWCF sets its prices that is of interest in this study. Unfortunately, DBOF (now the DWCF) has failed to meet its goal of operating on a break-even basis. In other words, it has not been able to fully recover the cost of its operations. In fact, a 1997 GAO report, *Defense Depot Maintenance*, estimated that by the end of fiscal year 1997, the operating loss across all funds would reach \$1.7 billion (GAO, 1997: 7). Today, the Funds continue to lose money. The problem lies in the fact that the rates the Funds must charge are set as early as two years in advance of the budget year and cannot be changed once included in the President's Budget (PB). This lead-time is necessary to provide customers the insight needed to plan and budget their resources. As one might expect, by the time the current year rolls around, actual prices can change dramatically, yet the customer is still charged the same rate established by the PB.

Additionally, any loss incurred in a previous year must be added to the rates of the subsequent year in an attempt to recoup those lost monies. As one of the DWCFs, the Air Force Working Capital Fund has not been immune to these pricing deficiencies.

The AFWCF itself is separated into four distinct funds: the Supply Maintenance Activity Group (SMAG), the Defense Maintenance Activity Group (DMAG), the Information Services Activity Group (ISAG), and the United States Transportation Command's (USTRANSCOM) Transportation Working Capital Fund (TWCF) (Figure 2). The first three activity groups are the sole responsibility of the Air Force while the TWCF has been placed under the AFWCF for cash management purposes. As previously mentioned, the Funds sell unique goods and services to their customers. The SMAG procures and manages supply items such as spares, fuels and general consumables. The DMAG provides major overhaul, modification and repair services for aircraft, missiles, engines and spare parts while the ISAG provides various information technology services such as software development and computer support. Finally, the TWCF provides valuable transportation support for day-to-day operations, as well as contingency operations. Since each of these divisions of the AFWCF have unique missions, it is expected that they would also have unique pricing strategies.

Research Focus

It is the unique pricing strategies of the activity groups that are of interest to the researchers on this project. The DOD Financial Management Regulation 7000.14R, Volume 2B, Chapter 9 states:

“The (Defense Working Capital) Fund includes a variety of activity groups that are categorized in two groups for rate setting purposes.

1. Supply Management Activity groups. Utilize commodity costs in conjunction with a surcharge to establish customer rates.

2. Non-Supply Management Activity groups: Depot Maintenance, Research and Development, Transportation, Distribution Depots, Base Support, and all other activity groups have unit cost rates established based on identified output measures or representative outputs. These output measures establish fully cost burdened rates per output, such as a cost per direct labor hour, cost per product, cost per item received, cost per item shipped, etc. The activity groups establish both their output rates and the stabilized customer rates through the same general process.”

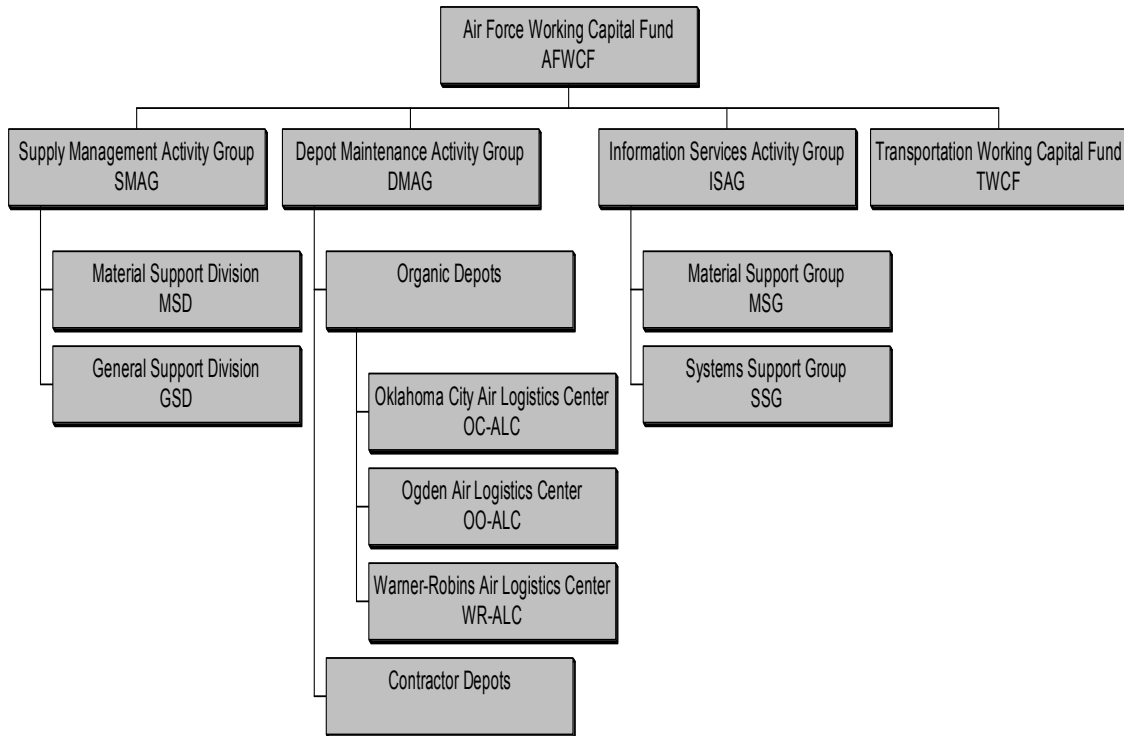


Figure 2. Air Force Working Capital Fund Organization

Based on the definitions above, the SMAG sets its rates based on the costs of its goods plus a surcharge added across all product lines. On the other hand, the DMAG and ISAG fall under the Non-Supply Activity Groups when setting their rates and prices. Each uses an output measure to set its rates for services provided. DMAG recovers cost of operations by charging customers a standard rate per hour dependent upon which type of aircraft, missile, engine, etc. it repairs; this is called the Direct Per Standard Hour (DPSH). ISAG recovers its costs by charging an all-inclusive rate per Direct Labor Hour (DLH); in this case

customers are charged the same rate per hour no matter what type of service they are receiving.

The particular focus of this study is two-fold. First, an analysis of the AFWCF's performance will be conducted to determine how well the activity groups are performing. The second concentration of this study is to determine if the pricing strategy employed by the Materiel Support Division (MSD) of the Supply Management Activity Group (SMAG) of the AFWCF preclude the DWCF from meeting its goal of fully recovering all costs. In order to determine where the division needs to make changes or improvements, the theory behind different pricing strategies must be studied. These different theories will aid in identifying a causal relationship between the price setting strategies employed and the regular loss of revenue or customer demand, and determine why the Fund fails to break-even.

Additionally, a recent study conducted by the RAND Corporation looked at the pricing strategy of another DWCF organization, the Defense Finance and Accounting Service (DFAS). DFAS provides assorted finance and accounting services to several DOD components. Its current pricing strategy utilizes expected average costs to set rates. The study found that a non-linear pricing strategy might be more appropriate than its current pricing strategy based on the expected average costs of services provided. This non-linear pricing schema allows DFAS to receive fixed annual payments from customers at high levels while receiving per-unit payments throughout the year. Additionally, they hypothesize that this type of pricing strategy may be suitable for other

DWCF organizations (Gates, 2002). This study will determine if non-linear pricing is appropriate for the MSD as well.

Research Questions

The intention of this research is to evaluate factors relevant to the pricing of the AFWCF goods and services. The following research questions were presented:

1. Are the goals of the DWCF reflected in the AFWCF Activity Group's pricing strategies?
2. How do the different Activity Groups under the AFWCF differ in their pricing strategies? Is any Activity Group's pricing strategy allowing them to break-even?
3. How can the current pricing strategies be improved upon to come nearer to meeting the DWCF's goals? Where should the Air Force focus its efforts to improve the MSD pricing strategy?

Methodology

The first portion of this research will be accomplished through a multiple-case design study where each activity groups of the AFWCF is a different case. This study will be accomplished by obtaining financial data for fiscal years 1999-2002 (The GAO reported that prior to 1999, accounting records are not complete enough to provide accurate data). I will look at the historical performance of the AFWCF based on the Net Operating Result (NOR). Then I'll narrow the scope to identify how the individual activity groups are performing. This will again be accomplished by analyzing the NORs along with revenue and expense categories.

That information, along with information obtained through interviews of key AFWCF personnel will assist in answering research questions one and two.

Then again, the focus will be narrowed to concentrate on the MSD portion of the SMAG in a single-case design study. This division was chosen due to its size and complexity; both of which will be explained in detail in chapter 2. We will study the pricing strategy of this division and its performance over the past few years. Based on information found in Chapter 2, we will determine how well the division is performing and point out strengths and deficiencies of the current pricing strategy based on commercial best practices.

Data necessary for this analysis will be obtained from budgeting and accounting records, Budget Estimate Submissions (BES), the Air Force Total Ownership Cost (AFTOC) system and through interviews with key Air Force Working Capital Fund personnel from the Assistant Secretary, Financial Management & Comptroller (SAF/FM), Washington, D.C., and Headquarters Air Force Materiel Command (HQ AFMC), Wright-Patterson AFB, OH. In addition, relevant information will be acquired from published regulations, policies, and procedures.

II. Literature Review

The purpose of this chapter is to examine and review literature applicable to revolving funds and how they work, why the Defense Working Capital Fund (DWCF) was formed, and current pricing strategies employed by the Air Force Working Capital Funds (AFWCF). It will also include information on price setting that will aid in determining if the strategy employed by the MSD is appropriate.

No different from civilian corporations, the Department of Defense (DoD) must accurately price its goods and services to avoid operating at a loss. However, the DoD is in a unique situation that most civilian corporations are not; the DoD is not in the business to turn a profit but rather strives to break-even.

Background

To gain an understanding of the how the AFWCF sets its rates and prices, it is first necessary to identify where the fund began and why it was established. As early as the 1870s, the United States military procured materials from commercial vendors, held these items in inventory, and resold them to the military forces as needed, recovering only the cost of the item. The monies incurred from these sales were used to restock inventories; thus the entire process repeated itself. This stock fund, which essentially provides spare parts to its customers, (GAO, 2001) is known as a revolving fund due to the cyclical nature of the buying and selling of goods. A revolving fund relies on the revenue it receives from goods or services sold to sustain its operations. The military introduced additional revolving-type funds in the 1940s to provide “industrial and commercial-type services” to the operating forces such as depot maintenance activities. Similar to the stock fund, the industrial fund was replenished with revenue from the sale

of goods or services and more goods were purchased or more services provided.

However, the industrial funds recouped the cost of materials along with any additional overhead costs (DWCF Handbook, Ch 2).

DBOF. The U.S. military operated under these funds until the early 1990s. In October 1991, Deputy Secretary of Defense Donald Atwood established the Defense Business Operations Fund (DBOF) (Jordan, 1995). This newly formed fund combined the cash balances of the various industrial and stock funds into one centrally managed account controlled by the Office of the Secretary of Defense (Comptroller) (GAO, 1997: 6). The purpose of establishing a centrally managed fund, as stated in the Defense Management Review Decision 971, was “to provide better tools and information for employees at every level of the support establishment, and to provide better information to decision makers at every level” (Jordan, 1995). Furthermore, it was an effort to both transform the way the Defense Department controlled its resources and encourage a more business-like, buyer-seller relationship with its customers (GAO, 1997: 6).

The underlying goal of DBOF was total cost visibility while stressing the cost consequences of decisions made by management (GAO, 1997: 9). Prior to the standup of DBOF, there were few incentives for customers to control the goods or services due to the absence of any relationship with the seller. The buyer ordered from the revolving funds to replenish their supply inventory. However, all too often parts were ordered simply because they were essentially free to the customer. Thus, many units were placing orders for goods or services not essential to their operations and getting them, in essence, for free. This concept is analogous to that of a new car with an all-inclusive warranty. While a vehicle is under warranty, the manufacturer is responsible for

repairing even the most minor problems at no charge to the customer. As such, there are no incentives for the car owners to make repairs themselves or make trade-off decisions on what they need repaired. Equally, revolving fund customers had no incentive to control what they purchased or when they purchased it.

DBOF, on the other hand, was intended to dissuade this type of behavior. Under the DBOF premise, Congress approves an annual budget for the customers and distributes the appropriated funds. The customer uses these funds (Operations and Maintenance money) for their day-to-day operations as well as any revolving fund goods or services they require. With this limited budget, the customer must manage its funds closely and often make critical choices where it will be spent; often having to forego necessary orders due to lack of funds. This can create a problem for the warfighter due to the fact that with the limited budget there is often a trade-off decision that must be made between ordering wartime spares and repairing an aircraft. This too is like the car warranty analogy. Fundamentally, when the customer's warranty has run out, any repairs are their responsibility. Now that the repairs are coming out of the car owner's "budget", they will most likely only request essential repairs. Hence, with the advent of DBOF, the revolving fund customer's "warranty" had run out.

DWCF. In late 1996, the Defense Working Capital Fund (DWCF) was formed through the reorganization of the one centrally managed DBOF fund into four separate funds: the Army Working Capital Fund (AWCF), the Air Force Working Capital Fund (AFWCF), the Navy Working Capital Fund (NWCF), and the Defense-wide Working Capital Fund. According to the GAO, "This was done in order to clearly delineate the responsibilities of the military services and Defense components for managing functional

and financial aspects of their respective business areas” (GAO, 1997:1). The business areas this statement refers to were established in April 1993. These ten areas consisted of “relatively homogenous activities” in supply, depot maintenance, transportation, communication, finance, information services, distribution, base support, Navy Labs, and other (Jordan, 1995:39-40). Other goals of the DWCF, as described in Chapter 2 of the DWCF Handbook, are as follows:

- Providing a better way to control the costs of goods and services
- Providing managers with increased flexibility and fiscal authority
- Enhance reporting to provide true cost visibility

Though the dissolution of DBOF did not change the way the revolving funds did business, it did provide even greater cash management while more clearly defining each of the military component’s roles in the fund (DWCF Handbook: Ch2).

AFWCF. When DWCF was initially established it was broken into four divisions: the Army WCF, the Navy WCF, the Air Force WCF and Other DoD WCF. Each of these divisions had the authority to further disseminate their division into logical, manageable activity groups. This research concerns the AFWCF and its activity groups. In FY02, the AFWCF is expected to generate \$20.5 billion of the \$74.5 billion in revenue expected by the DWCF (Cerde, 2002). Today the AFWCF is comprised of the Supply Management Activity Group (SMAG), the Depot Maintenance Activity Group (DMAG), and the Information Services Activity Group (ISAG). Furthermore, the AFWCF is responsible for the cash management of the United States Transportation Command’s (USTRANSCOM) Transportation Working Capital Fund (TWCF). Because this is the only function the Air Force has with the TWCF, it is rarely included in AFWCF studies. However, it will be included simply to show how this WCF is operating. Each of these

activity groups has a unique mission and more often than not, is tied to one of the other activity groups in a quite confusing fashion. In fact, the AFWCF activity groups are often one another's largest customers. However, before discussing their relationships with one another, an introduction to their purpose is necessary.

SMAG. The Supply Management Activity Group (SMAG) has the responsibility of providing inventory items, medical supplies, and various other support services and materials (FMRS, Ch. 80). The SMAG was expected to generate \$9.0 billion in revenue in fiscal year 2002. It is broken into four divisions, each handling a specific aspect of the SMAG. They include the Materiel Support Division (MSD), the General Support Division (GSD), the Medical-Dental Division (MDD), and the Air Force Academy Store Division (ACSD). Each division sells its goods or services to other Air Force organizations and other AFWCF activity groups. MSD, the largest of the SMAG divisions, is the wholesale division responsible for managing over 132,000 items in inventory for aircraft, missiles and engines with expected revenues of \$5.9 billion. It is also responsible for supplying initial spares for Depot Level Repairables (DLR) to the DMAG and purchases repair services from DMAG to make repair on exchangeable DLRs so they can be returned to inventory. MSD works with DMAG at the Air Logistics Centers across the Nation (Cerda, 2002). All remaining divisions of SMAG are retail divisions. The GSD provides over 2.2 million consumable parts to its base and depot level customers through the Defense Logistics Agency. It's expected to produce \$1.9 billion in revenue in fiscal year 2002. The MDD maintains in excess of 2500 items across 83 bases through the Medical Logistics Office with expected revenues of \$0.9 billion. Finally, the ACSD maintains and sells uniform items for Air Force Academy

cadets at the United States Air Force Academy in Colorado Springs, CO. This entity is the smallest of the four and has had no problems breaking even from year to year.

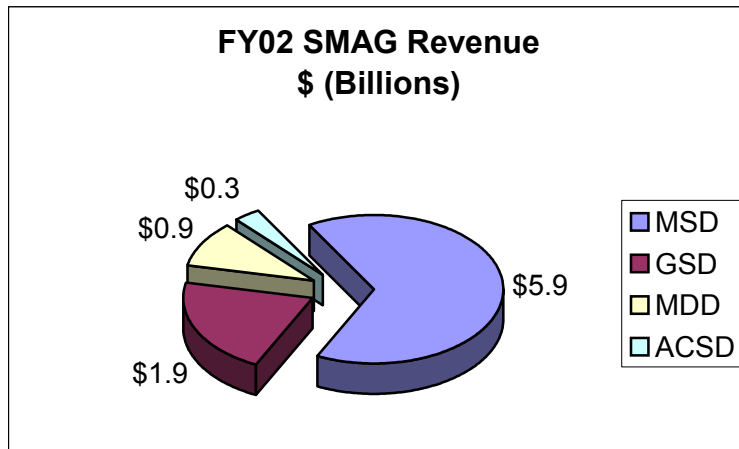


Figure 3. Projected SMAG Revenue- FY02

DMAG. According to the Air Force Working Capital Fund Overview, the Depot Maintenance Activity Group (DMAG) is responsible for providing support at the depot-level for “repair and modification of aircraft, missiles, and equipment; the overhaul of engines and exchangeables; local manufacture; and area and base tenant support.” It generates approximately thirty percent of the AFWCF revenue. And, it supports operations from Air Logistics Centers (ALC) located throughout the United States: the Warner-Robins ALC (WR-ALC), Robins AFB, GA; the Ogden ALC (OO-ALC) located at Hill AFB, UT; and the Oklahoma City ALC (OC-ALC) at Tinker AFB, OK. Each of these divisions is responsible for several types of weapons systems. For instance, when a KC-135 needs repairs, it is sent to the OC-ALC. When an F-15 needs modifications it is sent to the WR-ALC. It is also important to note that the DMAG has both organic repair facilities and contract repair facilities. The organic facilities generate 60 percent of the DMAG revenue with the inorganic facilities generating the remaining 40 percent. DMAG has control over what prices are charged for the organic facilities but prices charged by

the contract facilities are set in the binding contract with the Air Force or Department of Defense.

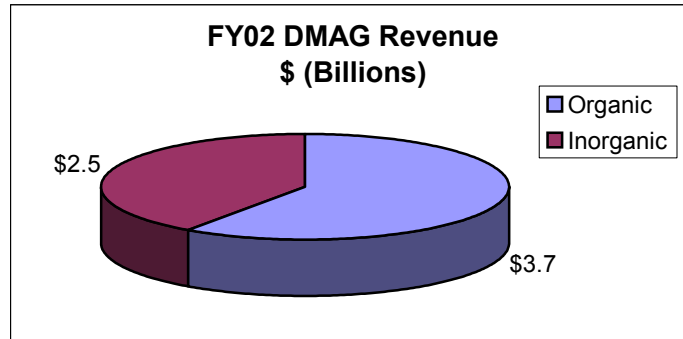


Figure 4. Projected DMAG Revenue- FY02

ISAG. Finally, the Information Services Activity Group is the provider of information services and information technology solutions for the Air Force. Particularly, this AG analyzes requirements, designs and develops systems, and performs testing and integration for its customers along with support services. It generates the smallest amount of revenue for the AFWCF with an expected FY02 generation of only \$0.6 billion (Cerda, 2002). The ISAG is separated into two divisions, each generating approximately equal revenues, known as the Central Design Agencies (CDA): the Materiel Systems Group (MSG), and the Standard Systems Group (SSG).

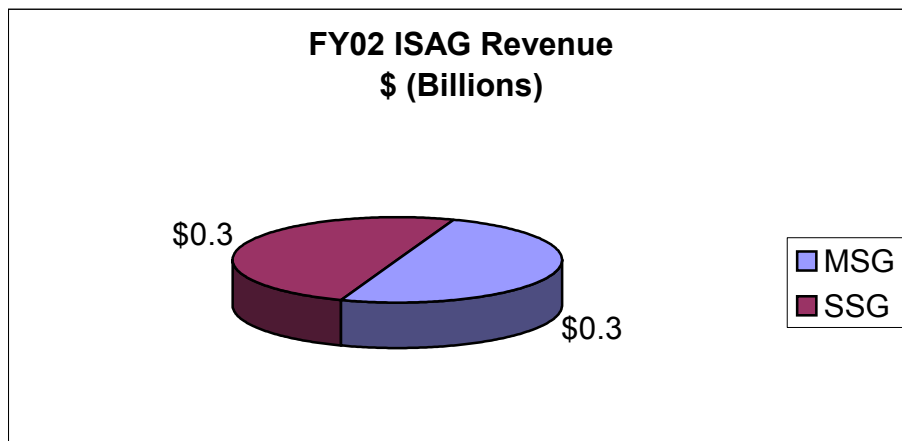


Figure 5. Expected ISAG Revenue- FY02

As its name implies, SSG has the responsibility of supporting base level computer systems Air Force wide. On the other hand, MSG is responsible for maintaining the logistics systems within the Air Force Materiel Command (AFMC) (AFWCF Overview, 80-7).

The Relationship

The workings of the AFWCF could be described as an “incestuous relationship”. All the Activity Groups require goods and services from one another. As such, the transfer of goods or services to each other creates cyclical funds transfers. An oversimplified example of the relationship between the activity groups follows:

1. Customer orders part from Supply (SMAG) with program sustained by ISAG
2. SMAG checks inventory for part and if part is in stock, issues it and bills customer; otherwise, requests it from DMAG
3. DMAG sends part to SMAG and bills SMAG for part
4. SMAG sends part to customer and bills customer for part
5. ISAG supported programs track parts and inventory

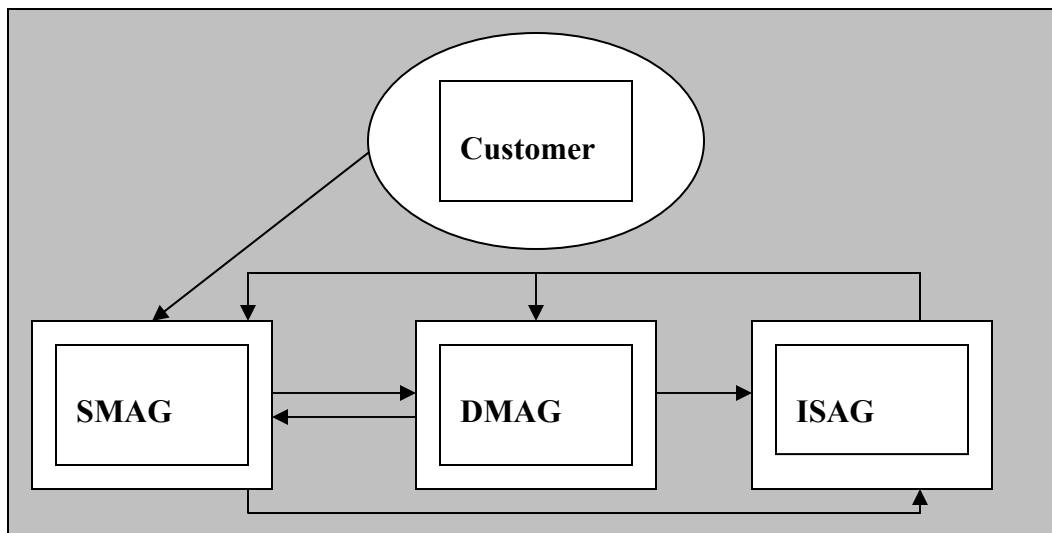


Figure 6. AFWCF Relationship

As one can plainly see from the example, each of the Activity Groups relies on the others to get their job done. And, though the process seems simple enough in the example, it is

hardly that. In fact, the entire AFWCF process is a delicate balance of give and take on all sides. This research examines the rate setting process of the Materiel Support Division of the Supply Management Activity Group.

Pricing

Pricing is a means for an organization to meet its goals and objectives. As those goals and objectives differ, so does the way a price is built. Pricing accurately can lead to a successful business while inaccurate pricing can lead to destruction. “Setting a price, just any price, is easy”, (Engelson, 1995: 6). Although this statement is true, it fails to mention that price is directly related to the revenue it generates. Daly suggests there are three possible outcomes of establishing prices. First, setting prices above what consumers will tolerate may drive customers elsewhere and send revenues down. Second, setting prices too low (under pricing) may increase sales yet make the sale unprofitable. Finally, the most sought after outcome occurs when prices are set properly, resulting in sales and profits (Daly, 2002: 1). It appears that the AFWCF is the victim of inappropriate pricing. Though the Fund does not operate on the premise of making a profit, the continual losses from year to year indicate that it can’t even operate as intended, on a break-even basis. And, to recoup the prior years losses and try again to break-even, it must in fact set its prices with profit in mind; profit being equal to the amount of the previous years losses. So, in order for the Fund to meet its break-even goal, it must price with profit in mind. Yet, how realistic is it to expect the fund to break-even at all?

Pricing Strategy

“Price is the value or worth of something”, (Engelson, 1995: 20). “Strategy is the coordination of multiple activities to achieve a common objective...” (Holden and Nagle, 2002: 149). Together, these definitions imply that a pricing strategy must accurately value the organization’s goods and/or services, while striving to attain corporate goals. It is important to note that price setting and strategic pricing are different. Holden and Nagle identify that price setting is “reacting to market conditions” while pricing strategically is being proactive in managing prices (Holden and Nagle, 2002: 149). These differences can either send a company’s profits soaring or launch them straight into bankruptcy. If the AFWCF were a public corporation, it would have filed bankruptcy long ago. Most organizations cannot tolerate the sustained losses experienced by the AFWCF. As of 1997, the total losses for the DWCF had topped \$1.7 billion. Thus, the pricing strategy utilized by the AFWCF, or any corporation for that matter, is imperative to its success.

Most companies set their prices on a cost-plus foundation where they set prices by summing all direct and indirect costs, then add an additional percentage above the price solely for profit. This is not the goal of the AFWCF. O’Guin (1991) states that “pricing reflects each competitor’s costs, barriers to entry and capacity, as well as customer desirability, available income, and other factors” (O’Guin, 1991: 256).

The authors of *Consumer Behavior and Marketing Behavior* have developed a six-stage approach to developing a pricing strategy. Most elements stated by O’Guin (1991) are reflected in this process. They claim that their approach is different from the traditional approaches to strategic pricing in that their process focuses more on consumer

analysis (Olson and Peter, 1996: 593). The approach, as presented by the authors, is as follows:

1. Analyze consumer-product relationships.
2. Analyze the environmental situation.
3. Determine the role of price in marketing strategy
4. Estimate relevant production and marketing costs.
5. Set pricing objectives.
6. Develop pricing strategy and set prices.

Though this approach is meant primarily for the private sector, several stages are pertinent to the AFWCF as well. An analysis of each step follows.

Step 1: Analyze Consumer-Product Relationships

The first step in the strategic pricing approach is perhaps the most important. This step is where you determine what the consumers needs are and how they affect your product. In the case of the AFWCF, this step is synonymous to obtaining customer requirements at the beginning of the two-year price-setting process. Since total costs are divided by the number of requirements to obtain the AFWCF rates, you can see how this step can either raise rates out of control by customers underestimating their requirements, or rates can end up lower than needed to recoup all costs if customers underestimate their requirements. This is shown in Table 1 below.

Table 1. Requirements Estimation Example

	Overestimated Requirements	Underestimated Requirements
Total Costs (\$)	1,000,000	1,000,000
# Of Engines Required	7	3
Price per Engine (\$)	142,857	333,333

As you can see from this simple example, the customer has a significant impact on what they will be charged. Specifically, it would be in the best interest of the customer to overestimate requirements. If only one organization overestimates their workload the

impact to the overall AFWCF would be insignificant. However, what happens if several organizations overestimate their requirements for several years? This may be what is causing the AFWCF to lose money each year. The point is the consumer plays a massive role in determining the financial health of the AFWCF.

Step 2: Analyze the Environmental Situation

Environmental elements should also be considered when determining what pricing strategy to use. Early consideration of these elements can bring to light risk factors so proactive measures can be taken. This step is primarily used to obtain information about competitors in the market. For instance, it is necessary to know how many competitors your company faces along with any pertinent information about their products, price structure, and financial strength (Olson and Peter, 1996: 596). But, it can also be used to consider the customer's impact on the environment. For instance, in the AFWCF environment, the customer is working with a limited budget. Once those monies are expended, they will not purchase any more services. So, it's important to realize that price determines the workload in the depots. If prices are too high, the customer will not be able to send as many aircraft through the depots for repairs or modifications. On the other hand, if the prices are too low, the customer may send more workload to the product centers than originally intended thus exceeding the maximum workload of the centers. There is a fine balance between many factors that must be taken into account.

Determining what value the customer places on the product or service will aid in identifying an appropriate pricing strategy. The value a customer places on an item is actually a compilation of several factors including product or service quality, costs and

intangible costs and benefits. It is important to understand this mix and adjust the price accordingly (Ferrell et al., 2002: 130). The customer's value can be viewed as an output of this formula:

$$\text{PerceivedValue} = \text{CustomerBenefits} \div \text{CustomerCosts}$$

This stage of the strategic pricing approach is not as important to the AFWCF as to commercial businesses. First of all, the AFWCF does not have many competitors in its "market". In essence, the AFWCF works like a monopoly. It has goods or services that cannot be obtained outside of the DoD or its contractors. Because of this situation, its customers must rely on the AFWCF to set prices that will allow them to meet the needs of the warfighter. Therefore, the value that the customer places on the products are not as important in the price setting scheme because more often than not they have to purchase the product from an internal source. As expected, the environmental elements of the AFWCF are considerably different than those encountered by the private sector.

Some additional environmental factors include:

- Current and Future Threats
 - Where and when will the DoD be called upon to respond?
- Technology Advancements
 - Advances in technology are continually occurring and must be addressed to remain superior
- Contract Modifications
 - Changes to current agreements with DoD Suppliers of goods and services
- Budget Constraints/Cuts
 - Money is continually being shuffled from one program to another

Step 3: Determine the Role of Price in Marketing Strategy

This step helps the company determine the role price plays in their ability to sell their product. There are different strategies used to gain a better hold on the market. For instance, if a company wants to flood the market with their item, they may price it lower

than their competitor to gain sales and notoriety. It is important to understand, however, that the price of a product may not always play a role in its sale. There are several other aspects of sales that customers may prefer like free shipping, high quality products or extended warranties that override a higher price (Olson and Peter, 1996: 597).

Determining the importance of price is also essential to the success of any pricing strategy. One source suggests two specific reasons why pricing gets so much attention. First, revenue is easy to understand. Unlike many other aspects of marketing, revenue has little complexity to it; it is simply price times quantity. As such, there are only two ways that a company can increase its revenue: by increasing the quantity it sells or raising the selling price. Both, however, are profoundly controlled by price. Second, management views price as one of the easiest variables to influence. Ferrell et al. (2002) imply that since price is the easiest aspect to change, it gets the most attention. The time it takes to change a product design can take months or years. Prices in the commercial sector can be raised with little effort or thought. Think of the last time you drove by a gas station in the morning to see one price and drove by in the evening to see yet another price. It is the effortlessness of changing prices that can wreak havoc on a company's pricing posture. And, more often than not, rapidly adjusting prices to vary to demand does not mean that the company is accurately setting prices. They are simply reacting to the immediate situation (Ferrell et al., 2002: 128).

The AFWCF is in a unique position when it comes to their marketing strategy. First, as mentioned before, the consumer plays a large role in price development by submitting product and service requirements at the beginning of the AFWCF budget process. Second, the AFWCF market is very small due to the monopolistic nature of the

business. The only areas truly affected by an outside market are the GSD and MDD of the SMAG. Both of these divisions sell products that are readily available from private businesses. Finally, the marketing strategy is one that it is constrained by laws, regulations and directives. There is not much leeway when it comes to the options the AFWCF has to operate its business-like structure.

Step 4: Estimate Relevant Production and Marketing Costs

Concerning production and marketing costs, Olson and Peter do not give enough consideration to this area. They simply state that knowing the costs of marketing and production will enable the company to regard the variable prices of products, thus enabling them to determine the minimum price they must charge to enter the market (Olson and Peter, 1996: 597).

Though this area received little attention by Olson and Peter, and may not be of great importance in the private sector, it is of great interest to the AFWCF. The accurate estimation of workload and supply requirements is the key to a successful AFWCF. By accurately estimating workload, rates will be set close to where they should be. However, no estimate is accurate! By using historical data and identifying past deficiencies, future prices can be set more accurately. Granted, there are several unknowns when setting prices two-years in advance of the budget execution year but this risk can be managed with proper price setting techniques that will be discussed later. This also goes back to step two, where the environmental factors are evaluated. The military does not operate in a vacuum. There are new challenges every day that force personnel and systems to adapt. By identifying the key areas where change may occur

with the most adverse affects, you have taken a proactive approach to correctly identifying accurate costs.

Step 5: Set Pricing Objectives

Perhaps the most crucial step prior to developing the pricing strategy is setting the pricing objectives. A company must identify its goals in order for it to obtain them. Olson and Peter (1996) identified the top pricing objectives used by the private sector today. They pointed out that the most common one is realizing a specific return on investment. Other objectives include increasing sales, maximizing long run and short run profits, growth, targeting a market share and desensitizing the customer to price (Olsen and Peter, 1996: 598). Each objective meets the needs of a different corporate strategy. The AFWCF uses the objective of breaking-even over time. It is also appropriate to attempt to desensitize customers to the price. The less the customer feels angst about the price of the goods or services, the more business the depot receives and the better the chances are that the AFWCF will be close to breaking even. There are too many fixed costs in organizations like the ALCs. Civilian Pay and Benefits is one expense in the ALCs that does not change in proportion to the workload. They must have enough personnel on hand to manage the expected workload. And due to policies governing civilian personnel, lay-offs are not an option. When their workload decreases, their costs remain the same, so a loss will most definitely occur. Yet it may be impossible to desensitize the AFWCF customers to price since most of them are working within limited budget constraints set forth by the Congress.

Step 6: Develop Pricing Strategy and Set Prices

The pricing strategy is the key element in determining either the success or failure of a company. Once all the other steps have been accomplished, it is necessary to choose a pricing strategy that will aid the company in achieving its goals. With the private sector in mind, Olson and Peter (1996) listed three tasks necessary to produce an applicable pricing strategy. First, prices must be set far enough above costs to produce the level of revenue desired. Second, choose a pricing strategy that is in harmony with the marketing strategy. Last, the prices must be strategically set so demand is generated while keeping in mind that the customer will have the opportunity to make trade-off decisions. Furthermore, the corporation must remember that “most price changes occur as a result of changes in consumers, the environment, competition, costs, strategies, and objectives”, (Olson and Peter, 1996: 599).

Pricing Methods

The choice of pricing method depends on the many factors mentioned above. What follows are several pricing strategies commonly used today. However, it is important to keep in mind that many of these strategies might not work for the AFWCF. This is because (1) the AFWCF operates to recover its costs only, (2) AFWCF customers have a limited budget that is often only adjusted downward, (3) the “market” the AFWCF operates in is autonomous, and (4) the AFWCF implements transfer pricing due to its relationship with primarily internal customers. This portion of the chapter will focus on identifying pricing strategies that are principally based around the transfer-pricing concept including Cost-Based pricing, Cost-Plus pricing, Rate-of-Return pricing, Market-Based pricing, Value-Based Pricing and Activity Based Costing.

Internal Transfer Pricing

Internal transfer pricing is a common category of pricing often used by companies to avoid taxation of sales of products to its other divisions. Transfer pricing is a “system of pricing the transfer of goods, services and intangibles between entities of one multinational enterprise” (Pagan and Wilkie, 2001: 15). A transfer price is simply a mechanism for pricing products sold from one division of a company to another division of the same company. In the case of the AFWCF, a sale to a DoD customer should be sold with a transfer price. Similarly, a sale from the MSD to the DMAG is also a transfer price. Revenue is created from the sale of the product from MSD and constitutes an expense as a buy for the DMAG. The operating income of both of these internal organizations is affected by the same transaction. One source asserts that transfer pricing should “promote goal congruence and a sustained high level of management effort” (Datar et al., 2000: 793). These factors are inline with the goals and operations of the AFWCF. As such, the type of transfer price used deserves as much scrutiny as external pricing does.

Common Transfer Pricing Strategies

Cost-Based Pricing

This pricing method uses the cost of producing the product or service to set the price. The full-cost of the product is included in the price. Factors include fixed and variable costs of the product along with direct and indirect production costs. Most often the price is set by using the budgeted costs of an item because collecting actual cost data can be time consuming and too costly (Datar et al., 2001: 794). There are two approaches under cost-based pricing that will be discussed briefly: cost- plus and rate-of-

return. Each has similar goals but distinct differences. And though the cost-based approach is simple, its major weakness is that it fails to take into account any of the external market factors such as value or demand, making it difficult for management to determine how much it will sell. However, it is suitable to use this method when obtaining market data is too time consuming or too costly (Datar et al., 2001: 797-799).

Cost-Plus Pricing

The goal of cost-plus pricing is to make a profit. As mentioned earlier, cost-plus strives to account for all costs associated with a product and then adds a rate to the average variable costs (Cintron, 2002: 9). This rate recovers any indirect costs associated with the product and includes any profit the company wishes to make. The benefit of this method is the seller knows how much profit it makes from the sale of each item.

Rate-of-Return Pricing

This method is very similar to the cost-plus method above. However, the difference lies in the fact that instead of arbitrarily marking up the price to make a profit, the price is increased to reach a desired rate-of-return. Cintron (2002) does a thorough job of explaining this method in his thesis. He uses the following example:

“Suppose a manufacturer has the following costs and sales expectations:

Variable cost per unit	\$ 10
Fixed cost	300,000
Expected unit sales	50,000

The manufacturer’s unit cost is given by:

$$\begin{aligned}\text{Unit cost} &= \text{variable cost} + (\text{fixed costs}/\text{units sales}) \\ &= \$10 + (\$300,000/50,000) = \$16\end{aligned}$$

Now assume the manufacturer wants to earn a 20 percent markup on sales. The manufacturer’s markup price is given by:

$$\text{Mark-up price} = \text{unit cost} / (1 - \text{desired return on sales}) = \$16 / (1 - 0.20) = \$20$$

The manufacturer would charge \$20 per product and make a profit of \$4 per unit (Cintron, 2002: 9).”

Though both of these methods are widely used and easy to understand and explain, they are not the best methods for pricing. Neither of them takes into account value, demand or competition. As a result, the seller never knows if they will reach their desired rate-of return or profit level (Kotler, 2000: 466).

Market-Based Pricing

The strength of market-based pricing is the demise of cost-based pricing. This method of accounting focuses on how customers react to fluctuations in the price and concentrates on the market conditions. Two examples of market-based pricing are explained below.

Value-Based Pricing

This method of pricing falls inline with steps two and three of Olsen and Peters (1996) strategic pricing method. This strategy sets prices based on the perception the customer has of the value of the product. Value is a relative term that has different meanings for all consumers. It is a mix of everything the customer values in your product. Recall the perceived value formula earlier in this chapter. It says that value is equal to customer benefits divided by customer costs. Ferrell et al's list of possible benefit and cost components is below.

As one can see, the components in Figure 7 encompass almost every aspect of an organization. Put simply, the main premise of this method is that the consumer strives to get the "biggest bang for the buck." Holding all the components constant, a consumer will buy from the store with the lowest price. It is the value of the components that lead to trade-off decisions and ultimately a sale. For instance,

suppose that there are two products available from different manufacturers for the same price. Since price is no longer an issue for the consumer, they will turn to

<u>Customer Benefits</u>	<u>Customer Costs</u>
<i><u>Core Product Quality</u></i>	<i><u>Monetary Costs</u></i>
Product Features	<i><u>Transactional Costs</u></i>
Brand Name	Retail of wholesale price
Durability	Delivery Charges
Ease of Use	Sales Tax
Warranties and Guarantee	Licensing Fees
<i><u>Customer Service Quality</u></i>	<i><u>Life Cycle Costs</u></i>
Reliability	Maintenance Costs
Responsiveness	Repair Costs
Timeliness	Replacement Costs
<i><u>Experience-Based Quality</u></i>	<i><u>Nonmonetary Costs</u></i>
Retail Atmosphere and décor	Time
Advertising and Publicity	Effort
Entertainment Benefits	Risk
	Opportunity Costs

Figure 7. Components of Customer Benefits and Customer Costs
(Ferrell et al, 2002: 102)

other aspects of the product or product's company to make their purchase decision. Perhaps company A has a reputation for great customer service and prompt attention to problems, while the other company's product is a relatively unknown brand name or has a reputation of not being very durable. The consumer will most likely choose company A. It is this information that it necessary for the company to accurately set its prices. It needs to know not only what the customer's perceived value is, but also the perceived value of the other competitor's in the market (Ferrell et al., 2002, 102).

Activity Based Costing

Although outside the realm of price setting, Activity Based Costing (ABC) can play a vital role in the price setting process, particularly when it comes to cost-based pricing. Prices are only as good as the cost allocation method associated with it. ABC is a method used to allocate indirect costs to products or product lines. The most common method or allocation of indirect costs is to arbitrarily spread the support costs of an

operation across all products and product lines at the same rate, perhaps 15% is added to all products to cover overhead costs. This method of allocating costs is flawed in that it often allocates too much overhead to one product and not enough to another. This leads to under pricing and overpricing of goods and services, which will affect revenue generation.

With ABC, overhead costs are allocated to the appropriate products or product lines that are creating the indirect costs. There is no more “peanut butter spreading” of the costs to all products. For instance, there are more costs associated with holding an engine in inventory than holding a bolt. The engine takes up more floor space and should be allocated more of the inventory warehouse costs. Using ABC can assist an organization in finding out what the true cost drivers are in the company and lead to more accurate pricing. However, ABC is often expensive and difficult to implement. Before an ABC method is used in conjunction with a pricing method, a cost-benefit analysis must be performed to see if the expected benefits will outweigh the expected costs.

III. Methodology

Overview

The methodology behind this research effort was an exploratory study of the AFWCF. To answer questions about the overall health of the AFWCF, a multiple case study was used where the activity groups of the AFWCF were each a case: these included SMAG, DMAG, ISAG and TWCF. Comparisons of the NOR were evaluated among the groups so conclusions about the efficiency of their operations and accuracy of their pricing strategy could be made. The focus then switched to a single case study of the Materiel Support Division's pricing strategy compared against commercial best practices. With this approach, we were able to focus on what was motivating the continually growing Accumulated Operating Result (AOR). Throughout the research effort, concentration was aimed at obtaining answers to the research questions outlined in Chapter 1.

Research Design

The most important step when determining which research approach to use is the definition of the research questions (Yin, 1994: 7). This particular research builds on a March 2002 thesis written by First Lieutenant Edwin Cintron, *An Analysis of the Pricing Strategy of a Government Fee-For-Service Organization*. Cintron's (2002) research focused on the pricing strategy of the Materiel Support Group, a division of the ISAG. The author studied this primarily service oriented organization and found that the accuracy of its pricing strategy is limited by its inability to make changes in a timely fashion, due in large part to the restrictions forced on it by the DoDFMR. He further points out that it may be beneficial to research other areas of the AFWCF and see what

type of impact they have on meeting the objectives of the DWCF. As such, this research was born.

The next step determined which research strategy to use. Yin suggests that there are three conditions that will aid in determining which strategy to use: “(a) the type of research questions, (b) the control the investigator has over the actual behavioral events and (c) the focus on a contemporary phenomenon within some real-life context” (Yin, 1994: 1). The fact that this research asks how and why questions, the researchers have no control over the events and it focuses on contemporary events leads to the archival analysis and the case study analysis. However, the archival process should only be used when data is historical. The data necessary for this analysis, though past data, is recent; and so, this study was deemed a multiple case study with a single case focus (Yin, 1994: 5-7).

Data Collection

The data collection phase of this research was an iterative process that used numerous resources. The first step in answering the research questions was to obtain financial figures from fiscal years 1999 through 2002, in particular, the Budget Estimate Submission (BES) for the Air Force Working Capital Fund. These documents provided expected and actual revenues and expenditures along with bottom-line figures for the AOR and NOR. The NOR is the Net Operating Result of the fund each year. If this number is negative, the fund has lost money and it must be recouped in a subsequent year. If it is positive at the end of the fiscal year, there is a surplus that will be absorbed back into the fund, resulting in lower prices to the customers. The AOR is the Accumulated Operating Result, which is the sum of the NORs since the funds inception.

The AOR and NOR are the measures for the health of the AFWCF. It is these figures that we want as close to zero as possible from year to year.

Next, to analyze the operations of the Materiel Support Division, the current pricing strategy of the division, along with any proposed changes, had to be identified. This information was obtained from SAF/FMBMR and HQ AFMC/LGIF. A comparative analysis was then performed to determine if MSD was inline with commercial best practices outlined in the literature review.

In addition to gathering numerical data, it was essential to interview personnel working in the WCF field to collect information not readily available through other avenues such as reports, regulations and directives. The hands-on experience of these personnel provided valuable insight into the business operations of the AFWCF. Valuable information was also gathered at the Air Force Working Capital Fund Summit at Wright-Patterson Air Force Base in October 2002, and at the Cost-Per Flying Hour Conference in Columbus, Ohio in September 2002.

Data Analysis

Like the data collection phase, and even more so, the data analysis phase of this research was an iterative process. The first step in the analysis was to use the data from the BES to determine the overall position of the AFWCF. This was done by simply graphing the AOR and NOR data included in the BES. The next step was to graph the AOR and NOR data for each of the four activity groups: SMAG, DMAG, ISAG and TWCF. This illustrated which of the funds was having the most difficult time meeting the goal of breaking even and outlined which activity groups could be driving the Fund's performance. After the visual inspection, a bivariate correlation was conducted amongst

the AFWCF and each of its activity groups. This helped determine which areas, if any, were true statistically significant drivers of the AFWCF's overall performance.

Then, the scope was altered to establish how accurate the initial estimates were when compared to actual revenues and expenses. By computing a growth factor for each of the activity groups at the Total Income and Total Expense levels as outlined in the BES, a determination was made as to how the Fund was operating. Again, statistical analysis was performed to test the significance of the results.

Finally, estimating consistencies were identified among the specific revenue and expense categories for each of the activity groups and the average over or under estimation was computed. A consistency was defined as a revenue or expense category that was being either overestimated for all years being reviewed or underestimated during all years under review. If an activity group underestimated a category in one year and overestimated that same category in a different year, it was not considered to be consistent. After identifying which areas were consistent estimating problems for the activity groups, common categories among all the activity groups was identified. The goal was to determine if there was an area of the budget process that needed more attention. Perhaps personnel are not as accurate at determining the requirements or prices as they thought.

Data analysis for the MSD portion of this study was conducted in conjunction with the literature review. This resulted in a comparative analysis of MSD's pricing strategy to Olsen and Peter's (1996) six-step pricing process. The primary goal of this part was to determine if MSD is aligned with commercial best pricing practices.

Summary

This research employs both a multiple-case and a single-case study design with the four activity groups of the AFWCF contained in the multiple-case study and the Materiel Support Division of the Supply Management Activity Group as the case in the single case study. The case study was considered most appropriate due to the type of questions being asked, the lack of control over the events and the context of the case. Data collection was obtained through databases, interviews and documents. While data analysis was accomplished through a comparison of budgeted and actual data along with statistical verification of results.

IV. Analysis

Overview

This research endeavor focused on several aspects of the Air Force Working Capital Fund. First, its purpose was to determine if the goals of the DWCF were reflected in the current pricing strategies of the AFWCF based on the AFWCF's performance. Second, it examined how the pricing strategies of the AFWCF activity groups differ and seeks to determine if any of the Activity Groups are able to break even. Finally, based on current commercial pricing practices, determine if the current pricing strategy of the Materiel Support Division of the Supply Management Activity Group, the largest single division of the AFWCF, can be improved upon while making suggestions where the Air Force should focus its improvement efforts. Responses to these questions will provide insight into the implications behind an appropriate pricing strategy and aid in educating the AFWCF community.

AFWCF Performance

The majority of DoD literature encountered during this investigation stated in one way or another that the WCF was failing to operate as intended. Yet, none of this literature stated whether or not the changes the WCF has been encountering in the past few years has resulted in a positive or negative impact on the fund, due in part to the fact that the only acceptable performance of the Fund is when it is able to break-even. So, the first step in determining if the goals of the DWCF are reflected in the current pricing strategies was to analyze past performance data. This will enable us to see where the AFWCF is working and where improvements can be made. We will first look at the

AFWCF and its activity groups in their broadest sense and then delve down into more explanatory aspects like revenues and expenses.

The Net Operating Result, NOR, is undoubtedly the most important indicator of the effectiveness of the AFWCF operation. Recall that this is the variance between the expected results and the actual results in a single year. When there is a positive NOR in a given year, this money will be returned to the fund in a subsequent year, ultimately driving down prices customers pay in the short run. However, and as equally often the case, the NOR is a negative amount (Figure 8). This means that the Fund's total expenses have surpassed its total revenue. This money must be recouped in a subsequent year, thus artificially raising prices the customers are charged. This artificial inflation of prices creates undue hardship on the customers of the Fund. Rather than paying a fair price for goods or services, they are paying prices that are often higher than their budgets will allow and higher than prices found in the commercial sector. This results in a reduction in the revenue the Fund will receive since customers are unable to purchase as many goods or services at the inflated rate, which ultimately drives the Fund's loss. Or, revenue is lost due to the customer purchasing their goods from the private sector if available.

The other measure of the AFWCF's position from year to year is the Accumulated Operating Result (AOR). This number is the cumulative gain or loss since the inception of the fund in 1991. One would think that due to the regulatory requirements set forth by the Department of Defense Financial Management Regulation (DoDFMR) that the AOR would have to be zero every year. The reason there is a balance in this category is due to the lag in recovering the NOR. By the time it is

determined that FY00 has a negative NOR for the year, it is too late to recover it in FY01 because this budget has already been approved and execution has begun for FY01. So, the AOR rides until the next fiscal year where it is supposed to be recovered. However, when FY02's budget is executed, the NOR that had occurred in FY01 must either be recouped or reintroduced. So, the cumulative loss of the fund can grow before anything is recovered. This is what is often referred to as the downward death spiral. The problem keeps getting worse, that is to say that the negative AOR keeps growing larger, before it has a chance to recover. This problem has been recognized and over \$1.2 billion was introduced into the Fund in fiscal year 2003 to zero out the AOR, thus balancing the Fund for the first time since its establishment.

Yet, it is still important to recognize how well the fund has performed over the past few fiscal years. This was accomplished by obtaining the NOR from Budget Estimate Submissions (BES) for fiscal years 1997 to 2001. The results are displayed in Figure 8.

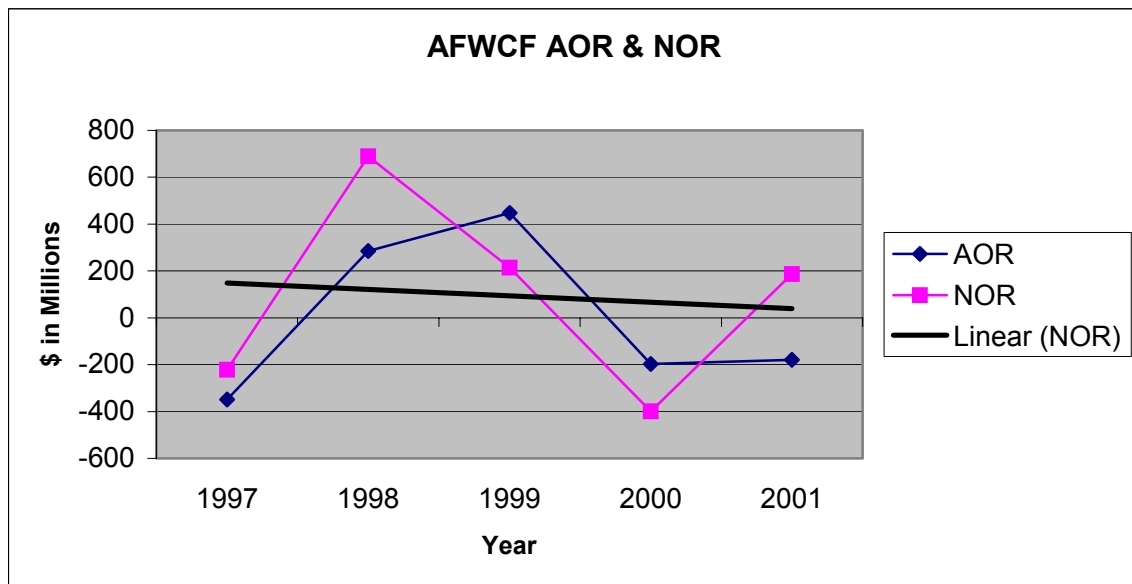


Figure 8. AFWCF AOR & NOR (FY97-FY01)

As one can see from the graph in Figure 8 above, there has been a great deal of fluctuation in the fund's operation over the past fiscal years. The NOR has an oscillating pattern with a decreasing trend. The trendline shows that the variance in the annual NOR is decreasing as the Fund matures. This suggests that the Fund is coming increasingly closer to operating as intended. Still, some of the vast fluctuation can be explained by the fact that the prior year's AOR is being recouped so the NOR is either a great deal larger or smaller than it should've been. Technically, the NOR should be at zero once the previous year's AOR has been recouped from or reintroduced into the Fund.

Two significant problems have been identified with the way the AFWCF or any of the DWCFs operate. The first is the time lag between the initial budget submission and the budget execution. In the FY97 BES, the estimators predicted that the FY99 NOR would be approximately -\$83.5 million (Figure 9). This however was based on the fact that the AOR at the end of FY98 was +\$35.9 million. By the time the FY97 budget was approved, the FY98 AOR had been updated to +\$415.2 million and the FY99 NOR to -\$390.3 million. And, once the FY99 budget execution was completed, the FY98 AOR sat at +\$289.1 and the FY99 NOR was +\$214.1 million.

\$ Millions	FY 99 Requested	FY 99 Approved	FY 99 Actual
Revenues	19,247.981	19,404.879	19,645.718
Expenses	19,373.819	19,221.631	19,529.049
NOR	(83.548)	(390.324)	214.065
Prior Year AOR	35.859	415.191	289.083

Figure 9. FY 99 AFWCF Operating Results

It is evident that the initial expectations of the Funds operation swing by as much as \$372 million when the initial estimations are compared to the actuals. This is unacceptable by any standard. Yet regrettably, it is mostly unavoidable.

The timeline used by the Fund to set its prices is not only prescribed by laws and regulations, but is necessary to ensure that customers have enough lead time to build and submit their POMs so they can identify where they should spend their budgets. On the other hand, when fluctuations are as widely distributed as they have been, it may be just as easy to use a best guess approach when submitting the initial estimates. As with any estimation, they are just that, an estimate, and by definition they will never be 100% accurate because analysts are not fortunate enough to have a crystal ball. There are, of course, other ways to set prices but they do not take into account the large role the customer plays in the AFWCF.

The second problem with the Fund is the way the AOR is recouped. This has been a longstanding issue within the Fund. In the early 1990s, the AOR just rode from year to year in the Fund, and got larger each year. But this was soon recognized as a problem because the Fund was losing capital that wasn't being recouped. So, in the mid-1990s, the AOR was required to be recouped from the Fund within the year of execution in an attempt to zero it out. This was impossible to achieve due to the budget constraints of the customers. The problem was that customers were budgeting for one amount and were being asked to pay a larger amount. By raising these prices within the year of execution, customers were unable to purchase as many goods or services as they had initially projected in their POMs. So, the AFWCF received less revenue than it had anticipated due to the decreased customer requirements but had many of the same

expenses. This again increased the AOR negatively. There appeared to be no solution to this problem that didn't end up doing more harm than good. Later, the AOR was recovered in a subsequent fiscal year. This worked better because the AOR was now budgeted for in a later fiscal year. Yet, there were still many unforeseen factors that arose causing the revenues or expenses to fluctuate widely from the anticipated amounts. Presently, one of the Activity Groups has undergone a change in the way the AOR is recouped that appears to have a very positive affect on the Fund. This will be discussed in the MSD Pricing Strategy.

Recall that the NOR is recovered in a year after it is incurred. Referring to the graph in Figure 8, in FY97, there was a loss of approximately \$200 million in the NOR and then the FY99 AOR had a large increase. Why such a large fluctuation? If the Fund only needed to recoup \$200 million, why was there a large spike in the Funds operating result the next year? This may be the result of overcompensation. In order to make up the negative funds lost in FY97, the AFWCF needed to recoup the money in FY99 which meant raising prices. Maybe they raised the prices too high when incorporating the negative NOR into the Fund. The behavior of the fund is erratic at best. Perhaps this can be better explained by observing how the individual activity groups were performing during this same timeframe since the four activity group's data were consolidated to arrive at the AFWCF's results.

We expect to see the same erratic behavior in each of the activity groups as we have seen in the AFWCF. With the exception of ISAG, a quick look at each of the activity group's performance measures shows a similarly inconsistent pattern (Figure 10).

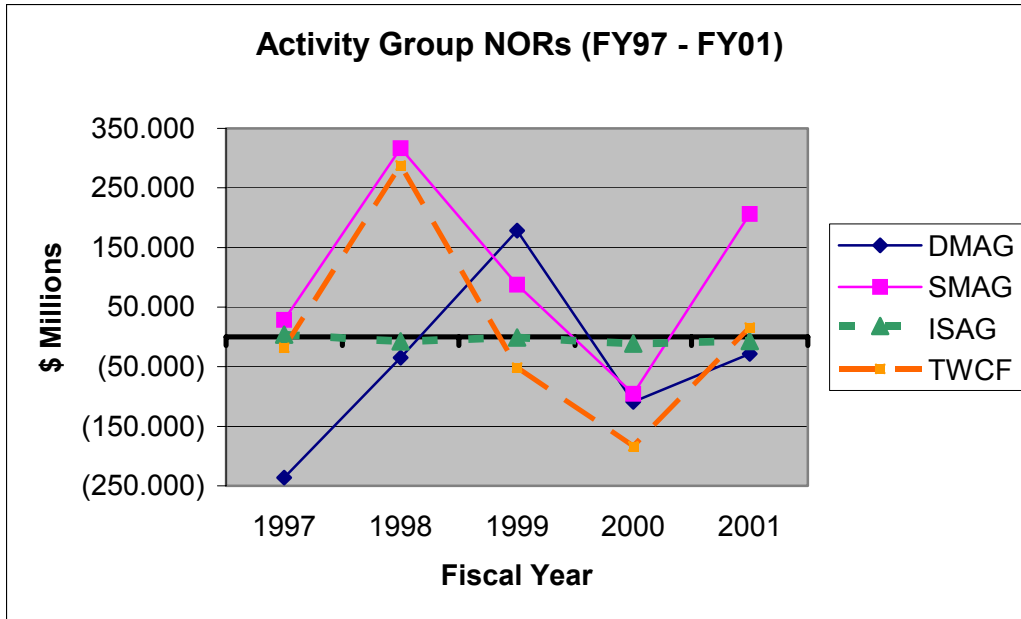


Figure 10. Activity Group NORs

When compared to Figure 8, we see that the consolidated NOR of the AFWCF most closely follows the pattern of the SMAG. A look at each of the Activity Groups individually will provide a better understanding of their impact on the Fund as a whole.

First, consider the SMAG data. This is the largest of the Activity Groups so it is reasonable that any fluctuations in its operation have the largest impact on the Fund overall. Notice in Figure 11 how the SMAG data trend closely resembles the AFWCF data. This verifies the large effect the SMAG has on the AFWCF.

Looking at the graph in Figure 12 shows the DMAG NOR against the AFWCF NOR. The trend between the two is similar but does not provide evidence that DMAG is a large contributor to the Fund's overall performance; it isn't nearly as obviously driving the Fund's outcome as the SMAG's fluctuation is.

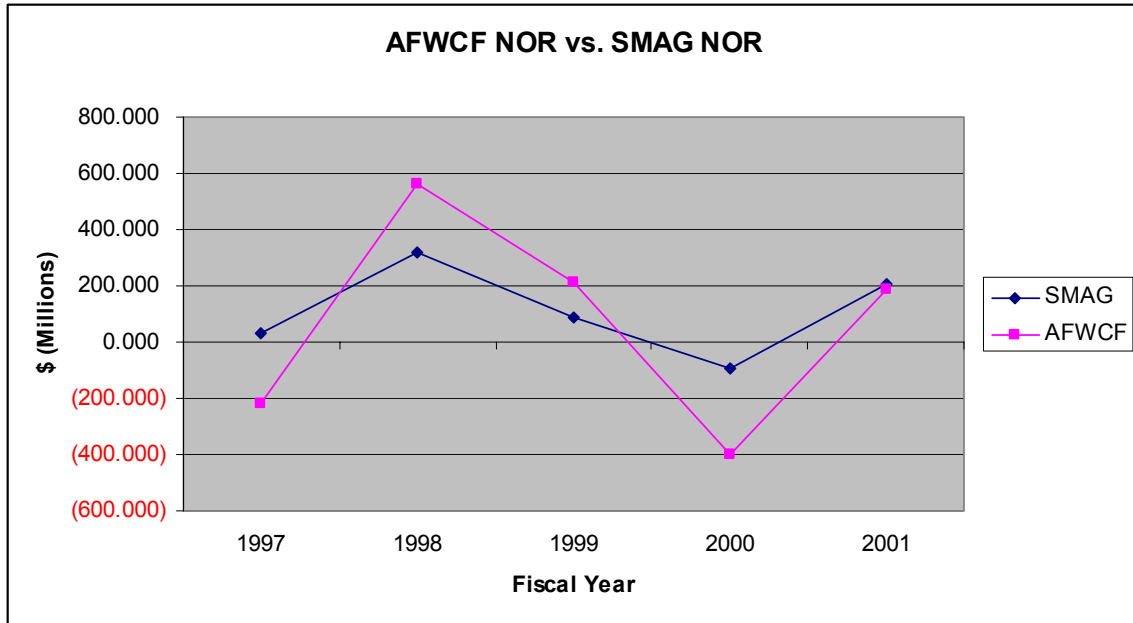


Figure 11. AFWCF NOR vs. SMAG NOR

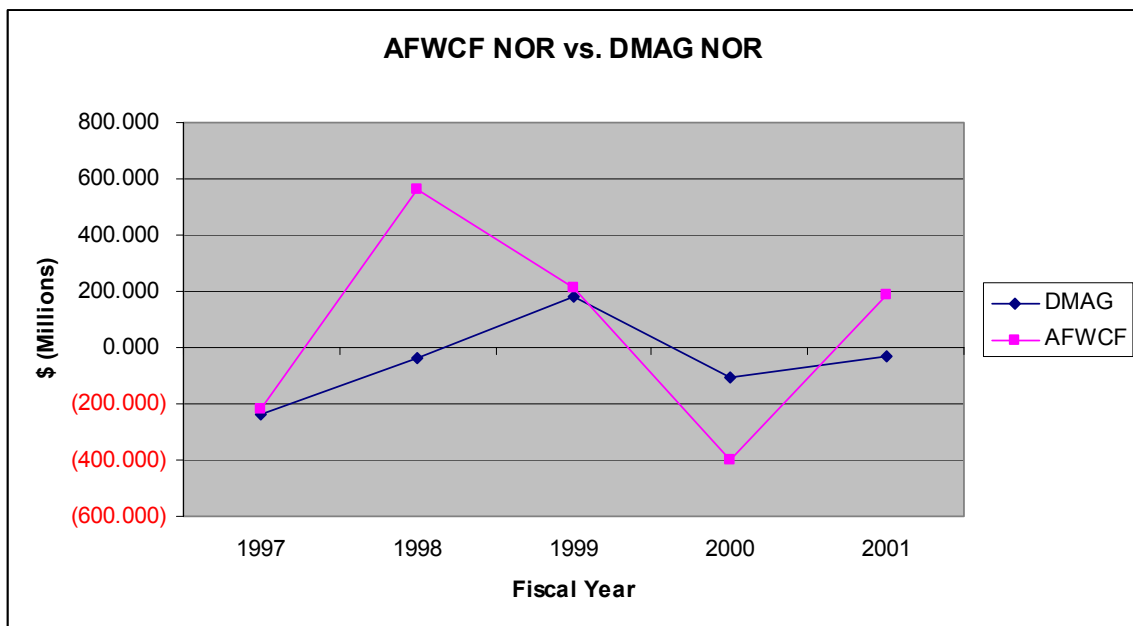


Figure 12. AFWCF NOR vs. DMAG NOR

Looking at the ISAG NOR below, there appears to be significantly less correlation than the previous two (Figure 13). The ISAG NOR is so small in comparison to the entire AFWCF that it hardly shows up when compared against the AFWCF NOR in the same graph, in fact there appears to be no fluctuation at all. Yet when viewed

alone, ISAG shows opposite patterns than the AFWCF NOR for fiscal years 97-99. This suggests that ISAG is counteracting the NOR and is thus bringing it closer to zero. This is the desired impact of the Fund. Unlike SMAG, this activity group appears to be aiding the AFWCF in attaining its goal of breaking even. Unfortunately, its impact is minute due to the size of ISAG in comparison to the rest of the Fund.

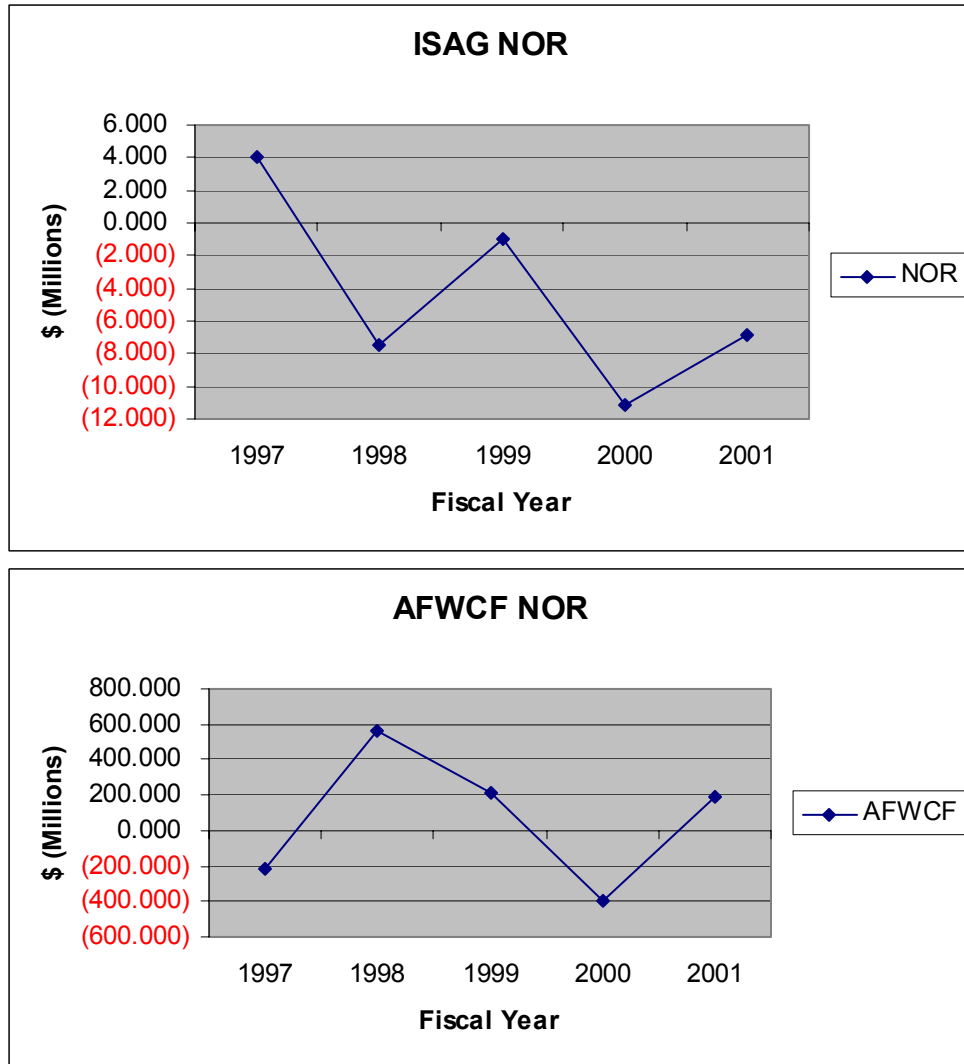


Figure 13. AFWCF NOR vs. ISAG NOR

Lastly, a comparison of the TWCF NOR against the AFWCF NOR shows another interesting trend. The graph in Figure 14 illustrates the relationship between the two.

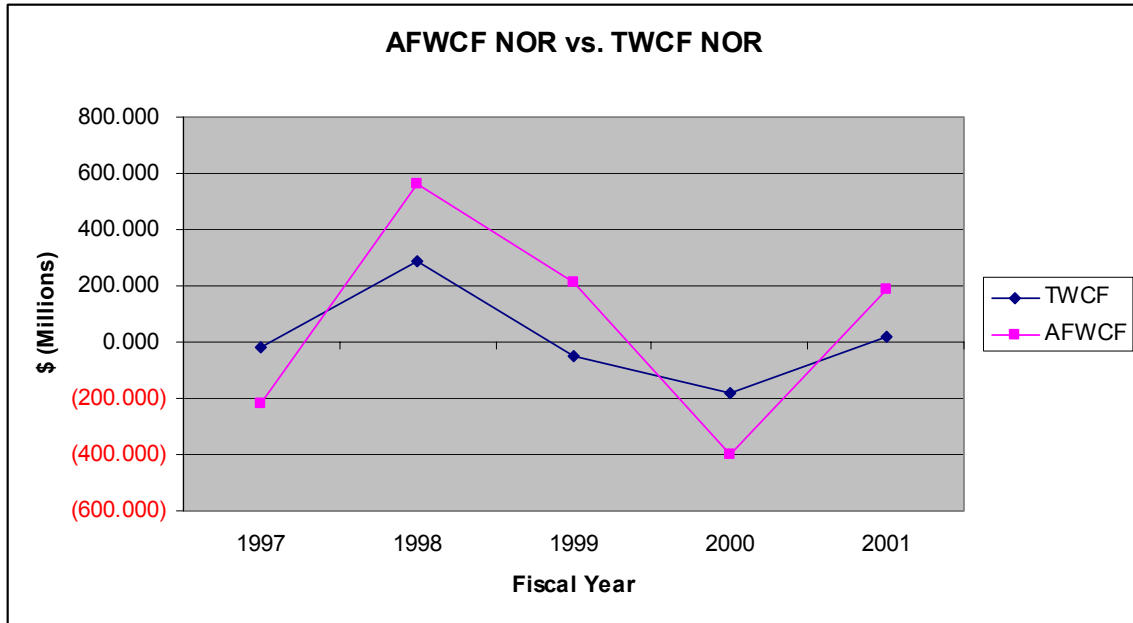


Figure 14. AFWCF NOR vs. TWCF NOR

Notice that the TWCF NOR, like SMAG, closely mirrors the AFWCF NOR. This too shows that the TWCF could be a significant driver of the consolidated NOR. Table 2 below shows the actual contribution of each of the activity groups to the overall AFWCF NOR. It is evident that based on the size of the different activity group operations, some contribute a great deal more than others.

Table 2. Individual NORs

\$ Millions	DMAG	SMAG	ISAG	TWCF	AFWCF
1997	(236.254)	28.639	4.092	(18.200)	(221.723)
1998	(34.636)	316.715	(7.419)	287.800	562.460
1999	178.461	87.800	(0.996)	(51.200)	214.065
2000	(109.030)	(95.211)	(11.179)	(183.200)	(398.620)
2001	(28.216)	206.036	(6.865)	15.700	186.655

To confirm the contribution each of the activity groups makes to the overall operating result in the NOR, a bivariate correlation was run to identify which activity groups have had the greatest impact on the Fund. This descriptive measure also

identified any correlation among the activity groups themselves. The results are presented in Table 3.

Table 3. NOR Correlations and Significance Levels

Correlation					
	<i>DMAG</i>	<i>SMAG</i>	<i>ISAG</i>	<i>TWCF</i>	<i>AFWCF</i>
<i>DMAG</i>	1				
<i>SMAG</i>	0.286485	1			
<i>ISAG</i>	-0.1384	-0.06181	1		
<i>TWCF</i>	0.067861	0.922708	0.002225	1	
<i>AFWCF</i>	0.543569	0.94694	-0.06374	0.864207	1
Significance					
	<i>DMAG</i>	<i>SMAG</i>	<i>ISAG</i>	<i>TWCF</i>	<i>AFWCF</i>
<i>DMAG</i>	.				
<i>SMAG</i>	0.640	.			
<i>ISAG</i>	0.824	0.921	.		
<i>TWCF</i>	0.914	0.025	0.997	.	
<i>AFWCF</i>	0.344	0.015	0.919	0.059	.

Use of a bivariate correlation function allowed for comparison among all pairs. Looking at the AFWCF correlation row, it appears that both the SMAG and TWCF are highly correlated to the AFWCF NOR while DMAG is moderately correlated and ISAG has a slight negative correlation. To verify these findings it was necessary to observe the resulting p-values. A correlation is said to be significant if its corresponding p-value is less than alpha. In this case, the significance levels were tested against an alpha of 0.05 and were instrumental in determining true statistical significance.

Based on the p-values presented above (Table 3), the only correlation that holds true is the relationship between the AFWCF and SMAG. The p-value of 0.015 indicates that there is a statistically significant correlation among these factors. However, the relationship between AFWCF and TWCF is very near the significance level with a returned p-value of 0.059. Ordinarily, this would be further scrutinized to determine if significance really exists here but with so few data points (5) for comparison there is no

need. A larger sample of NORs would yield different results and would more clearly identify if there were significance.

Finally, one other to point out is the statistically significant correlation among the SMAG and TWCF pair with a correlation coefficient of 0.923 and a p-value of 0.025. The best explanation for this result is that SMAG expends the largest amount of any of the activity groups on the transportation of people and things. These expenditures directly relate to the revenue TWCF receives. However, with so few data points in the model, a 0.846 correlation coefficient is not considered highly correlated nor is it statistically significant.

Based on the information presented on the preceding pages, there is difficulty ascertaining whether or not the pricing strategies of the AFWCF reflect the goals of the DWCF. Although all of the activity groups strive to come as close to breaking even as possible, their efforts are thwarted by the need to recoup the AOR and the regulatory constraints that are in place. This being the case, it is necessary to look at the pricing strategy of each of the activity groups individually to determine if they are being a hindrance or help to the health of the DWCF. Unfortunately, due to the time constraints of this research, only a small portion of the AFWCF was studied. The AFWCF is a complicated process of give and take on the part of the customers and activity groups. Fully understanding the price setting process often takes those directly involved with the Fund years to comprehend. There is a delicate balance between all parties involved and very often the actions of one affect many. This is most often the case in the DMAG and SMAG relationship described earlier in the paper. Therefore, we suggest that further research be conducted to look at each division of each activity group. We have chosen to

focus our efforts on the pricing strategy of the Materiel Support Division of the SMAG. This will be discussed later in this chapter.

In answering the second question of whether or not the activity groups have differing pricing strategies, the answer is yes. As outlined in Chapter One, the price setting technique used by each activity group is prescribed by the DODFMR 7000.14R, Volume 2B, Chapter 9. This document states that there are two ways to setting rates, based on whether the activity group is supply management-oriented or not. The SMAG is a supply entity so its pricing strategy must incorporate the cost of its commodities along with a surcharge to establish the rates it will charge customers. DMAG, ISAG and TWCF, on the other hand, are all service-oriented divisions. Their rates are based on their respective output measures, such as direct labor hour or direct per standard hour.

Although it is evident that only a couple of the Fund's activity groups have a large affect overall, specific areas of the budget estimates (revenues and expenses) will be studied to identify any trend in the estimations. This information will provide valuable insight into areas being consistently over or under estimated and those having a significant impact on the Fund.

The Budget Estimate Submission is a compilation of the expected revenues and expenses the Fund expects to generate in a given fiscal year. It includes a compilation of the four activity groups' data as well as each individual activity groups' specific data. There is a general format that the revenues and expenses are reported in that all submissions have followed subsequent to FY97. The activity groups report their operations in the categories shown in Figure 15.

Revenues and Expenses			
Air Force Working Capital Fund			
FUND14	Consolidation		Fiscal Year (FY) 2003 Budget Est
(Dollars in Millions)			February
	2001 AC	2002 AP	2003 R
Revenue:			
Gross Sales	21,517.340	22,708.781	23,590.943
Operations	20,985.627	22,088.478	23,210.252
Capital Surcharge	13.500	0.000	0.000
Depreciation exc Maj Const	188.200	200.900	210.100
Major Construction Dep	16.171	17.043	17.037
Cash Surcharge	47.600	50.000	25.000
Other Income	684.646	759.058	360.875
Refunds/Discounts	2,395.476	2,643.307	3,416.874
Total Income:	19,540.268	20,472.172	20,435.590
Expenses:			
Cost of Materiel Sold from Inv	8,095.803	7,945.207	7,603.086
Mobilization	29.224	29.786	30.356
Full Cost Recovery	0.000	0.000	0.000
Lean Logistics	0.000	0.000	0.000
Inventory Gains/Losses	(49.095)	(14.103)	(3.693)
Inventory Maintenance	0.101	0.048	0.049
Salaries and Wages:			
Military Personnel Compensation & Benefits	107.327	98.213	100.453
Civilian Personnel Compensation & Benefits	1,714.973	1,793.528	1,968.782
Travel & Transportation of Personnel	107.213	115.162	116.362
Materials & Supplies (For internal Operations)	2,842.137	3,269.258	3,398.165
Equipment	37.224	48.556	41.055
Other Purchases from Revolving Funds	1,105.927	1,401.267	1,413.800
Transportation of Things	133.729	96.846	91.376
Depreciation - Capital	349.250	368.791	384.054
Printing and Reproduction	4.370	8.433	8.380
Advisory and Assistance Services	68.718	71.500	70.723
Rent, Communication, Utilities, & Misc. Charges	73.007	78.596	82.752
Other Purchased Services	4,607.793	4,847.872	4,986.419
Other Expenses	(1.300)	8.642	0.090
Total Expenses	19,226.401	20,167.602	20,292.209

Figure 15. FY03 BES Sample

Each BES includes data in these categories in one of three fiscal years. It includes the requested (expected) revenues and expenses for the fiscal year that is being budgeted, the approved budget amounts for the fiscal year prior and the actual revenues and expenditures for the fiscal year prior to that. For example, the FY 2003 BES included the requested FY 2003 amounts (2003 R), the approved FY 2002 amounts (2002 AP), and the actual FY 2001 amounts (2001 AC).

After obtaining the BES' for fiscal years 1997 – 2004, analysis of the differences between the requested and actuals, and the fluctuation in the requested and approved

amounts was examined across each of the activity groups. This information was valuable in determining accuracy of the estimates, and whether or not there are areas of the AFWCF that are consistently estimated incorrectly; thus having a negative impact on the Funds operating result and preventing it from achieving its goal of breaking even. It should however be stated that the Fund can never break-even and it is an impossibility to create an exact estimate. In fact, the statistical probability of achieving 100% accuracy is zero.

Examination of Estimate Accuracy

According to many critics, one of the chief problems with the Fund is that it does not reach its goal of breaking even. The next measure of the Fund's performance was the accuracy of the initial estimates against the actual revenues and expenses. First, a Revenue Growth Factor (RGF) and an Expense Growth Factor (EGF) were computed for each of the activity groups in fiscal years 1999 to 2002. These values show whether the revenues or expenses were under or over estimated in a given year. A Growth Factor value > 1 indicates that the initial estimate was less than the actual income or expenditure while a Growth Factor value < 1 indicates the opposite. The impact to the activity group depends on the whether it is an expense or a revenue. For instance, when a RGF is less than 1, the initial revenue estimate was less than the actual revenues recorded. This difference creates a loss in the activity group. On the other hand, when an EGF is less than 1, the initial expense estimate was also less than the actual expenses recorded but this creates a gain for the activity group.

Examining tables 4 and 5, it is evident that there are large fluctuations in the estimates of the activity groups. The group best at estimating revenues is TWCF with an

average RGF of 0.990, indicating that TWCF is generally within 1% of its initial estimate. TWCF is also the most accurate when estimating expenses with an average EGF of 0.967, signifying that TWCF's initial expense estimations are within 3.3% of the actual expenditures. While TWCF experiences the least fluctuation, ISAG has averaged the worst fluctuations with an RGF and an EGF of 1.158 and 1.179 respectively. However, these values are overstated due to the largely inaccurate estimates in FY99 due primarily to the fact that this was one of the activity groups first years in existence and experienced many growing pains. Their estimations since then have improved considerably. Omitting the inflated data from FY99, the RGF and EGF are 1.053 and 1.066 respectively.

Table 4. Revenue Growth Factors

A RGF < 1 = initial < actual (Fund gains \$)					
A RGF > 1 = initial > actual (Fund loses \$)					
	2002	2001	2000	1999	Average
SMAG	0.955	0.904	1.010	0.935	0.951
DMAG	1.081	1.115	1.107	1.113	1.104
ISAG	1.047	1.030	1.083	1.470	1.158
TWCF	1.001	0.931	0.957	1.072	0.990

Table 5. Expense Growth Factors

A EGF > 1 = initial < actual (Fund loses \$)					
A EGF < 1 = initial > actual (Fund gains \$)					
	2002	2001	2000	1999	Average
SMAG	0.954	0.881	0.995	0.913	0.936
DMAG	1.127	1.088	1.153	1.121	1.122
ISAG	1.051	1.044	1.102	1.518	1.179
TWCF	0.884	0.933	0.963	0.963	0.967

Another detail to take note of is the consistent pattern in the activity groups: DMAG and ISAG are consistently overestimating revenue and underestimating expenses; SMAG primarily underestimates revenue and has always overestimated expenses. Fortunately, these inaccurate estimates are counteracting each other. For example, in

FY01, DMAG projected revenues to be \$5.05 billion and expenses to be \$5.07 billion. Actual revenues ended up coming in at \$5.63 billion; an increase in revenue of \$0.58 billion. Actual expenses were reportedly higher than expected at \$5.52 billion, an increase in expenses of \$0.45 billion. All but \$0.13 billion of these errors are negated by the other category. So, as long as one category is overestimated and the other underestimated, the activity group can counter the effect of any extreme changes in that particular year.

Before proceeding to the analysis of the individual revenue and expense categories, a hypothesis test was constructed to determine if the revenues and expenses were statistically equivalent. The following hypotheses were tested using a two-tailed t test and a 95% confidence interval:

$$\begin{aligned}H_0: \mu_{\text{RGF}} &= \mu_{\text{EGF}} \\H_1: \mu_{\text{RGF}} &\neq \mu_{\text{EGF}}\end{aligned}$$

Table 6 shows the results as they appeared in Microsoft Excel. The null hypothesis will be rejected if the test statistic falls outside of the confidence interval. The 95% confidence interval is (-2.04,2.04); the test statistic is 0.83442. The test statistic falls between the critical values of the confidence interval. Therefore, we fail to reject the null hypothesis and assume the mean RGF and the mean EGF to be statistically equivalent.

The impact of the previous statement supports evidence that the AFWCF is statistically meeting the break-even goal as far as revenues and expenses are concerned. However, when the prior-year AOR is included in the budget estimate submission problems arise and the activity groups move farther from the break-even goal. Removing the requirement to recoup or reintroduce the prior-year AOR from the activity group's responsibility may lead to a better-balanced Fund.

Table 6. Two-Tailed t Test for Growth Factor Equivalence

	<i>RGF</i>	<i>EGF</i>
Mean	1.050688	1.017125
Variance	0.01741	0.008475
Observations	16	16
Pooled Variance	0.012943	
Hypothesized Mean Difference	0	
df	30	
t Stat	0.83442	
P(T<=t) two-tail	0.41064	
t Critical two-tail	2.04227	
Std Dev	0.131948	0.092061
CV	0.125583	0.090511

Analysis of Individual Categories

A brief analysis of the trends associated with individual revenue and expense categories was conducted to locate areas necessitating more attention while building estimates. Large variations were found among the activity groups so each group was evaluated separately. In fact, some categories had estimates that were incorrect by as much as 2000% while others had only a 0.01% inaccuracy rate. Yet in all fairness to the estimators, there is no crystal ball that allows them to see what will happen two years down the road. They are limited by the information at hand and are unaware of future fluctuations. By identifying areas of consistent inaccuracy, the intent is to provide insight to the AFWCF estimating personnel to aid in the elimination of the risk inherent in estimation.

Prior to exhibiting areas needing closer scrutiny, there are a few limitations needing identification. First, revenue categories were reviewed from FY99 to FY02 whereas expense categories were reviewed from FY00 to FY02. The reason behind this difference is that in FY97, when the initial budget estimate was submitted for FY99, the expense categories were broken out differently than they were in subsequent years. We

were unable to accurately match FY 99 expenses to the categories used today. Second, only categories were considered that had activity all years in review. And last, only categories that are consistently overestimated or consistently underestimated will be identified. Those categories that have an overestimation one year and an underestimation the next were omitted from this investigation. The goal is to show recurrent trends that can be altered and adjusted for by the estimators. The categories under consideration are listed in the previous BES sample in Figure 15.

SMAG Estimations

After investigating the SMAG data, nine categories were found that were constantly overestimated or underestimated. All trends were found in the expense portion of the data; none were found in the revenue categories. Of those nine expense categories, only two showed constant underestimation. Table 7 presents the SMAG findings.

Table 7. SMAG Estimation Trends for Consistently Underestimated and Overestimated Budget Categories for FY 00-FY02

Expense Category	Finding	FY02	FY01	FY00
Materials & Supplies (For Internal Purposes)	Underestimated	81.41	39.22	53.49
Transportation of Things	Underestimated	121.91	32.65	131.06
Civilian Personnel Compensation & Benefits	Overestimated	2.78	11.63	7.20
Travel & Transportation of Personnel	Overestimated	40.97	29.58	23.37
Printing & Reproduction	Overestimated	33.14	12.68	28.33
Advisory and Assistance Services	Overestimated	100.00	100.00	31.85
Rent, Communications, Utilities & Misc. Charges	Overestimated	99.96	90.88	26.23
Other Purchased Services	Overestimated	99.65	98.99	32.70
Other Expenses	Overestimated	99.96	100.38	99.45

All values are percentages

Additional research should be conducted to identify which divisions of SMAG are the largest contributors to these trends. This detailed information was not available during this research project.

DMAG Estimations

Thorough analysis of the DMAG data resulted in finding seven categories consistently under or over estimated. Unlike SMAG, two categories fall under the revenue heading. Table 8 lists DMAG findings.

Table 8. DMAG Estimation Trends for Consistently Underestimated and Overestimated Budget Categories for FY 99-FY02

Revenue Category	Finding	FY02	FY01	FY00	FY99
Operations	Underestimated	4.16	6.29	5.15	8.45
Other Income	Underestimated	127.73	266.24	44.60	221.70
Expense Category					
Materials & Supplies (For Internal Purposes)	Underestimated	25.24	5.16	13.91	
Civilian Personnel Compensation & Benefits	Underestimated	6.53	6.25	6.13	
Rent, Communications, Utilities & Misc. Charges	Underestimated	12.62	21.88	9.42	
Other Purchased Services	Underestimated	9.80	17.16	25.14	
Other Expenses	Overestimated	100.00	100.00	100.00	

All values are percentages

Unlike SMAG, many of the DMAG categories are underestimated. The category entitled “Other Income” had the largest delta. In all but fiscal year 2002, the activity group was not expecting any additional income in this category. Yet, each year there was income ranging from \$266.242 million to \$547.000 million. Further study to identify the source of this income would aid in determining if this factor can be estimated more accurately. The same sort of situation applies to the “Other Expenses” category. In this case, expenses were expected but never materialized.

ISAG Estimations

Recall that ISAG is the smallest and newest activity group of the AFWCF so the impact it has on the Fund is minor compared to the rest of the activity groups, as

evidenced by the low correlation coefficient previously presented in Table 3. Yet, any adverse impact on the Fund needs to be studied and corrected if possible.

Analysis of ISAG revenues and expenses identified only four categories with consistencies; one of which falls under revenue. And with the exception of one category, all are underestimations. ISAG estimation trends can be found in Table 9. Note that the problem area is the estimation of equipment expenses but there is decreasing trend in the inaccuracy of this element.

Table 9. ISAG Estimation Trends for Consistently Underestimated and Overestimated Budget Categories for FY 99-FY02

Revenue Category	Finding	FY02	FY01	FY00	FY99
Operations	Underestimated	4.73	2.99	8.31	48.98
Expense Category					
Materials & Supplies (For Internal Purposes)	Overestimated	33.82	34.31	120.73	
Civilian Personnel Compensation & Benefits	Underestimated	17.95	2.26	3.11	
Equipment	Underestimated	87.56	524.36	2023.82	

All values are percentages

TWCF Estimations

Last, a look at TWCF trends completes this portion of the BES analysis. Six expense categories were identified as having consistent estimation patterns, all located in the expense category. They are shown in Table 10. Notice that the steadiest pattern is in the “Equipment” category. Based on the present data, this is a prime example of where a cost growth factor could be built into the estimate to eliminate the continual overestimation in years to come.

Estimation Summary

Reviewing the findings presented above, it is evident that two expense categories have been continuous problems for the estimators: Civilian Personnel Compensation &

Benefits and Material Purchases (For Internal Purposes). Each of the four activity groups had difficulties accurately predicting these elements for the three years under review. Table 11 illustrates the commonality among the activity groups.

Table 10. TWCF Estimation Trends for Consistently Underestimated and Overestimated Budget Categories for FY 00-FY02

Expense Category	Finding	FY02	FY01	FY00
Civilian Personnel Compensation & Benefits	Overestimated	63.67	3.52	0.08
Equipment	Overestimated	59.80	58.01	48.24
Materials & Supplies (For Internal Purposes)	Overestimated	8.05	14.64	10.12
Other Purchases from Revolving Funds	Overestimated	41.00	11.60	13.30
Rent, Communications, Utilities & Misc. Charges	Overestimated	56.39	31.05	9.61
Transportation of Things	Overestimated	40.91	13.13	0.64
Travel & Transportation of Personnel	Underestimated	127.82	0.36	0.72

All values are percentages

Table 11. Common Expense Categories Consistently Underestimated or Overestimated by AFWCF Activity Groups

Category	Activity Group	Finding	Average % Deviation
Civilian Personnel Compensation & Benefits	SMAG	Overestimated	7.2
	DMAG	Underestimated	6.3
	ISAG	Underestimated	7.77
	TWCF	Overestimated	22.42
Materials & Supplies (For Internal Purposes)	SMAG	Underestimated	58.04
	DMAG	Underestimated	14.77
	ISAG	Overestimated	62.95
	TWCF	Overestimated	10.94

These findings should be addressed to AFWCF senior leadership and more information should be gathered from the respective activity groups to determine if this is simply coincidence or if this is a problem that can be avoided with better identification of the risks associated with over or under estimating these categories. Again, with such a trend, a growth factor could be developed that can be incorporated into the estimation process that will effectively account for this discrepancy.

Lack of Inflation

One problem identified when reviewing information in the BES' obtained for this study was the omission of inflation when incorporating the AOR from a prior-year. The problem lies in the fact that when the prior-year AOR is added to the budget estimate, it is not reduced to account for inflation. This is the case throughout all of the activity groups in all of the BES reviewed. Because this was so common, the base year for each BES was verified to determine that this was in fact an omission. Personnel from HQ AFMC/LG verified what appeared to be true-- values in the FY01 column are in FY01 dollars, values in the FY02 column are in FY02 dollars and values in the FY03 column are in FY03 dollars. A sample transcribed from the Fund 14 report for DMAG in the FY03 BES is shown in Table 12 for explanation purposes.

Table 12. Actual Uninflated AOR Data from DMAG Portion of FY03 BES

	2001	2002	2003
(\$ in Millions)	Actual	Approved	Requested
Prior-Year AOR	(175.904)	(253.151)	(43.283)
Accumulated Operating Result	(253.151)	(43.283)	(43.283)

One would expect the prior-year AOR in FY02 that is being recouped from FY01 to be larger due to inflation and the same for FY03. The problem is that when the inflation factor is not accounted for, the prior-year AOR is underestimated. Using raw OSD inflation indices for O&M monies, with a base year of FY01 the values in Table 12 were inflated for FY02 and FY03 at 1.017 and 1.030 respectively to reflect the true amounts needing to be incorporated in the BES. These are shown in Table 13 below. Notice that there is now a large difference in the Prior-Year AORs being recouped. Approximately \$4.3 million more needs to be recouped in FY02 and \$1.3 million more in FY03. Keep in

mind that this is just the DMAG portion of the AFWCF, the other activity groups will need to be inflated as well which will produce an even greater effect. By correcting this easily remedied error, the Fund's estimates will be more accurate which will aid in approaching the break-even point.

Table 13. Proposed Inflation of AOR Data from DMAG Portion of FY03 BES

	2001	2002	2003
(\$ in Millions)	Actual	Approved	Requested
Prior-Year AOR	(175.904)	(257.455)	(44.581)
Accumulated Operating Result	(253.151)	(43.283)	(43.283)

MSD Review

Remember that the MSD is responsible for providing parts, frequently referred to as Depot Level Repairables (DLRs), to its customers for use in weapons systems. Most often MSD obtains these DLRs from the Depot Maintenance Activity Group (DMAG), but also purchases them from commercial vendors. The MSD is an integral part of the warfighter's capability. Without the necessary spares for repair, the mission may not be accomplished. This importance is also demonstrated in the fact that this is the largest division of the SMAG and in FY02 was projected to generate \$9 billion of the activity group's \$20 billion in expected revenue. The focus on MSD is therefore necessary to understand why the SMAG is the key driver in the AFWCF's performance as mentioned earlier in this chapter.

MSD Pricing Strategy

The Materiel Support Division's (MSD) pricing strategy has undergone recent changes that are expected to positively affect its customers. Before describing the new strategy, it is important to understand what type of pricing process it is moving from.

After the strategy is explained, we will determine if it follows commercial best practices as outlined by Olsen and Peter.

Up until fiscal year 2003, the MSD pricing strategy revolved around recouping the prior year losses it had generated so a surcharge was added to all DLR orders. And like most of the other activity groups, it wasn't able to accurately price its products so customers were continually canceling orders because prices were raised higher than their budgets would allow. It was a form of cost-plus pricing. Ordinarily, cost-plus pricing encompasses all direct and indirect costs associated with a product and adds an additional percentage for profit. The MSD tries to capture all direct costs but has done a poor job of capturing the true indirect costs of a product. As such, you will see that MSD charges a surcharge that is essentially summarizing its best guess at indirect costs. However, there is an added portion that is necessary to recoup prior year losses. This is in essence the same as trying to make a profit. This is the best description of MSD's pricing method in the early days. The pricing approach up until FY03 had been in place for several years. A multi-part pricing scheme is slated to begin in FY05, which alleviates much of the burden to recoup the NOR from the customers, and shifts it to HQ AFMC.

Like all other AFWCF divisions, MSD begins the pricing process two years prior to the year of execution. So, in FY99, the FY01 budget estimate along with the price build commenced. The first step was to obtain customer requirements. These requirements are estimated by the customer and are output in the form of the D200 Report. This automated report utilizes computer algorithms to evaluate prior year requirements and projected requirements to arrive at the future requirements that are ultimately used to build the prices. The algorithms within this program have not been

studied but warrant a closer look to determine the accuracy of their output. Accurate requirements are vital to the accuracy of the rates emerging from the budget process since, in its simplest form, the rate is a function of the costs and requirements.

While estimated requirements are being built, MSD personnel are gathering data to determine what revenues and expenses the division expects to encounter. The revenues and expenses are what you will find in the BES. However, this portion of the research is concerned with the price development procedure. Prior to FY03, there were three areas to consider during the rate (price) build. The first component of the price is the weighted average repair cost which is also known as the Latest Repair Cost (LRC). This is the cost to repair a DLR. It is comprised of both organic repairs and repairs made by contractors. These factors are then weighted to obtain the total LRC. This amount is then divided by the estimated requirements from the D200 to obtain the cost to repair each DLR. Note that this price will fluctuate based on the type of DLR being priced.

The next component of the price charged the customers is called the Total Buy Surcharge Base on Projected Orders. This element is a surcharge added to the LRC and is determined by the requirements system. It is based on total orders so it includes orders for condemnations as well as orders for routine repairs, making no distinction on when the order will be delivered. Often times, an order will be submitted for a condemnation but the part will not be delivered to the customer for a few years later. This was the most volatile portion of the price because the surcharge was often very different for customers. It is based on the expected buys, as outlined in the requirements, for individual DLR items. There were large fluctuations in the surcharge being charged different customers. While one customer may have a small surcharge, another may encounter one that is

enormous. This was due to the fact that the surcharge was based on a market basket of goods; this does not encompass all items in the inventory. So parts were simply put into a category that best fit its description and that surcharge prevailed. Many customers felt there was no real rhyme or reason on how this surcharge was set. It just didn't add up. And as you will see later, this is the portion of the price process that sees the most change in future years.

The last element in the price is a surcharge that's added to all DLRs to cover business operation expenses, also known as overhead. This portion of the price was more predictable than the latter but it still fluctuated because the Supply Chain Managers (SCM) were able to set the surcharge based on the parts they control at their location. As one can probably ascertain, this type of pricing strategy did not lend itself to helping the AFWCF achieve its break-even goal. Let's see how the process changes in the coming years.

The FY03-04 pricing strategy is similar to the previous process with the exception of the surcharges. Now, instead of having two surcharges based on the commodity or SCM, there is one flat surcharge that encompasses both of these elements which is computed at the HQAFMC level. Another change is that rather than the surcharge taking into account parts for repairs and condemnations, it will only be based on projected delivery of parts. Customers will no longer be paying for condemnation items they have not yet taken delivery of. This increases rate stability for customers as well as decreases losses for the Fund. But, according to HQAFMC personnel this is expected to meet only 90% of the DLR pricing objectives. The other 10% is an expected loss in this fiscal year. This is clearly not promoting a break-even mentality. Yet, this situation is only

temporary. In FY05, another change is projected to occur and should remedy this problem.

The final projected change to the MSD pricing strategy will occur in FY05. Again this method is similar to the previous years' process, with the exception of further changing the surcharge portion of the price. This final change is definitely a step in the right direction. Beginning this fiscal year, Air Force customers will only be charged the LRC when a sale is made. The remaining overhead expenses will be billed directly to a corporate Air Force account that will not affect the operation of the division. All non-Air Force customers will be required to pay the surcharge. The initial set-up of this corporate account will be the result of funds being realigned from the Air Force and the Office of the Secretary of Defense. In subsequent years, it will be the sole responsibility of HQAFMC to fund this account. The bad news is that HQAFMC needs to realign funds to do this. The good news is that customers will see costs that are more comparable to items they can purchase on the outside so they will be less apt to cancel orders. This results in more stabilized revenue for the SMAG and ultimately the AFWCF, which will aid the Fund in reaching its primary goal.

MSD vs. Commercial Pricing Practices

Looking back in the Literature Review you will find a six-step pricing strategy proposed by Olsen and Peter. Their approach, though focused on the private sector, was especially of interest to this study due to its foundation of consumer analysis. An in depth look at their process was also included in chapter 2. What follows is a comparison of the MSD pricing strategy to Olsen and Peter's strategy to determine if MSD is operating inline with commercial best practices. The six steps are as follows:

1. Analyze consumer product relationship
2. Analyze the environmental situation
3. Determine the role of price in marketing strategy
4. Estimate relevant production and marketing costs
5. Set pricing objectives
6. Develop pricing strategy and set prices

Step 1 – Analyze Consumer Product Relationship

This step is essential for MSD since it relies on its customer's projections of requirements to set its prices. This research found that MSD does a fair job of obtaining the information needed. However, one disturbing fact discovered early on was that MSD was not tracking the accuracy of the requirements submitted by the customer. Yet, as of December 2002, MSD was working on remedying this oversight. If you refer back to Table 1 you can see the impact to the customer if they over-estimate their requirements. On the other hand, it has a serious affect on the fund because it will not sell as many parts due to the over-inflated requirements, which drives a loss in the Fund because expenses do not change in proportion to revenue. MSD is aware of the implication of accurate requirements estimates and is taking appropriate action to track their exactness.

Step 2 – Analyze Environmental Situation

The environment MSD operates within is notably unique and typically more constrained than what is found in the commercial sector. Revisiting information stated in chapter 2, the main purpose of performing this phase in strategic pricing is to obtain information about competitors in the market and determine the value the customer places on the product. MSD, like any other military organization, operates within a distinctive environment focused ultimately on national defense. As such, MSD must focus on meeting the needs of the warfighter above all else. An examination of each of these factors and their pertinence to MSD was completed.

The unique operating environment of MSD encompasses a wide array of situations. First and foremost is the realization that MSD functions like a monopoly due to the unique nature of the parts it supplies to customers. MSD manages over 132,000 inventory items for aircraft, missiles, engines and DLRs that in most cases cannot be obtained from the private sector due to contractual agreements or one-of-a kind requirements. There is no outside source for these parts so it can be said that MSD has an internal market. Equally, MSD must analyze its internal market to assess its readiness to respond to not only current requirements but also future requirements brought about by contingency operations or future threats the military will respond to.

Another difference in the MSD environment when compared to the commercial sector is the imposition of strict constraints. All large businesses encounter some degree of adversity when altering their business operations but in most cases, an act of Congress is not required to change these instructions. The strict oversight by Congress of the DoD, the stringent regulatory requirements MSD must follow and looming budgetary limitations are all constraining factors that must be addressed and dealt with accordingly. Unlike a commercial firm, MSD can carry a negative operating result for an extended period of time without the formidable fact that it will either go out of business or go bankrupt because other divisions in the AFWCF can counter the negative effect on the Fund.

When considering value from the customer's point-of-view, many factors are present in the commercial environment including not only the monetary value of the product but the importance or value customers place on intangible costs and benefits. Unfortunately, the perceived value of the warfighter is often a moot point. They must

purchase items whether they value them or not to continue to support the mission. And again, due to the limited source of many products MSD carries, customers are forced to make purchases regardless of how they perceive the product's value to their program.

To summarize, MSD's environmental situation is influenced by many constraining elements and has few, if any, competitors. The main constraints are those imposed by the Congress and DoD regulations along with the limited budgets its customers are working with. The perceived value of MSD's customers is not a consideration due to the uniqueness of the parts it supplies. However, it may warrant further research in other areas of the AFWCF. For instance, the GSD supplies many items that can be purchased in the private sector. And often the prices in the private sector are considerably lower than what the GSD division is charging due to the over inflation of price caused by the surcharges. Though this step of the price setting process is entirely appropriate for the commercial sector, it is only partially so for the MSD.

Step 3 – Determine the Role of Price in Marketing Strategy

To begin with, the marketing strategy of MSD is not to make a profit or gain hold of a new market segment as in a commercial firm. When considering marketing strategy in the MSD, the focus remains on accurately pricing products so customers will purchase as close to the number stated in their initial estimates as possible. Remember that the customer plays a large role in the price of the product due to the formula used to compute the price. The LRC for an item is divided by the total requirements submitted by all customers for that item resulting in the price charged each customer for that item. Surcharges are then added to cover other operating expenses. Understanding this

relationship is the key to understanding the role of price in the marketing strategy of MSD.

Another element of understanding price in the marketing strategy is the realization that there is little, if any external market for MSD to conquer. Instead, MSD operates in an internal market, supplying primarily Air Force customers with its products. One noted exception is the foreign military sales of products to other allied governments. Yet the percentage of these sales in relation to the sales to the Air Force and other DoD services is minute. The role of pricing in MSD is highly related to the performance of the SMAG. And based on the high correlation between the AFWCF and SMAG, MSD is strongly related to how the AFWCF performs as well. Yet, the importance of price to MSD customers cannot be understated. This is the single most important step MSD must focus on, not only for the benefit of this division, but also for the benefit of the AFWCF and ultimately the DWCF. Inaccurate pricing can push the performance of the AFWCF away from attaining its break-even goal. In fact, the role of price in the MSD performance is simply charging customers inter-fund transfer prices. Due to the large internal market and the absence of an external market, MSD sells a large portion of its products to Air Force customers. Understanding how internal customers are affected by changes is vital to the division's success.

The role of price in the MSD is simple, if prices are too high, customers cannot buy as many products as they had estimated. Without this revenue, the division will suffer a loss due to the expenses not dropping in proportion to the decreased income. The accurate estimation of requirements is a vital part of the revolving fund process and must be watched carefully to ensure the division's successful financial operation.

Step 4 – Estimate Relevant Production and Marketing Costs

Requirements estimation is vital to this phase as well. Estimating the relevant production and marketing costs is difficult for the MSD to do accurately due to the length of the budget process. The MSD has the most trouble enacting this phase of Olsen and Peter's process. This phase is very important to the success of the Division but this is also where the budgetary process imposed by the DoD is questioned. Not only is MSD required to accept the requirements from their customers two years in advance of the budget execution, they must also determine what costs will be two years in advance. Ideally, a firm should be able to accurately estimate its costs prior to setting its prices yet the commercial sector does not impose this lengthy budget process.

This phase of the process is also where it is identified how prices should be set. In the commercial world, this enables the identification of the minimum price needed to enter the market. For MSD, this is comparable to determining what the prices will have to be to meet its goal of breaking-even. Although the MSD meet the requirements of this step, it is again hindered by the regulatory constraints imposed upon it.

Step 5 – Set Pricing Objectives

Setting the pricing objectives a firm wants to achieve can be a daunting task. For many, this can include identification of the company's goal and objectives. The objectives are set here to meet those goals. The private firms will generally aim to make a minimum return on investment or minimum profit it will accept. Unfortunately, MSD does not have the luxury of setting its own objectives. Instead, it must seek to achieve the goals of its parent organization, the DWCF. So, rather than striving to meet a certain

return on investment, its main objective is to set its prices so it can come as close to breaking even as possible.

Step 6 – Develop Pricing Strategy and Set Prices

The final step in Olsen and Peter's (1996) process is the culmination of the work performed under the five previous steps. All aspects of the organization and its goals come together here. The commercial side will mainly focus on setting prices that are far enough above its costs to produce the revenue required to sustain its operations and meet its goals. Furthermore, it strives to set its prices strategically so the required level of demand is maintained.

MSD follows this step similarly to a private firm. It too wants to set its prices to generate a predetermined amount of revenue. And, MSD focuses on the customer demand by accepting requirements from its customers because if it doesn't, it will not meet its pricing objectives outlined in step 5. The only drawback for MSD is yet again, the lengthy budget process that is drawn out beyond anything the commercial sector could easily accommodate.

All in all, MSD is aligned with the commercial best practices outlined here with a few notable exceptions. First, MSD works in a unique environment with little outside competition. This limits the need for MSD to seek information about competitors. Instead, the relationship with its customers necessitates the most attention. Second, the lengthy budgetary process limits MSD's ability to adapt to changing requirements in a timely manner. Finally, regulatory guidance imposes strict rules on changes that can be made during the budget process. This limits the flexibility MSD had to adapt to changing environments, changing requirements and changing costs it encounters.

V. Conclusion

Results

This study visited several aspects of the AFWCF's operation and performance thus enabling the study's research objectives to be answered. Referring back to the three research questions we sought to answer, it is apparent that answers to some are more complex than others and have a greater impact on the Fund. Recall that the three research objectives outlined in Chapter I are:

1. Are the goals of the DWCF reflected in the AFWCF Activity Group's pricing strategies?
2. How do the different Activity Groups under the AFWCF differ in their pricing strategies? Is any Activity Group's pricing strategy allowing them to break-even?
3. How can the current pricing strategies be improved upon to come nearer to meeting the DWCF's goals? Where should the Air Force focus its efforts to improve the MSD pricing strategy?

The remainder of this paper will present answers to these questions, identify limitations in the research process, make recommendations based upon the research findings, and suggest additional areas of the AFWCF and related topics that warrant future research.

AFWCF Goals

The answer to the first research question was identified throughout the literature review phase of this study. It was determined that the goals of the DWCF are reflected in the pricing strategies of the AFWCF. First, the AFWCF is a subsidiary division of the

DWCF. As such, it inherits the DWCF's goals and objectives. Additionally, the pricing strategies for all of the DWCF divisions are outlined in the DODFMR 7000.14R and must be followed with few exceptions. If a division is commodity based, it must price its products based upon the cost of the commodity and add an additional surcharge to cover the cost of operations. Non-supply based divisions price their services based upon their output measures whether it be direct labor hour, direct per standard hour or some other output measure. Due to this regulatory requirement, there is little room for fluctuation. Though the AFWCF can have additional goals and objectives of its own, it must follow and align itself with those of its parent organization. All things considered, the AFWCF is inline with the DWCF's goals.

Pricing Strategies & Performance

Closely related to the first research question, the first part of question number two seeks to determine if the AFWCF activity groups have different pricing strategies. The answer to this question was again found throughout the literature review. As mentioned above, the divisions have different pricing strategies based upon the type of goods or services they provide as outlined in the DoDFMR 7000.14R.

To answer the second portion of this question, whether or not any of the activity group's pricing strategies allowing them to break-even, it was necessary to analyze past performance data. Remember that the general consensus is that the AFWCF is operating poorly due to its inability to meet its primary objective of breaking-even over time. First, the performance of the AFWCF based on the NOR and AOR, was plotted for fiscal years 1997 to 2001. This showed wide fluctuations in the both the AOR and NOR from year-to-year. However, since the AOR is the cumulative NOR since the Fund's inception, I

chose to focus on the performance at the NOR level as an indicator of the Fund's performance. The plot showed that although there are large fluctuations, the variance in the annual NOR is decreasing as the Fund matures. This is evidence that the Fund is becoming increasingly closer to meeting its goal of breaking-even which suggests that AFWCF personnel are building better estimates.

Next, the performance of each of the activity group's, based upon the NOR, was compared to the NOR of the AFWCF to determine if any of the activity groups were key drivers in the AFWCF's performance. Initially, the graphs illustrated a possible relationship between the AFWCF and SMAG, as well as the AFWCF and TWCF due to the closely related trends among the NORs. Further analysis would need to be conducted to determine if these are significant relationships. An additional relationship between the AFWCF and ISAG was identified. This relationship illustrated that although the ISAG is the smallest portion of the AFWCF, it appears to be having an opposite effect on the Fund. It is minutely counteracting the effects of the other activity groups, thus bringing the Fund closer to its break-even point.

Further analysis was conducted using bi-variate correlation. This identified that the AFWCF/SMAG relationship was the only relationship having statistical significance. Thus, SMAG is the key driver of the Fund's performance. This is intuitive due to the fact that SMAG is the largest activity group of the AFWCF. Nevertheless, it was important to support this notion with statistical evidence. By identifying which activity group is playing the largest role in the Fund's success or failure allows AFWCF personnel to more closely scrutinize the actions of the division in an attempt to improve the Fund's performance.

The final portion of the performance analysis required the use of Fund 14 data in Budget Estimate Submissions from fiscal years 1997 to 2004. Here, revenue and expense categories were examined. The goal was to determine if the initial submissions in the BES were equivalent to the actual income and expenditures for fiscal years 1999 to 2002. Revenue and Expense growth factors were computed for each of the activity groups. These factors demonstrated how accurate the initial estimates were when compared with the actuals. The results suggest that TWCF has been submitting the most accurate BES. However, it was also determined that DMAG and ISAG were consistently underestimating revenue while SMAG and TWCF consistently overestimated expenses in the BES'. These trends of over and under estimation deserve further study but were not addressed in this research effort.

Further analysis was conducted to determine if overall revenues are equal to the expenses. A hypothesis test was conducted to determine if the mean of the revenue growth factors was equal to the mean of the expense growth factors. A two-tailed t test as conducted to test for the equal means. This test resulted in a failure to reject the null hypothesis, thus, we assume that the means are equal. The impact of this previous statement supports evidence that the AFWCF is statistically meeting its break-even goal. In other words, the estimates of revenues and expenses are accurate. However, it is important to remember that this does not take into account the AOR that is recouped from previous years. Yet, it does suggest that the problem does not lie in the estimation of income and expenditures. Rather, it suggests that removing the requirement to recoup or reintroduce the prior year's AOR from the activity group's responsibility may lead to a better balanced Fund.

Finally, the scope was narrowed yet again to look at the individual revenue and expense categories for signs of consistent over or under estimation. Each of the activity group's had several areas that were consistent problems. However, there were two categories in particular that were common among all activity groups: Civilian Personnel Compensation & Benefits and Materials & Supplies (For Internal Purposes). Civilian Personnel Compensation & Benefits was consistently overestimated by SMAG and TWCF and underestimated by DMAG and ISAG. The Material & Supplies category was consistently underestimated by SMAG and DMAG, while it was always overestimated by ISAG and TWCF. More information should be gathered from the respective activity groups to determine if this is simply coincidence or if this is a problem that can be avoided with better identification of the risks associated with over and under estimating these categories. If this is truly a problem area for the activity groups, a growth factor could be developed that can be incorporated into the estimation process that will effectively account for this common discrepancy.

Aside from the information presented above, one last item of interest was identified when reviewing the figures presented in the BES. It appears that inflation was not taken into account when the prior-year AOR was rolled back into the Fund. The impact this has on the Fund is a negative one. By not incorporating inflation into the estimates, the Fund is not striving to recoup the full amount of the AOR. When the DMAG portion of the FY 2003 BES was observed and then properly inflated, it resulted in \$4.3 million more that needed to be recouped in FY02 and \$1.3 million more in FY03. Keep in mind that this is solely the DMAG portion of the AFWCF, the other activity groups will need to be inflated as well, which will produce an even greater effect. By

correcting this easily remedied error, the Fund's estimates will be more accurate which will aid in approaching the break-even point.

The analysis of the performance suggests that the AFWCF is not operating as poorly as is often thought. In fact, most signs point to an improving Fund. First, the NOR is decreasing over time. Next, SMAG is the key driver of the Fund's performance and should be treated as such, but it too has a decreasing NOR trend. And finally, the estimated revenues are equivalent to the estimated expenses. The identification of expense categories that are consistent problems among the activity groups will allow AFWCF personnel to focus their efforts on these areas in particular, which will aid in meeting the goals primary objective. Although the Fund is not breaking-even, this analysis suggests that the AFWCF is as close to operating as intended as it will ever be, as long as the AOR is still a factor.

MSD Pricing Strategy

The final research question was addressed by comparing the pricing strategy of the Materiel Support Division against commercial best practices as outlined by Olsen and Peter (1996). An analysis of their six-step pricing scheme implies that MSD is inline with commercial best practices with a few minor exceptions. First, MSD operates within the internal DOD market, which insists on a close working relationship with the customer. Remember, customers tell MSD what the demand will be from year-to-year. Second, due to the unique parts MSD provides its customers, competition is not a factor. Third, price has a greater impact on MSD's customers than customers in the commercial sector. MSD's customers have budget constraints imposed by the Congress that rarely increase but often decrease. Any change in the price MSD charges will most certainly

have a negative impact on the customer as well as the Fund. Finally, regulatory requirements imposed on MSD prevent any flexibility in its pricing schema.

Limitations

There were a number of limiting factors throughout this research. Firstly, the time it takes to fully understand the AFWCF concept is monumental. This is an enormous process with many aspects. The research focused on the accrual accounting side of the AFWCF since it is the most widely published and analyzed. However, a look at the AFWCF's performance from the cash accounting aspect may yield different results. Second, gathering information to study this topic was both time consuming and difficult. Information is available in several different accounting and logistical systems but most background information was gathered from people and other AFWCF reports and articles. Yet, the form used by each is different so apples to apples comparison could not be made. Ultimately, the BES were the best source of data that could be obtained in a timely fashion. However, the assumption that the information is correct was made. This assumption was discovered to be false when looking at data for FY99. There were several instances where itemized category totals did not match the category total. We were unable to identify whether this was a simple addition error or if information was missing so this data was omitted from the study.

Finally, much of the data prior to fiscal year 1999 was incomplete or reported in different revenue and expense categories. Again, data prior to FY1999 was omitted from this study.

Recommendations

There are three recommendations that have stemmed from this research. The first recommendation is to revisit the break-even goal that looms over the AFWCF. Not only is this statistically impossible, it is unrealistic when looking at a \$20 billion program. Instead, a more realistic goal should be implemented that is both achievable and realistic. A more suitable goal would be to set a target AOR ceiling or floor. However, since the Fund receives the most attention when it carries a negative AOR, a ceiling would be most appropriate. The value of this ceiling should be a percentage of the each division's revenue. If the division is expected to generate \$9 billion in revenue, an AOR of \$100 million is a mere 1.1% loss, just a drop in the bucket from this perspective. In fact, a cost growth of only 1% would be welcomed in any program. The value the ceiling is set at is cause for additional study to determine the most realistic and achievable value.

As a result of the research conducted here, cost growth factors should be built and incorporated into the BES process for at least the two expense categories that proved to be consistent problems for all activity groups. However, additional factors should be built for each of the unique categories consistently over or underestimated by AFWCF personnel in the activity groups. The inclusion of growth factors in the forecasting process will provide a better estimation of revenues and expenses, thereby aiding the Fund in more closely achieving its goal.

The final recommendation concerns the lack of inflation identified in the BES. The lack of inflation when reincorporating the prior-year AOR drives a loss in the Fund. These amounts must be inflated to their respective year to accurately estimate the Fund's future performance. This is easily remedied and will not require additional work. The

inflation rates are already published when the BES is submitted. The time and effort required to accurately inflate the prior-year AOR is negligible. Although the impact this will have on the overall Fund may be minute, any estimate that is more accurate is appreciated.

Future Research

The final area of this study includes several recommendations for future research projects ranging from requirements estimation to other DWCF organizations. What follows is a brief description of each of the recommended research areas.

D200 Study. As presented earlier in this paper, requirements are a key player in the accuracy of AFWCF estimates. Thus, it is appropriate to recommend that a study be conducted to review the accuracy of past requirements as submitted by the customer. Additionally, the relevance and accuracy of the algorithms used in the D200 report generation also warrant study.

Forecasting. Another area recommended for study is the forecasting techniques utilized in the BES build process. Analysis of the current techniques may identify areas needing improvement. We already know that the forecasts should contain a growth factor for commonly misestimated elements to increase their accuracy. However, there are other elements of estimations that can be reviewed and adjusted to ensure more accurate forecasts.

Other DWCF Divisions. Other divisions of the DWCF should be studied to determine if they are having similar problems to those of the AFWCF. The insight this study can provide would be invaluable to the AFWCF. Information sharing is necessary

and expected since each of the other DWCF divisions are confined by the same regulatory and budgetary constraints.

Other AFWCF Activity Groups. Next, we recommend that other areas of the AFWCF be studied to ascertain where their processes can be improved upon. It has already been determined in Cintron's (2002) thesis and this research effort that flexibility in pricing and estimating is lost due to long lead times necessary in the PPBS cycle, as well as constraints imposed by regulations. Additionally, it would be interesting to determine if customers have as large an impact on service organizations as they do in the MSD of SMAG.

DMAG / MSD Relationship. The relationship between DMAG and MSD is recursive in nature. According to information obtained throughout this research effort, DMAG cannot set its rates for depot level maintenance until it knows the prices that MSD will charge it for parts. However, MSD cannot set their prices until they know what rate DMAG will be charging to repair the parts it sends to the depots. As one might suspect, there is an ongoing battle to accurately set these rates in a timely fashion. However, the recursive nature requires DMAG to set its rates, pass them to MSD, MSD will review and adjust their rates, and then send them back to the DMAG, and so on. This continues until both have agreed on their rates. This is a circle that must be broken. It is recommended that this relationship be studied to determine if there is a better way of doing business between the two divisions. The new DMAG/MSD reconciliation is a step in the right direction. Future research can determine if this will work long term and can perhaps identify if it is more appropriate for MSD to fall under DMAG's control.

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14. ABSTRACT The Air Force Working Capital Fund (AFWCF), a revolving fund established to create a more business-like environment between the Air Force and its customers, is comprised of several divisions providing depot level repairs, supplies and inventory, information technology solutions and transportation services to military customers. Since its establishment, the AFWCF has been the source of much criticism due to its inability to meet its primary goal of operating on a break-even basis. Ideally, the Fund will generate enough revenue from the sale of goods or services to cover its expenses and break-even. Instead, there is either a surplus that must be reintroduced into the AFWCF or, as most often the case, a deficit occurs. Due to regulatory requirements, the Fund must recoup these lost monies in a subsequent year. This profoundly affects the ability to accurately build the budget and reach the break-even point. This research analyzes the past performance of the AFWCF and identifies which areas are key drivers in preventing the AFWCF from meeting this goal. Lastly, the pricing strategy of the Materiel Support Division was evaluated based on commercial best practices to determine if its pricing schema lends itself to meeting the goals of the AFWCF.					
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