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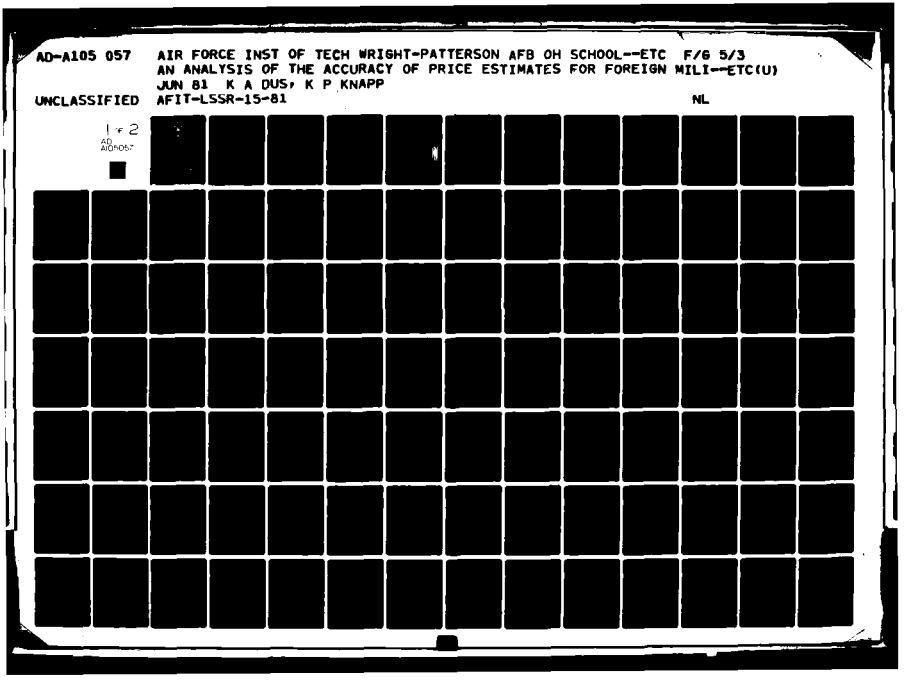

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AN ANALYSIS OF THE ACCURACY OF PRICE ESTIMATES FOR FOREIGN MILITARY SALES CASES.

Karen A. Dus, GS-11
Kenneth P. Knapp, First Lieutenant, USAF

AFIT-LSSR 15-81

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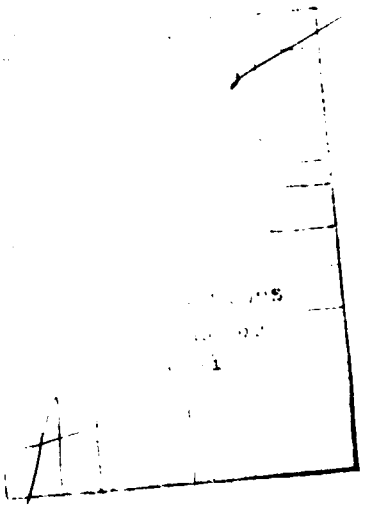

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This research examined the perception of foreign customers, and others familiar with FMS, that the U.S. price estimates of a case value are not very accurate when compared to the final price of the delivered material. The perception is that prices are underestimated. The researchers compared original price estimates, from a sample of AFLC defined order cases, with their respective final delivered values to determine their accuracy. Results indicated that for defined order cases, the price estimates tend to exceed the final delivered value by more than 60 percent. The analysis stratified the sample and found that cases estimated at Ogden ALC and Ammunition cases tended to be overestimated. Results of other strata were indeterminable. A series of interviews with Foreign Liaison Officers and USAF personnel familiar with FMS were conducted in conjunction with the data collection. The interviews indicated that inaccurate price estimates cause problems but price estimates of within ±10 percent of the final value would be acceptable.

LSSR 15-81

AN ANALYSIS OF THE ACCURACY OF PRICE ESTIMATES FOR FOREIGN MILITARY SALES CASES

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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CHAPTER I

INTRODUCTION

Overview

> One of the primary objectives of the foreign policy of the United States is the creation of conditions in which we and other nations will be able to work out a way of life free from coersion. . . . We shall not realize our objectives however, unless we are willing to help free peoples to maintain their free institutions and their national integrity against aggressive movements that seek to impose upon them totalitarian regimes. . . .
>
> I believe that it must be the foreign policy of the United States to support free people who are resisting attempted subjugation by armed minorities or by outside pressures . . . the free people of the world look to us for support in maintaining their freedom. If we falter in our leadership, we may endanger the peace of the world, and we shall surely endanger the welfare of our own nation [15:5-6].

With his address to Congress on March 12, 1947, President Truman opened a new period in American foreign policy--one in which the United States has taken an active role in supporting the defense of allies and other friendly nations. America's commitment to international security has continued to this day. A security assistance program which had modest beginnings in 1947 has since grown dramatically in magnitude and scope to become an established tool of U.S. foreign policy. In 1964, the value of Foreign Military Sales (FMS) programs exceeded Grant Aid for the first time. Grant Aid is now being phased out, but FMS

continues to grow with over $15 billion in FMS agreements signed in FY 1980 (30).

This thesis is concerned with FMS. More specifically, the focus is on the difference between the price estimates given for defense articles and services and the actual price paid by the customer. There have been justifiable complaints from FMS customers that inaccurate estimates have caused great inconveniences and hurtful budgetary compromises (16). These complaints cannot be ignored--particularly in light of the economic and political implications of FMS. This thesis can address only part of the problem. Further study will be recommended based on the findings of this initial study. Scores of countries now obtain defense equipment and services through United States Security Assistance programs. It is in the best interest of all parties that these programs continue and be properly administered.

There seems to be no better way to gain an appreciation of Security Assistance, and in particular, Foreign Military Sales, than to provide a sketch of the legislative history of these programs. Such a review will put FMS in its rightful place as a basic element of U.S. foreign policy and will show how changing times have required changing legal authorizations for FMS programs. This review will be followed by a discussion of the magnitude of today's FMS programs and a brief explanation

of the FMS process. Finally, the research problem and objective for this thesis will be presented.

Legislative Background

Since President Truman's declaration of principles in 1947, foreign assistance programs have been a cornerstone of United States foreign policy (15:7). As a result of President Truman's strong belief in foreign assistance programs, the National Security Act of 1947 was passed by Congress. This act provided economic aid and military assistance to Greece and Turkey and was to be the predecessor for all subsequent military assistance legislation (19).

United States foreign aid policy has changed a great deal since 1947, but is solidly based on legislative direction and remains a vital part of America's foreign policy. A chronological outline of military assistance legislation highlights some of the changes:

1. The Mutual Defense Assistance Act of 1949 authorized Grant Aid assistance to our NATO allies and was instrumental in rearming Europe after the devastation of World War II. Three forms of aid were provided through this act: (a) machinery and raw materials, (b) direct transfer of military equipment, and (c) technical assistance (20).

2. The Mutual Security Act of 1951 consolidated the administration of aid programs under the newly

established Mutual Security Agency. This was the first of many attempts at improving the administration of foreign aid programs. However, administrative duties were fragmented under this act with the DOD administering military assistance programs and the State Department administering economic aid and technical assistance programs (21).

3. The 1951 act was supplemented in 1953 with the Mutual Assistance Act of 1953. This act abolished the Mutual Security Agency and consolidated the administration of the various aid programs under the Foreign Operations Administration (22). (This Administration has since been replaced by the Agency for International Development.)

4. The Mutual Security Act of 1954 is notable for the fact that it gave the State Department the responsibility to license the export of arms from the U.S. (23). This provision had a significant impact on later legislative developments concerning FMS and on the FMS business itself.

5. A major overhaul of the aid programs was carried out under the Foreign Assistance Act of 1961. Although this Act was aimed at Grant Aid rather than Foreign Military Sales, it authorized sales and contained several points relevant to later FMS policy:

a. The President was given authority to approve recipients of aid and to stipulate the terms involved.

b. The Secretary of State was given responsibility for foreign aid policy and the supervision and coordination of aid programs.

c. The military items obtained from aid programs were to be restricted to defensive uses and could not be transferred to a third party without presidential authorization.

This act also created the Agency for International Development (AID) which is still active (24).

6. The Foreign Military Sales Act of 1968 (renamed the Arms Export Control Act of 1968) authorized the President (a) to sell defense articles and services, (b) to enter into contracts for the procurement of defense articles and services for sale to foreign nations, (c) to finance the procurement of defense articles and services by foreign nations, and (d) to guarantee credit to FMS purchasers as he sees fit (25).

Today's governing legislation is the International Security Assistance and Arms Export Control Act of 1976 (AECA), as amended. This act consolidated and revised all preceding foreign assistance legislation. It states that the ultimate goal of the United States is to have a world free from the dangers and burdens of armaments (5:734). These are some of the most important provisions of the act:

1. Military Assistance Advisory Groups (MAAGs) overseas were to be terminated or if authorized by Congress, reduced in size.

2. Grant Aid programs were to be terminated on 30 September 1977.

3. The U.S. was to promote arms control.

4. Future sales were to be held to current (1976) levels.

5. FMS customers were liable for all costs incurred by the USG when carrying out FMS programs.

6. Within certain limits, presently sales exceeding $25 million or major defense equipment costing $7 million or more, Congress was given the option of vetoing a sale.

7. The President was authorized to designate items placed on the Munitions List (5).

The wide range of controls and restraints put forth in this act imply that by 1976 arms transfers by the U.S. were a matter of concern to many in the government. However, by its very existence, the AECA emphasizes that FMS programs are still very much a tool of America's foreign policy and are governed by legislatively imposed controls.

FMS Programs

In the business world, Arms Sales or Arms Transfers are called Military Export Sales and can occur either

on a government-to-government basis or on a U.S. industry-to-foreign government basis (28:I,10). Those sales made by U.S. industry directly to a foreign buyer and not administered by the DOD are defined as commercial, or direct sales (28:I,3). Government-to-government arrangements for the sale of defense articles and services managed through the DOD are defined as Foreign Military Sales programs (28:I,7). Some examples of these sales include not only aircraft, such as the McDonnell Douglas F-4 and the Northrup F-5, but also spare parts, support equipment, maintenance services, and training.

Foreign Military Sales have three principle objectives: (1) to provide the defensive strength of our allies and selected friendly foreign countries, (2) to promote the concept of cooperative logistics, and (3) to offset the unfavorable balance of payments (11:p.11-1).

As a form of international business, FMS is conducted by the Department of Defense under the supervision and authority of the Secretary of State (13:7). In addition to being an integral part of U.S. foreign policy, FMS programs have become an important business. A glance at the values of FMS agreements made during the past ten years helps show how the programs have increased in size. The value of FMS agreements made during FY 1971 was $1.3 billion. In FY 1974, a total of $10.3 billion of FMS agreements were signed. The value of agreements for FY 1977

dropped to $8.3 billion, but in FY 1980, the upward trend recovered with $15.2 billion in FMS agreements. The cumulative value of FMS agreements made from 1950 through 1980 was $110.5 billion. During that thirty-year period, agreements were signed with over ninety nations (30:1-5).

Looking at FMS in terms of its impact on the U.S. labor market, the Congressional Budget Office has estimated that based on an annual FMS program of $8.2 billion, 42,000 jobs are supported by every $1 billion in FMS. Other studies have different results. The Carter Administration determined that $1 billion in FMS accounted for about 38,000 jobs (2:179). Without trying to resolve the differences between these studies, the fact remains that the use of this tool of foreign policy has a significant impact on employment in U.S. defense-related industries.

FMS Process

An understanding of the FMS process will help the reader understand some problems inherent in FMS programs. Among those problems is that of giving the Purchaser an estimated cost for the items furnished through FMS.

General Process. The details of the FMS process cannot be easily simplified, but generally when an eligible country expresses a desire to buy articles or services either through a letter of request or otherwise, representatives of that nation meet in conference with U.S.

representatives for the purpose of negotiations. If the negotiations lead to an agreement, a contract is prepared. This contract, with supplements as necessary, is called a "Letter of Offer and Acceptance" (LOA). The LOA is sometimes referred to simply as the DD Form 1513; which is the number of the DOD form used as the contract instrument (14:12-14). This form is used for all FMS agreements, thus it is an important source of information for anyone conducting research in this area.

The DD Form 1513 serves two purposes. It is the vehicle for the United States Government (USG) offer of defense articles and services to a foreign purchaser and is also the instrument of acceptance (28:III,D-1). The USG specifies the items or services to be provided and gives the Purchaser an estimate of the cost and delivery date. The terms of payment will vary with the items involved but in any case (28:III,D-14) the Purchaser is advised that the price to be paid will be "the total cost to the USG [29:2]." The USG offer is signed by an authorized U.S. Military Department or Defense Agency representative before it is submitted to the Purchaser for acceptance (28:II,D-12). If it is accepted, it is then signed by an authorized representative of the Purchasing government. These two, the seller and buyer, constitute the competent and responsible parties of the contract.

Methods of Participation. There are three methods by which a foreign country can participate in FMS.[1] One method is via a Cooperative Logistics Supply Support Arrangement (CLSSA). Using this method, a country can establish an equity in the DOD stock system against which it can receive support on a basis equal to that of a comparable DOD unit. Another method is the blanket order case. The customer signs a Letter of Offer and Acceptance (LOA) for a self-determined amount of money against which requisitions can be placed for as yet undetermined items. The third method is the defined order case, for which the Purchaser specifies the items and quantities desired when the LOA is written. The responsible DOD component makes an estimate of the cost of the items and uses this estimate as the basis for the cost of the LOA (28:II,F-2,2a,2b).

Pricing. Pricing for FMS is generally based on the fact that according to the AECA the USG must recover all costs relating to FMS and at the same time avoid any excessive profit (5). Because of this requirement, the DOD has to consider a number of pricing elements before it can give a Purchaser a price estimate. Some of the price elements are (12:p.15-5):[2]

---

[1]These methods may be combined for special programs, such as sale and initial support of an aircraft system.

[2]Not all of these elements are applied to each item. The appropriateness of each pricing element depends on

1. Cost of the items or services
2. Nonrecurring RDT&E and production costs
3. Administrative charge
4. Asset use charges
5. Packing, crating and handling

In order to comply with the AECA, which stipulates that DOD will recover full costs, the estimates are adjusted after delivery so the Purchaser can be billed for all costs incurred (28:III,C-7). The DD Form 1513 makes it clear that the costs cited are only estimates and that the Purchaser is obligated to pay the total cost of the items. Although the USG states that it will "use its best efforts to advise the Purchaser . . . of any identifiable cost increase . . . in excess of 10 percent," the Purchaser is obliged to pay the total costs whether or not the USG advises of the increase in a timely manner (29:2).

As can be imagined, this approach to price determination and notification can be a problem. It can disrupt the Purchaser's budget and cause dissatisfaction with the FMS process. Although present pricing practices have not reduced the demand for arms and services from the USG, in view of the significance of FMS as a part of U.S. foreign policy, it is important that the United States Government

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whether the item will be supplied from DOD stocks, whether those stocks will be replaced, or whether the item will be furnished through direct procurement.

maintain a reputation as a reliable and responsible supplier of defense articles. One aspect of this reputation is the accuracy of price estimates quoted to foreign governments (28:III,C-4a).

Problem Statement

Interviews with individuals working in FMS have indicated that a comprehensive study of the accuracy of price estimates would be useful. While it would not be surprising to find some differences between initial and final price quotations, there is no statistical evidence to substantiate the general perception that price estimates for FMS cases are inaccurate. A review of applicable literature reveals that no comprehensive study has been made to verify the extent of inaccurate estimates, although a number of individual inaccurate estimates have been cited.

Justification

According to Mr. Roger E. Reynolds, the Director of Security Assistance Management and Policy, Headquarters AFLC, a comprehensive study of the accuracy of estimated costs could provide the necessary statistical evidence to initiate further investigation into such areas as price estimating procedures (18). The findings of this study may or may not substantiate the general opinion that cost estimates are inaccurate. The study may well determine that only a small portion of the estimates are inaccurate,

or vice versa. A study completed in August 1969 entitled "The Buyer's View of the Management of the United States Foreign Military Sales Program" stated that "The customer's complaint is that, in too many instances, prices charged substantially exceed the estimated price . . . [6:71]." This report also cited eighteen examples of price variations provided by a foreign country representative (6:143). The authors conceded that the examples given may represent only extreme instances and left the topic open for further research (6:71). In August 1975, the Army Logistics Management Center initiated a study which was to improve the calculations and documentation of price estimates for FMS. The study was initiated because there had been ". . . a significant number of FMS cases . . . in which the price estimates for material were inaccurate and unrealistic [17:7]." In November of that same year, a Defense Security Assistance Agency point paper entitled "Price and Availability Information for Planning (Preliminary P&A)" stated that there was a "general skepticism" that price estimates could be both timely and reliable (8:92). A more recent research effort, in June 1980, entitled "Determination and Analysis of Problems in Air Force Foreign Military Sales of Munitions," documented the problems encountered in the sale of munition items via FMS from the point of view of those in various United States Department of Defense activities who work with FMS. Included in Appendix H of

that report was a list of problems cited by foreign military officers who are either working in or have knowledge of FMS. One of the problems listed was that "the final cost [of FMS] was normally higher than the agreed upon cost [4:192]."

Intent of Study

The results of this study are intended to lend credence to or help dismiss the perception that price estiates are inaccurate. This study may facilitate the identification of specific sources of both accurate and inaccurate price estimates and guide FMS managers to revise procedures as necessary. Such revisions could have a significant effect on the price estimates of future Foreign Military Sales cases.

Scope

Foreign Military Sales programs are managed by each of the United States Department of Defense Military Departments and their subordinate commands. This study is limited to those cases managed by the Air Force Logistics Command (AFLC), Department of the Air Force. AFLC handles a sizable portion of FMS. At the end of FY 1980, AFLC was managing 2642 open FMS cases totaling $11.7 billion (1).

Of the three methods of participating in FMS,[3] only defined order cases for non-systems sales will be considered. Because the dollar value limit of blanket order CLSSA cases is normally determined by the customer, these cases have been excluded from this study.[4] Cases for the sale of defense systems and associated support are excluded because many of them incorporate subcases which are managed by USAF commands other than AFLC and are thus outside the scope of this thesis.

In order to have accurate information as to the final cost of items delivered on defined order cases, research will be limited to closed cases. These are cases for which "all materiel has been delivered and/or all services have been performed [and] all financial transactions [28:I,3]" have been completed. In an effort to focus as much as possible on current events, the data collection will be limited to those cases which have been both implemented and closed within the past five years (1976-1980).

When signing an LOA, a Purchaser agrees not only to pay for materiel and services ordered, but also for

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[3]Defined order, blanket order, Cooperative Logistics Supply Support Arrangement (CLSSA).

[4]While it is true that the DOD provides a recommendation of appropriate stock levels for each CLSSA program, the Purchaser is able to make adjustments to this recommendation and can thereby determine the materiel value of the CLSSA program (27:pp.7-54,7-55).

appropriate surcharges, such as administrative and accessorial costs. The surcharges are usually calculated as a percentage of the material value and therefore are only a reflection of the material value. They will not be considered in this study. Also, this study will not analyze the price estimating procedures used in writing FMS cases. While this is a legitimate area of inquiry, this study will take the estimates as they were recorded and proceed to measure how accurate they proved to be.

Research Objective

The objective of this study is to determine the accuracy of price estimates given to foreign customers by AFLC for defined order FMS cases. The estimates will be analyzed according to the categories of defined order cases involved and according to the AFLC activity which prepared the estimate.

Research Questions

1. What is an acceptable level of accuracy for the estimated costs?
    a. Customers' viewpoint
    b. AFLC viewpoint
2. What is the accuracy of cost estimates for FMS cases overall?
3. What is the accuracy of cost estimates by source of estimate?

4. What is the accuracy of cost estimates by category of case?

5. What is the accuracy of cost estimates on selected FMS items? Can these be related according to category of case or price estimating source?

Plan of Presentation

Chapter I was an introduction to the legislative background of FMS and the FMS process. It introduced the research problem, scope, objectives, and questions. Chapter II outlines the methodology and plan for data collection. Chapter III presents a detailed analysis of the data. Chapter IV states the findings of the research, conclusions, recommendations, and areas for further research.

CHAPTER II

METHODOLOGY

This research methodology is established to obtain the answers to the research questions stated in Chapter I. These answers will help achieve the research objective of this thesis.

Research Question Number 1

What is an acceptable level of accuracy for the estimated costs?

a. Customers' viewpoint

b. AFLC viewpoint

Two procedures will be used to determine the acceptable level of accuracy for estimated costs. First will be a review of all Department of Defense Directives and Instructions, Air Force Regulations, written policy and internal guidance that may establish a standard for the accuracy of estimates. Second will be a series of structured interviews with U.S. Air Force personnel involved in FMS and with knowledgeable representatives of purchasing countries, such as the Foreign Liaison Officers assigned to Wright-Patterson AFB. The combination of interviews and literature review will be used to establish the acceptable

level of accuracy for estimated costs from the customer's viewpoint as well as the AFLC viewpoint.

Research Questions Number 2, 3, and 4

2. What is the accuracy of cost estimates for cases overall?

3. What is the accuracy of cost estimates by source of estimate?

4. What is the accuracy of cost estimates by category of case?

To answer these questions a sample of data will be drawn from the defined population. Using the sample data, a separate statistical analysis will be completed resulting in solutions to each question.

Population. The population consists of all AFLC managed defined order FMS cases. Data will be collected from those cases that have been implemented and closed within the past five years. The five year period from 1976 through 1980 yields a population of 430 cases which meet the above criteria.

Sample. The data will be stratified by the categories of cases to determine the number of cases in each category.[1] From each of these stratum, a random sample

[1]For a description of the categories of defined order cases, see Appendix A.

of 40 percent of the cases will be selected. This selection process will insure the sample is proportionally representative of the population both by category and estimating source.

Data Collection Plan. Data collected will include the estimated cost of material and services in each case and the final material and services value of each case. The estimated cost will be taken from the entry for "Estimated Cost" on the DD Form 1513 (or 1513-1, 1513-2 as appropriate).[2] The final material value will be the entry "Delivered Value" (Del Val) as recorded for each case on the Program Status of Selected Control Elements (R47:H051. NH5AT). This value is the cost of material or services delivered. It does not include surcharges, such as administrative and accessorial costs.

Analysis of Data. The Estimated Cost (EC) and Total Delivered Value (TDV) will be used to calculate the accuracy of each estimate as a percentage of the delivered value:

$$\frac{EC}{TDV} = \text{\% accurate}$$

[2]The application of DD Forms 1513-1 and 1513-2 to this study is discussed in Appendix B.

For example,

$$\text{Estimated Cost} = \$100$$

$$\text{Total Delivered Value} = \$150$$

$$\frac{EC}{TDV} = \frac{100}{150} = 66.67\% \text{ accurate}$$

The computer program "Statistical Package for the Social Sciences" (SPSS) will be used to compute the accuracy of the estimate for each case in the sample. The accuracy of the cases in the sample will be grouped according to their relation to the acceptable level of accuracy as determined through research question 1. Analysis of this distribution will contribute to an understanding of AFLC price estimating performance.

Next, the mean accuracy for this entire sample will be calculated. This mean value will be used as an estimator of the true population mean and answer research question number 2, which was to determine the accuracy for cases overall.

Finally, we will draw a conclusion about the value of the population mean based on the simple random sample data. Using the computed mean value and an appropriate error level, we will test which of the following conclusions is correct:

H_0: $\mu = 1$, the estimated costs are accurate;

H_1: $\mu \neq 1$, the estimated costs are not accurate (10:257).

To answer research question number 3, the cases in the sample will be stratified according to the source of the price estimates given in each case. The mean accuracy of the cases in each stratum will be calculated. The accuracy of the costs will again be used to test the same alternative conclusions. This analysis will allow insight into the performance of various price estimating sources.

To analyze the accuracy of costs by category of case, research question 4, the sample will be stratified by category. The mean accuracy of costs will be computed for each category and used to test the two possible alternative conclusions. This procedure will answer research question number 4 and provide information about the accuracy of costs for case categories.

This entire method of data collection and analysis will determine how accurate cost estimates are overall, how accurate each source of cost estimate is and how accurate estimates are for each category of case in the sample.

Research Question Number 5

What is the accuracy of cost estimates on selected FMS items? Can these be related according to category of case or price estimating source?

It should be understood that a single FMS case can be and usually is composed of more than one item.

Consequently, the accuracy of the estimated cost of the case is subject to the averaging affect of the accuracy of the estimated cost of each item on the case. By selecting a sample of individual items, the accuracy of the estimated costs can be compared to the accuracy of the estimated costs of cases. This comparison will add significance to the analysis of the accuracy of cost estimates for Foreign Military Sales.

Population. To determine the accuracy of cost estimates for selected items, the random sample of cases used for research questions 2, 3, and 4 will be used as the population. Since that sample was selected by a random method, it can be assumed to be representative of the entire population under study.

Sample. Because the population of concern for this research question is itself a sample, a double sampling technique will be used to select a sample of items to study. The unit price of each item ordered through the cases in the population will be recorded. These unit prices will then be grouped into a series of price ranges. The items from the price range with the highest frequency will be used as the sample for this part of the study. The price range with the highest frequency is expected to be the most likely to include items from all categories of cases and from all estimating sources. The items selected

will be identified by case identifier and according to the item description in Block 13 of the DD Form 1513.

Data Collection Plan. For each item in the sample, the original estimated cost will be the entry on the DD Form 1513 (or 1513-1, 1513-2, as applicable) labeled "Estimated Unit Cost" (EUC). The final material value will be the "Actual Delivered Value" for that item as recorded on the Consolidated Status Report (R058,RCN:NC1AL), divided by the quantity requisitioned to obtain the Delivered Unit Cost, (DUC).

Analysis of Data. The accuracy of each estimated unit cost will be computed by dividing the Estimated Unit Cost by the actual Delivered Unit Cost:

$$\frac{EUC}{DUC} = \% \text{ accurate}$$

The quotient will be expressed as the percent accuracy of the estimated cost in relation to the delivered value.

SPSS will be used to compute the accuracy of each item in the sample and to compute the mean accuracy of all items as a group. Additional values of mean accuracy will be obtained for these items as classified by category of case and by source of cost estimate.

Using the previously determined level of acceptable price accuracy, the proportions of items which exceed

and which are below the acceptable level can be determined. The mean values, calculated for the items overall, the separate categories of items, and the separate estimating sources will be used to draw conclusions about the individual population and subpopulation means. Using the computed mean values as the test statistic, and an appropriate error level, we will repeat the statistical test to determine which of the following conclusions is correct:

H_0: $\mu = 1$, the estimated costs are accurate;

H_1: $\mu \neq 1$, the estimated costs are not accurate (10:257).

CHAPTER III

ANALYSIS

This chapter presents an analysis of the data collected through interview and research. A descriptive analysis is used to answer research question 1. Research questions 2, 3, 4, and 5 are answered using a statistical analysis of the collected data. Conclusions of this research and suggestions for further research follow in Chapter IV.

Research Question Number 1

What is an acceptable level of accuracy for the estimated costs?

a. Customers' view

b. AFLC viewpoint

The objective of research question 1 was to determine an acceptable level of accuracy for price estimates quoted on DD Forms 1513. When interviewed, representatives of foreign air forces which participate in FMS and representatives of AFLC both agreed that an acceptable level of accuracy for the estimated material cost of a defined order case was ±10 percent of the delivered material value (see summary of interviews in Appendix D). This range of accuracy is one which most of the customers said they

could deal with. After a thorough search of appropriate regulations, directives, and policy information nothing was found explicitly defining an AFLC position on price estimate accuracy. However, one factor which probably influences the choice of ±10 percent as acceptable by AFLC personnel is the fact that paragraph A5b(1), Annex A, of the DD Form 1513 states that the United States Government will notify the customer "of any identifiable cost increase that may result in an increase in the 'Estimated Total Cost' in excess of 10 percent."

While the responses to the interview questions reflected only personal opinions and were not necessarily the official view of any Air Force or government, we concluded for the purpose of this study that a price estimate that was within ±10 percent of the delivered value would be considered to be acceptably accurate.

Research Question Number 2

What is the accuracy of cost estimates for cases overall?

To determine the accuracy of cost estimates overall, a 40 percent sample was drawn at random from the population of 430 AFLC managed defined order cases that had been both implemented and closed within the past five years. These cases were identified using two reports: (1) DSAA Foreign Military Sales Case listing (RCS 1200) and

(2) Program Status of Selected Control Elements (R47:H051. NH5AT). The sample was selected to yield category proportions equal to those in the population (i.e., 21 percent "A" cases, 27 percent "L" cases, etc.). The sample size, n, equaled 176 cases. The sample, selected at random, was representative of the population and sufficiently large to apply the Central Limit Theorem[1] to the distribution of $\bar{x}$, the sample mean accuracy.

The value of the accuracy (ACC) of each case was computed as a ratio of the Estimated Cost (EC) divided by Total Delivered Value (TDV). The value of ACC could be any number greater than 0.

$$\text{If EC} < \text{TDV, then ACC} = \frac{\text{EC}}{\text{TDV}} < 1;$$

$$\text{If EC} = \text{TDV, then ACC} = \frac{\text{EC}}{\text{TDV}} = 1;$$

$$\text{If EC} > \text{TDV, then ACC} = \frac{\text{EC}}{\text{TDV}} > 1.$$

(Note the value of ACC for each case in Appendix E.)

Table 1 indicates the proportional breakdown of the sample by the individual values of ACC. The largest proportion in the sample is ACC > 1 where the Estimated Cost is greater than the TDV (59.1 percent). The

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[1] "Central Limit Theorem. For almost all populations, the sampling distribution of $\bar{x}$ is approximately normal when the simple random sample size is sufficiently large [10:202]."

TABLE 1

PROPORTIONAL BREAKDOWN OF SAMPLE

Value of ACC	n	n/176
ACC < 1	31	.176
ACC = 1	41	.233
ACC > 1	104	.591
TOTAL	176	1.00

breakdown indicates only 23.3 percent of the sample cases were determined accurate (ACC = 1).

Using an acceptable level of accuracy of ±10 percent, as determined in question 1, the value of the acceptable accuracy of each case may lie within the range of $.9 \leq ACC \leq 1.1$. Table 2 indicates the breakout of the sample proportions using ±10 percent as acceptable limits on ACC. With a ±10 percent accuracy level, 40.9 percent of the sample fell within the acceptable range. We thus concluded that for the sample, 40.9 percent of the cases were considered acceptably accurate.

To determine the accuracy of cost estimates overall, the mean value of ACC, $(\bar{x})$, was used as the estimator of the population mean, μ. The mean is the most common and useful measure of central tendency of a distribution (9:27). The sample mean, $\bar{x}$, was equal to 1.664. This value, $\bar{x} = 1.664$, was used to test the null hypothesis (H_0)

TABLE 2

PROPORTIONAL BREAKDOWN GIVEN ±10 PERCENT ACCEPTABLE ACCURACY

Value of ACC	n	n/176
ACC < .9	18	.102
.9 ≤ ACC ≤ 1.1	72	.409
ACC > 1.1	86	.489
TOTAL	176	1.00

that the mean accuracy is equal to 1, against the alternative (H_1) that the mean is not equal to 1. That is:

H_0: $\mu = 1$, the estimated costs are accurate;

H_1: $\mu \neq 1$, the estimated costs are not accurate.

> The goodness of any statistical test of an hypothesis is measured by the probabilities of making a Type I or Type II error, denoted by the symbols α and β, respectively [9:170].

The α limit for this statistical test was established at .10. This value indicates the probability of committing a Type I error when the true mean, μ, equals 1. In this analysis, a Type I error was committed when we concluded that the estimates are not accurate and, in fact, they were. A Type II error was committed when we concluded H_0, that the price estimates are accurate and, in fact, they are not (see Table 3).

TABLE 3

ILLUSTRATION OF TWO TYPES OF ERRORS (10:261)

True State / Conclusion	$\mu=1$, H_0 is Correct	$\mu\neq1$, H_1 is Correct
H_0: $\mu=1$	Correct Conclusion	Type II Error
H_1: $\mu\neq1$	Type I Error	Correct Conclusion

For this thesis, both Type I error and Type II errors were serious. If a Type I error was committed (concluding H_1 when H_0 is true), management may take action to correct the situation when no action is required. If a Type II error was committed (concluding H_0 when H_1 is true), it implies no management action need be taken when in fact there is a problem. Because of the seriousness of both type errors, it was important to minimize the probability of both α and β.[2] The α limit, therefore, was established at the .10 level for this and all subsequent statistical tests. The β level (which could be calculated and would differ for each sample) would be comparatively low based on the α level established.[3]

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[2]"For a given random sample size, one type of error probability can be reduced only at the expense of increasing the other type [10:268]."

[3]For further discussion of hypothesis testing consult Mendenhall, Introduction to Probability and Statistics, pp. 147-188.

Using $\alpha = .10$ and the standard error of the sample, $s(\bar{x})$, a rejection region could be calculated to test the null hypothesis. The decision rule to test H_0 was:

If $A_1 \leq \bar{x} \leq A_2$, conclude H_0;
If $\bar{x} < A_1$ or $\bar{x} > A_2$, conclude H_1;

where, $A_1 = \mu_1 + z(\alpha/2)s(\bar{x})$;
$A_2 = \mu_1 + z(1-\alpha/2)s(\bar{x})$ (10:284).

For the accuracy of the cases overall, $\alpha = .10$, $s(\bar{x}) = .258$, $z(\alpha/2) = -1.645$, and $z(1-\alpha/2) = 1.645$ (for all calculations see Appendix H); $A_1 = .576$, $A_2 = 1.424$. The decision rule therefore was:

If $.576 \leq \bar{x} \leq 1.424$, conclude H_0 ($\mu = 1$);
If $\bar{x} < .576$ or $\bar{x} > 1.424$, conclude H_1 ($\mu \neq 1$).

Since $\bar{x} = 1.664$, the decision rule led to conclusion H_1--that the price estimates of overall defined order cases are not accurate ($\mu \neq 1$).

Beta is the probability of accepting H_0 when μ, the population mean, is actually equal to some μ_I other than 1. For this analysis, beta is evaluated where μ_I was equal to the sample mean: 1.664. To determine β, the probability of a Type II error, the equation $z = \frac{\bar{x} - \mu}{s(\bar{x})}$ was used where $\bar{x} = A_2$ (the upper limit of the rejection region),

μ = the sample mean and $s(\bar{x})$ = the standard error of the sample (9:174-176). Calculating the z value we obtained:

$$z = \frac{\bar{x} - \mu}{s(\bar{x})} = \frac{1.424 - 1.664}{.258} = -.9302;$$

$$z(\beta) = -.9302;$$

$$\beta = .1762.$$

For this test (where $\alpha = .10$, $\beta = .1762$) we concluded H_1, that the estimated costs of cases overall are not accurate.

Stratified Cases

The sample of cases drawn from the population of defined order cases was stratified in two manners: (1) by source of estimate, and (2) by category of case (questions 3 and 4). When stratified, a mean value of ACC could be calculated for each stratum and used to test the null hypothesis as stated. A new rejection region for each stratum was calculated using the standard error for that stratum. (The α level = .10 for all tests.) When stratified, we found some of the strata could not be tested because of insufficient sample size. This shortcoming of the study was a result of the population definition and original sample selection. The population used was all defined order FMS cases, implemented and closed during the period 1976-1980. These cases were used to ensure available and current data. However, although the population

was large, some strata were not of sufficient size to be tested. For example, "G" cases only totaled 24 in the entire population. Similarly, "M" cases only contained 26. By selecting 40 percent of the entire population, the data collection was reduced to a manageable effort. Unfortunately, 40 percent of some strata again resulted in stratum sizes too small to be tested. For example, 100 percent of "C" cases = 61, but 40 percent sampling of "C" cases = 25. For our purposes, if the sample size of the stratum was less than 30, it was not considered sufficiently large enough to apply the Central Limit Theorem. Other statistical tests for small samples are available but were not used because the results of such tests would be much less conclusive than those for the large sample tests. The conclusions made using numerous small sample tests and resulting inferences about the subpopulations would be unreliable.

Table 4 indicates only those strata that were tested. Also included in Table 4 are the standard errors of the strata, the calculated acceptance regions, the mean values, and the hypothesis conclusions. A breakdown of all the case samples and statistics is contained in Appendix G.

Research Question Number 3. What is the accuracy of cost estimates by source of estimate?

TABLE 4

SUMMARY OF SAMPLES TESTED

Sample Tested	$s(\bar{x})$	$A_1 \leq \bar{x} \leq A_2$	$\bar{x}$	Conclude H_0	Conclude H_1
Overall	.258	$.576 \leq \bar{x} \leq 1.424$	1.664		X
Ogden (Source)	.095	$.844 \leq \bar{x} \leq 1.156$	1.328		X
"A" (Category)*	.113	$.814 \leq \bar{x} \leq 1.186$	1.275		X
"L" (Category)*	.816	$-.342 \leq \bar{x} \leq 2.342$	2.086	X	

*Note: "A" cases are Ammunition; "L" cases are Equipment

After testing the hypothesis for the accuracy of the cases overall the sample was stratified by source of the estimated costs for each case. The source of the estimated cost falls into one of seven possibilities. They are: (1) Ogden ALC; (2) Oklahoma City ALC; (3) Warner Robins ALC; (4) Sacramento ALC; (5) San Antonio ALC; (6) International Logistics Center, Wright-Patterson AFB; and (7) Other (2750 ABW, AF Clothing & Textile Office, etc.). Of these groupings only one division contained enough elements ($n \geq 30$) to be used to test the null hypothesis. Ogden ALC contained a sample size of 72 which was sufficiently large to apply the Central Limit Theorem and do the statistical testing required. As indicated in Table 4, the decision rule to conclude H_0 is $.844 \leq \bar{x} \leq 1.156$. For this sample, $\bar{x} = 1.328$, therefore we

concluded H_1, that the estimated costs originating at Ogden ALC are not accurate.

Research Question Number 4. What is the accuracy of cost estimates by category of case?

The original sample of 176 defined order cases was then stratified by the category of each case. The categories are: (1) A, (2) B, (3) C, (4) G, (5) H, (6) L, (7) M, (8) P, (9) V, and (10) Other (J, W, X, Y, N). Of these ten categories only two had sample sizes sufficiently large to apply the statistical tests. The categories, as indicated in Table 4, are the "A" cases, n = 37, and "L" cases, n = 47. For the "A" cases the acceptance region for H_0 was calculated as $.814 \leq \bar{x} \leq 1.186$. $\bar{x} = 1.275 > 1.186$ therefore we concluded H_1, that the accuracy of cost estimates for "A" cases is not equal to 1; not accurate.

The mean accuracy of "L" cases was 2.086. This value fell within the acceptable region of H_0 because the calculated acceptance region was $-.342 \leq \bar{x} \leq 2.342$. (Be aware that it was not possible to have a negative value for $\bar{x}$ because all values of ACC > 0.) The large acceptance region about $\bar{x}$ was due to the comparatively high standard error of the sample: .816. The standard error is a measure of variability in the sample values (10:201). An examination of the sample of "L" cases revealed that one case did have an extremely large ACC value: 39.373. Consequently,

for the subpopulation of "L" cases we concluded H_0, that the cost estimates are accurate ($\mu = 1$).

Research Question Number 5

What is the accuracy of cost estimates on selected FMS items? Can these be related according to category of case or price estimating source?

The unit price of each item in the 176 sample cases was recorded and then grouped into price ranges. A price range of \$10.01 - \$70.00 was selected for analysis because this range contained a sufficiently large (n = 108) sample of items. The price range with the highest frequency was expected to include items from most categories of cases and from most estimating sources. By selecting as narrow a price range as possible we expected to include items that were handled similarly in the FMS process; i.e., \$10.01 - \$70.00 items would be given the same administrative handling (priorities and other conditions excepted). This sample of 108 items was examined to gather further information about the accuracy of cost estimates.

The value for the accuracy (ACC) for each item was computed as a ratio of the Estimated Unit Cost (EUC) divided by the Delivered Unit Cost (DUC). The value for EUC and DUC was obtained from the DD Form 1513 and the R058 report respectively. Similar to the case analysis, the value of ACC could be any number greater than 0. Table 5

TABLE 5

PROPORTIONAL BREAKDOWN OF SAMPLE (ITEMS)

Value of ACC	n	n/108
ACC < 1	17	.157
ACC = 1	42	.389
ACC > 1	49	.454
TOTAL	108	1.00

indicates the proportional breakdown of the sample by the individual values of ACC. This breakdown indicates a high proportion of the accuracy values (38.9 percent) equals exactly 1. That this is a higher percentage than the accuracy of cases overall (23.3 percent) can be expected because it is more likely that the price of a single item will remain constant than it is likely that the price of a group of items (such as a case) will remain constant.

As previously determined, an acceptable level of accuracy for the estimated cost is ±10 percent of the delivered cost. The sample proportions of ACC using a ±10 percent acceptable limit are displayed in Table 6. Clearly, the majority (54.6 percent) of estimated costs for individual items fell within the acceptable range of accuracy.

To determine the accuracy of the cost estimates for items overall, the mean value of ACC was used as the

TABLE 6

PROPORTIONAL BREAKDOWN GIVEN ±10 PERCENT ACCEPTABLE ACCURACY (ITEMS)

Value of ACC	n	n/108
ACC < .9	10	.093
.9 ≤ ACC ≤ 1.1	59	.546
ACC > 1.1	39	.361
TOTAL	108	1.00

test statistic to test the null hypothesis. H_0, the null hypothesis, was that the estimates of costs for items are accurate; the alternative, H_1, was that the estimates are not accurate. That is:

H_0: $\mu = 1$, estimated costs are accurate;

H_1: $\mu \neq 1$, estimated costs are not accurate.

The α limit for this statistical test was again established at .10. Using the SPSS computer program, the standard error of the sample, $s(\bar{x})$, equaled .059. The decision rule for the hypothesis was:

If $.903 \leq \bar{x} \leq 1.097$, conclude H_0;

If $\bar{x} < .903$ or $\bar{x} < 1.097$, conclude H_1.

Since $\bar{x} = 1.153$ for the sample, we concluded H_1, that the estimated costs are inaccurate for items overall.

Stratified Items

The sample of items from the defined order cases were again stratified in two ways: (1) by source of the estimated cost, and (2) by the category of the item. When stratified, a mean value of ACC was computed for each stratum and used to test the null hypothesis. For each stratum a new rejection region was calculated using the standard error for that sample. Just as some strata of the cases could not be tested using the Central Limit Theorem, some of the stratified samples of items could not be tested because their sample size was not sufficiently large ($n \geq 30$). Table 7 is a breakdown of the strata tested, their standard errors, acceptance regions, mean ACC values, and the hypothesis conclusions. A breakdown of all the item samples and statistics is given in Appendix G.

TABLE 7

SUMMARY OF SAMPLES TESTED (ITEMS)

Sample Tested	$s(\bar{x})$	$A_1 \leq \bar{x} \leq A_2$	$\bar{x}$	Conclusion H_0	Conclusion H_1
Overall	.059	$.903 \leq \bar{x} \leq 1.097$	1.153		X
Ogden (Source)	.089	$.854 \leq \bar{x} \leq 1.146$	1.159		X
"B" (Category)*	.056	$.908 \leq \bar{x} \leq 1.092$	1.123		X
"L" (Category)*	.025	$.959 \leq \bar{x} \leq 1.041$	1.050		X

*Note: "B" cases are Spares; "L" cases are Equipment.

Items by Source. When stratified by source of the cost estimates, only one sample was sufficiently large to test the null hypothesis. The stratum of items which had Ogden ALC as a source of estimate contained a sufficiently large sample size of items, (n = 42), to apply the Central Limit Theorem and assume a normal distribution of the value for ACC. Table 7 shows the decision rule to include H_0 was $.854 \leq \bar{x} \leq 1.146$. Since $\bar{x} = 1.159$ for this sample, we rejected H_0 and concluded that the estimated costs are not accurate.

Items by Category. The sample of 108 items was stratified by the categories of items. There are ten possible categories into which the items may fall (A, B, C, G, H, L, M, P, V, Other); however, when divided by category the items fell in only five categories: A, B, C, L, V. Of the five categories represented, only two contained samples sufficiently large enough to be tested--B and L. The categories B and L contained 34 and 33 items in their samples, respectively.

Table 7 indicates the two categories tested and the calculated acceptance regions. For the items in category B cases, the acceptance region to conclude H_0 was $.908 \leq \bar{x} \leq 1.092$. The mean ACC, $\bar{x}$, for the sample equaled 1.123. $\bar{x} = 1.123 > 1.092$, therefore we rejected H_0 and

concluded H_1, that the estimated costs of items from \$10.01 to \$70.00, for B cases, are not accurate.

The computed mean accuracy of items in category L cases was 1.050. The calculated acceptance region for H_0 was $.959 \leq \bar{x} \leq 1.041$. For the sample of items $\bar{x} = 1.050 > 1.041$, therefore we again rejected H_0 and concluded H_1. For this sample we concluded that the estimated costs are not accurate.

CHAPTER IV

CONCLUSIONS

The intent of this study was to support or dismiss the perception that FMS price estimates are inaccurate. The scope was limited to include only defined order cases managed by AFLC, excluding systems sales and CLSSA programs. This chapter concludes the report of this study and presents the findings answering each research question. Also included are recommendations for possible management investigation and areas for further research based on the findings.

Findings

Research Question 1. What is an acceptable level of accuracy for the estimated costs?

Both AFLC and foreign representatives expressed the opinion that an estimated price that came within ±10 percent of the delivered cost would be acceptably accurate.

Research Question 2. What is the accuracy of cost estimates for FMS cases overall?

The mean accuracy of the sample was 1.664. This value indicates that prices for material value are overestimated in comparison to the final delivered value

(ACC = $\frac{EC}{TDV}$ = 1.664). The statistical testing concluded that price estimates for defined order cases overall are inaccurate. Research indicated the inaccuracy tends towards overestimating prices.

Research Question 3. What is the accuracy of cost estimates by source of estimate?

When the sample of 176 cases was stratified according to the sources of price estimates, only the stratum of cases estimated by Ogden ALC contained a sufficient number of cases to allow statistical testing. The mean accuracy of the cases estimated by Ogden was 1.328. As it was for the cases overall, the case values estimated by Ogden ALC tend to be overestimated. The statistical test indicated that the estimated costs on defined order cases from Ogden ALC are inaccurate.

Research Question 4. What is the accuracy of cost estimates by category of case?

When the sample of cases was stratified by category of case, only two categories, "A" and "L", contained sufficient numbers of cases to analyze. The mean accuracy for "A" cases was 1.275. This was found to indicate that estimates for "A" cases are inaccurate and overestimated. The mean accuracy for "L" cases was 2.086. The estimated costs for these cases were found to be accurate. However, the resulting conclusion for the "L"

cases was a result of the standard error for this stratum which at .816 was a relatively large figure. This large standard error was a reflection of an extreme deviation in the sample data. Consequently, this conclusion may be less valid than the others in this study.

Research Question 5. What is the accuracy of cost estimates on selected FMS items? Can these be related according to the category of case or the price estimating source?

Statistical testing of the mean accuracy of the estimated costs of the items concluded that the estimates are inaccurate. When the sample of selected items was stratified according to the category of case on which they had been purchased, only category "B" and "L" cases had sufficient data for analysis. The accuracies of "B" cases and "L" cases were both found to indicate inaccurate price estimates. When the items were stratified by source of estimate, only the stratum of items estimated by Ogden ALC had a sufficient amount of data for analysis. Again, the cost estimates were found to be inaccurate. All estimated costs for items, both stratified and taken as a whole, are overestimated.

Conclusions

The research objective of this thesis was to determine the accuracy of price estimates given to foreign

customers by AFLC for defined order FMS cases. This research was motivated by the need to substantiate common perceptions of price estimating performance. This research indicated that the mean accuracy of price estimates given to foreign customers by AFLC for defined order FMS cases was 1.664 or that the estimated cost was 166.4 percent of the final delivered value. This shows that AFLC over-estimated costs on defined order cases. Further, except for the sample of cases in category "L", each test in this study concluded that estimated costs were inaccurate and had in fact been overestimated. A look at the proportions of cases and items which were accurate, overestimated, or underestimated confirmed that overestimated cases and items constituted a significant part of the samples and by inference, the population. Based on this study, under-estimating prices for defined order FMS cases may not be a serious problem for AFLC. However, underestimates were made. It was outside the scope of this study to evaluate the logistical, financial, or management problems resulting from those underestimated cases. It may be that this small proportion of cases could have caused a disproportionate amount of trouble for FMS managers and purchasers. Whether or not the overestimated cases caused problems for the Purchaser would depend on the country involved. In talk-ing to people who work with FMS programs, one could con-clude that an overestimated case, especially one that was

within +10 percent of the final value, was not viewed as a major management problem for the Purchaser.

Recommendations and Areas for Further Research

One recommendation which can be made as a result of this study is that the International Logistics Center (ILC) look into the feasibility of monitoring on a continuing basis the relationship between the estimated and delivered values of FMS cases. The data is readily available and the information generated would give FMS managers and policy makers a timely indicator of performance. The information would also show when price estimating procedures should be adjusted to meet changing conditions. Having this information would also allow FMS managers to respond to customers' perceptions of price estimate accuracy.

Another recommendation is that price estimating procedures be given a thorough and critical review by HQ AFLC with the purpose of incorporating what is now known through research and the experience of AFLC and ILC management about ways to make price estimates more accurate. Although it may not be possible to make exact price estimates, any effort to improve accuracy will help lessen the management problems now being experienced by both the ILC and foreign country managers of FMS programs when price estimates prove to be inaccurate.

During the course of this research effort several areas for further research were identified. Among these were the following:

1. This study could be repeated, redefining the population to insure a sufficiently large sample in each case category or for each source of estimate. This would allow a comparative analysis of these subpopulations that was not possible in this thesis.

2. The sale of weapon systems with associated support is an important aspect of FMS which was not addressed in this thesis. Considering the high cost and political importance of these sales, a study of price estimate accuracy for systems cases would be of great interest.

3. Among the factors believed to impact the accuracy of price estimates, the appropriateness of the inflation factor used was frequently mentioned. Research in this area may be of benefit to AFLC when revising FMS procedures.

4. Some people working in AFLC believe that price estimates can be improved by retrieving and reviewing current cost information which is now available to FMS managers through the information systems which record FMS deliveries. It would be useful to determine the feasibility of providing price estimating support through these existing systems.

APPENDICES

APPENDIX A

CASE IDENTIFIER

> Due to the variety of articles and services available and the number of purchasers participating in FMS cases [the] system identifies the purchaser and the material or services being sold [26:4-1].

The U.S. Air Force FMS case identifier is made up of a two-digit alphanumeric code for the purchasing country or organization followed by a dash "-" and the U.S. Air Force Service Code - "D". This is followed by a dash "-" and a three-letter case designator. A typical FMS case identifier could be: AT-D-AAB. "AT" is the country code that identifies the purchaser--in this case, Australia. The letter "D" is used for all USAF-managed FMS cases (U.S. Army uses service code "B", U.S. Navy uses service code "P"). The first position of the three-letter case designator identifies the category of material or services purchased on the case. The second and third positions are used to identify one case from another within the same category and for the same purchaser (26:4-2). In the example, the first "A" of the designator identifies the category as munitions, the last two letters indicate that this is the second munitions case established for Australia. (The first case would have been AT-D-AAA, the third case would be AT-D-AAC) (26:4-2).

The following is a list of codes used in the first position of the case designator to identify the categories of items or services included in the case. The letters I, O, and Q are not used (26:4-1 to 4-8).

Notes

* Defined Order case included in the population of this study.

**Can be either Defined Order or Blanket Order Case. It is included in the population of this study if it is a Defined Order case.

No asterisk indicates Blanket Order Case. Not included in the population.

* A - Munitions

* B - Spare parts

* C - Cartridge Actuated Devices and Propellant Actuated Devices (CAD/PAD)

* D - Systems Sales of Communications, Electromagnetic, Meteorological facilities (CEM)

E - Support Equipment (previously designated as an "LX_" case)

* F - Training Films and film strips

** G - Technical services

* H - Transportation services

* J - Aircraft ferry services

K - Follow-on spares support under CLSSA

* L - Equipment

** M - Programmed depot and emergency repair, overhaul, and return of major items

** N - Follow-on engineering support

** P - Publications

R - Spare parts (Blanket Order Case)

S - Aircraft system sales

** T - Training

* U - Reserves

** V - Class IV modifications

* W - Class V modifications

X - Trust Fund Account (not an FMS case)

* Y - System sale (other than aircraft or CEM)

* Z - Leases under Title 10 USC 2667 (not an FMS case)

APPENDIX B

ESTIMATED COST

In accordance with AFR 400-3, Block 21 of the DD Form 1513 is the "estimated articles and services costs in whole dollars [26:6-26]." This figure includes all direct charges and should not include administration or accessorial charges. This cost is used in the study unless DD Forms 1513-1 or 1513-2 have been issued.

The DD Form 1513-1 is the document used for certain bilateral amendments to FMS cases. It is used to reflect small changes in scope when it would be impractical to process a new DD Form 1513. For example, minor increases in the quantity of an item ordered on a defined order case, or increases in the time of performance which result in increased cost would both be processed using a DD Form 1513-1. An amended cost estimate, if different from that given on the original DD Form 1513, is reflected in Block 22b of the DD Form 1513-1. In this study, the amended cost estimate will be used in lieu of the original DD Form 1513 estimate.

A DD Form 1513-2 is used for unilateral notices of actions under existing LOA conditions and for certain bilateral actions as authorized by MASM, Part III (26:6-38). If the DD Form 1513-2 is issued because of item cancellation or quantity reduction, the Revised Cost given in Block 19b of the DD Form 1513-2 will be used in place of

the original estimate. If the DOD Form 1513-2 is issued for any other reason, the Revised Cost will not be used.

APPENDIX C

DD FORMS 1513, 1513-1, AND 1513-2

UNITED STATES DEPARTMENT OF DEFENSE
OFFER AND ACCEPTANCE

(1) PURCHASER *(Name and Address) (Zip Code)*

(2) PURCHASER'S REFERENCE | (3) CASE IDENTIFIER

OFFER

Pursuant to the Arms Export Control Act, the Government of the United States (USG) hereby offers to sell to the above purchaser the defense articles and defense services listed below (hereinafter referred to collectively as "items" and individually as "defense articles" or "defense services"), subject to the terms contained herein and conditions set forth in Annex A, and to such other special terms and conditions which may be a part of, and appended to, this Offer and Acceptance.

(4) _____
Signature *(US Dept./Agency Authorized Representative)*

(5) _____
Typed Name and Title

(6) ADDRESS: _____

(7) DATE: _____

(8) THIS OFFER EXPIRES:

(9) _____
Countersignature *(Office of the Comptroller, USAA)* *(Date)*

(10) _____
Typed Name and Title

(11) DSAA ACCOUNTING ACTIVITY

NOTE: This offer must be accepted not later than the date shown in block 8. Within five (5) days of its acceptance, you must notify the Office of the Comptroller, USAA. Otherwise, this Offer is cancelled and retension of initial deposit by offeree pending disposition instructions shall not be deemed a waiver of such cancellation. Request prompt notification if this offer is rejected.

ITEM OR REF NO (12)	ITEM DESCRIPTION (13)	QUANTITY (14)	UNIT OF ISSUE (15)	ESTIMATED UNIT COST (16)	ESTIMATED TOTAL COST (17)	AVAILABILITY AND REMARKS (18)	OFFER RELEASE CODE (19)	DELIVERY TERM CODE (20)

(21) ESTIMATED COST	$	
(22) ESTIMATED PACKING, CRATING, AND HANDLING COST	$	
(23) ESTIMATED GENERAL ADMINISTRATIVE COSTS	$	
(24) ESTIMATED CHARGES FOR SUPPLY SUPPORT ARRANGEMENT	$	
(25) OTHER ESTIMATED COSTS *(Specify)*	$	
(26) ESTIMATED TOTAL COSTS	$	

(27) TERMS

(28) AMOUNT OF INITIAL DEPOSIT – $

ACCEPTANCE

(29) I am a duly authorized representative of the Government of _____ and upon behalf of said Government, accept this offer under the terms and conditions contained herein (30) this _____ day of _____ 19 ____

(31) _____
SIGNATURE

(32) _____
TYPED NAME AND TITLE

(33) MARK FOR CODE _____

(34) FREIGHT FORWARDER CODE _____

(35) PROCURING AGENCY _____

(36) DESIGNATED PAYING OFFICE

(37) ADDRESS OF DESIGNATED PAYING OFFICE

DD FORM 1 MAR 79 1513 PREVIOUS EDITIONS MAY BE USED UNTIL EXHAUSTED. PAGE 1 of PAGES

GENERAL CONDITIONS

Annex A

A. THE GOVERNMENT OF THE UNITED STATES.

1. Agrees to furnish such items from its Department of Defense (hereinafter referred to as "DOD") stocks and resources, or to procure them under terms and conditions consistent with DOD regulations and procedures. When procuring for the Purchaser, the DOD shall, in general employ the same contract clauses, the same contract administration, and the same inspection procedures as would be used in procuring for itself, except as otherwise requested by the Purchaser and as agreed to by the DOD. Unless the purchaser has requested that a sole source contractor be designated, and this Letter of Offer and Acceptance reflects acceptance of such designation by the DOD, the Purchaser understands that selection of the contractor source to fill this requirement is solely the responsibility of the Government of the United States (hereinafter referred to as "USG"). Further, the Purchaser agrees that the United States DoD is solely responsible for negotiating the terms and conditions of all contracts necessary to fulfill the requirements in the Letter of Offer.

2. Advises that when the DOD procures for itself, its contracts include warranty clauses only on an exceptional basis. However, the USG shall, with respect to items being procured, and upon timely notice, attempt to the extent possible to obtain any particular or special contract provisions and warranties desired by the Purchaser. The USG further agrees to exercise, upon the Purchaser's request, any rights (including those arising under any warranties) the USG may have under any contract connected with the procurement of any items. Any additional cost resulting from obtaining special contract provisions or warranties, or the exercise of rights under such provisions or warranties, or any other rights that the USG may have under any contract connected with the procurement of items, shall be charged to the Purchaser.

3.a. Shall, unless the condition is otherwise specified herein (e.g., "As is"), repair or replace at no extra cost defense articles supplied from DOD stocks which are damaged or found to be defective in respect of material or workmanship, when it is established that these deficiencies existed prior to passage of title, or found to be defective in design to such a degree that the items cannot be used at all for the purpose for which they were designed. Qualified representatives of the USG and of the Purchaser, upon notification pursuant to paragraph B.6. below, shall agree on the liability of the USG hereunder and the corrective steps to be taken.

b. With respect to items being procured for sale to the Purchaser, the USG agrees to exercise warranties on behalf of the Purchaser pursuant to A.2. above to assure, to the extent provided by the warranty, replacement or correction of such items found to be defective.

c. In addition, the USG warrants the title of all items sold to the Purchaser hereunder. The USG, however, makes no warranties other than those specifically set forth herein, in particular the USG disclaims any liability resulting from patent infringement occasioned by the use or manufacture by or for Purchaser outside the United States of items supplied hereunder.

4. Agrees to deliver and pass title to the items to the Purchaser at the initial point of shipment unless otherwise specified in this Offer and Acceptance. With respect to defense articles procured for sale to the Purchaser, this will normally be at the manufacturers' loading facilities, with respect to defense articles furnished from stocks, this will normally be at the U.S. depot. Articles will be packed, crated or otherwise prepared for shipment prior to the time title passes. If "Point of Delivery" is specified otherwise than the initial point of shipment, the supplying Military Department or Defense Agency will arrange movement of the items to the authorized delivery point as reimbursable service but will pass title at the initial point of shipment, the USG disclaims any liability for damage or loss to the items incurred after passage of title irrespective of whether transportation is by common carrier or by the U.S. Defense Transportation System.

5. Advises that: a. Unless otherwise specified, USG standard items will be furnished without regard to make or model.

b. The price of items to be procured shall be at their total cost to the USG. Unless otherwise specified, the cost estimates of items to be procured, availability determination, payment schedule, and delivery projections quoted are estimates based on current available data. The USG will use its best efforts to advise the Purchaser or its authorized representatives by DD Form 1513-2

(1) of any identifiable cost increase that might result in an increase in the "Estimated Total Costs" in excess of 10 percent,

(2) of any changes in the payment schedule(s), and

(3) of any delays which might significantly affect the estimated delivery dates;

but its failure to so advise of the above shall not affect the Purchaser's obligation under paragraphs B.1. and B.3. below.

c. The USG will, however, use its best efforts to deliver items or render services for the amount and at the times quoted.

6. Under unusual and compelling circumstances when the national interest of the United States so requires, the USG reserves the right to cancel or suspend all or part of this Offer and Acceptance at any time prior to the delivery of defense articles or performance of services (including training). The USG shall be responsible for all termination costs of its suppliers resulting from cancellations or suspensions under this paragraph.

7. Shall refund to the Purchaser any payments received hereunder which prove to be in excess of the final total cost of delivery and performance of this Offer and Acceptance, and are not required to cover arrearages on other open Offers and Acceptances of the Purchaser.

8. Advises that personnel performing defense services provided under this Offer and Acceptance will not perform any duties of a combatant nature, including any duties relating to training, advising, or otherwise providing assistance regarding combat activities, outside the United States in connection with the performance of these defense services.

9. Advises that in the assignment or employment of United States personnel for the performance of this Offer and Acceptance, the USG will not take into account race, religion, national origin or sex.

10. Advises that, notwithstanding Purchaser's agreement to pay interest on any net amount by which Purchaser may be in arrears on payments (as provided for in paragraph B.3.g. below), USG funds will not be used for disbursements by DOD to its contractors in the event of any such arrears in payments. Accordingly, failure by the Purchaser to make timely payments in the amounts due may result in delays in contract performance by DOD contractors, claims by contractors for increased costs (including the above mentioned interest costs), claims by contractors for termination liability for breach of contract or termination of contracts by the USG under this or other open Offers and Acceptances of the Purchaser at Purchaser's expense.

B. THE PURCHASER:

1. Shall pay to the USG the total cost to the USG of the items, even if the final total cost exceeds the amounts estimated in this Offer and Acceptance.

2. Shall make payment(s) for the items by check(s) or by wire transfer payable in United States dollars to the Treasurer of the United States.

3.a. Shall, if "Terms" specify "cash with acceptance", forward with this Offer and Acceptance a check or wire transfer in the full amount shown as the estimated total cost, and agrees to make such additional payment(s) as may be specified upon notification of cost increase(s) and request(s) for funds to cover such increases.

b. Agrees, if "Terms" specifies payment to be "cash prior to delivery" to pay to the USG such amounts at such times as may be specified from time to time by the USG (including any initial deposit set forth under "Terms") in order to meet payment requirements for articles or services to be furnished from the resources of the U.S. Department of Defense. USG requests for funds may be based on estimated requirements to cover forecasted deliveries of articles or costs to provide defense services. It is USG policy to obtain funds 90 days in advance of the time DOD plans such deliveries or incurs such expenses on behalf of the Purchaser.

c. Agrees, if "Terms" specify payment by "dependable undertaking" to pay to the USG such amounts at such times as may be specified from time to time by the USG (including any initial deposit set forth under "Terms") in order to meet payments required by contracts under which items are being procured, and any damages and costs that may accrue, or have accrued, from termination of contracts by the USG because of Purchaser's cancellation of this Offer and Acceptance under paragraph B.7., supra. USG requests for funds may be based upon estimated requirements for advance and progress payments to suppliers, estimated termination liability, delivery forecasts or evidence of constructive delivery, as the case may be. It is USG policy to obtain such funds 90 days in advance of the time USG makes payments on behalf of the Purchaser.

d. Agrees, if "Terms" specify "payment on delivery" that bills may be dated as of the date(s) of delivery of the defense articles or rendering of the defense services, or upon forecasts of the date(s) thereof.

e. Agrees, if "Terms" specify payment under a Credit Agreement between the Purchaser and DOD, to pay to the USG on a "dependable undertaking" basis, in accordance with B.3.c. above, such costs as may be in excess of the amount funded by the Credit Agreement.

f. Agrees, that requests for funds or billings under paragraphs B.3.b. through e. above are due and payable in full on presentation, or, if a payment date is specified in the request for funds or bill, on the payment date so specified, even if such payment date is not in accord with the estimated payment schedule, if any, contained in this Offer and Acceptance. Without affecting Purchaser's obligation to make such payment(s) when due, documentation concerning advance and progress payments, estimated termination liability or evidence of constructive delivery or shipment in support of request for funds or bills will be made available to the Purchaser by DOD upon request. When appropriate, Purchaser will request adjustment of any questioned billed items by subsequent submission of required discrepancy reports in accordance with paragraph B.6. below.

g. Agrees to pay interest on any net amount by which it is in arrears on payments, determined by considering collectively all of the Purchaser's open Offers and Acceptances with the DOD. Interest shall be calculated on a daily basis. The principal amount of the arrearage shall be computed as the excess of cumulative financial requirements of the Purchaser over total cumulative payments after (after) billing payment due dates. The rate of interest may shall be a rate not less than a rate determined by the Secretary of the Treasury taking into consideration the current average market yield on outstanding short-term obligations of the USG as of the last day of the month preceding the net arrearage and shall be computed from the date of net arrearage.

h. Shall designate the Procuring Agency and responsible Paying Office and address thereof to which the USG shall submit requests for funds and bills under this Offer and Acceptance.

4. Shall furnish shipping instructions for the items with its acceptance of this Offer and Acceptance. Such instructions shall include (a) Offer/Release Code, (b) Freight Forwarder Code, and (c) the Mark for Code, as applicable.

5. Shall be responsible for obtaining the appropriate insurance coverage and customs clearances, and, except for items exported by the USG, appropriate export licenses.

6. Shall accept title to the defense articles at the initial point of shipment (see A.4. above). Purchaser shall be responsible for in-transit accounting and settlement of claims against common carriers. Title to defense articles transported by parcel post shall pass to the Purchaser on date of parcel post shipment. Standard Form 364 shall be used in submitting claims to the USG for overage, shortage, damage, duplicate billing, item deficiency, improper identification or improper documentation and shall be submitted by Purchaser promptly. Claims of $100.00 or less will not be reported for overages, shortages, or damages. Claims received after one year from date of passage of title or billing, whichever is later, will be disallowed by the USG, unless the USG determines that unusual and compelling circumstances involving latent defects justify considerations of the claim.

7. May cancel this Offer and Acceptance with respect to any or all of the items listed in this Offer and Acceptance at any time prior to the delivery of defense articles or performance of services (including training). It shall be responsible for all costs resulting from cancellation under this paragraph.

8. Shall, except as may otherwise be mutually agreed in writing, use the items sold hereunder only:

a. For the purposes specified in the Mutual Defense Assistance Agreement, if any, between the USG and the Purchaser;

b. For the purposes specified in any bilateral or regional defense treaty to which the USG and the Purchaser are both parties, if subparagraph a. of this paragraph is inapplicable; or

c. For internal security, individual self-defense, and/or civic action, if subparagraphs a. and b. of this paragraph are inapplicable.

9. Shall not transfer title to, or possession of, the defense articles, components and associated support material, related training or other defense services (including any plans, specifications or information) furnished under the Offer and Acceptance to anyone not an officer, employee or agent of the Purchaser (excluding transportation agencies), and shall not use or permit their use for purposes other than those authorized by 8.8. above, unless the written consent of the USG has first been obtained. To the extent that any items, plans, specifications, or information furnished in connection with this Offer and Acceptance may be classified by the USG for security purposes, the Purchaser shall maintain a similar classification and employ all measures necessary to preserve such security, equivalent to those employed by the USG, throughout the period during which the USG may maintain such classification. The USG will use its best efforts to notify the Purchaser if the classification is changed. The Purchaser will ensure, by all means available to it, respect for proprietary rights in any defense article and any plans, specifications, or information furnished, whether patented or not.

C. INDEMNIFICATION AND ASSUMPTION OF RISKS:

1. It is understood by the Purchaser that the USG in procuring and furnishing the items specified in this Offer and Acceptance does so on a nonprofit basis for the benefit of the Purchaser. The Purchaser therefore undertakes, subject to A.3. above, to indemnify and hold the USG, its agents, officers, and employees harmless from any and all loss or liability (whether in tort or in contract) which might arise in connection with this Offer and Acceptance because of: (i) injury to or death of personnel of Purchaser or third parties; (ii) damage to or destruction of (A) property of the DOD furnished to Purchaser or suppliers specifically to implement this Offer and Acceptance, (B) property of Purchaser (including the items ordered by Purchaser pursuant to the Offer and Acceptance, before or after passage of title to Purchaser), or (C) property of third parties; or (iii) patent infringement.

2. Subject to any express, special contractual warranties obtained for the Purchaser in accordance with A.2. above, the Purchaser agrees to relieve the contractors and subcontractors of the USG from liability for, and will assume the risk of, loss or damage to: (i) Purchaser's property (including the items procured pursuant to this Offer and Acceptance, before or after passage of title to Purchaser) and (ii) property of the DOD furnished to suppliers specifically to implement this Offer and Acceptance, to the same extent that USG would assume for its property if it were procuring for itself the item or items procured pursuant to this Offer and Acceptance.

D. ACCEPTANCE:

1. To accept this Offer and Acceptance, the Purchaser will not later than the expiration date of the Offer and Acceptance, as set forth herein, return three copies properly signed to the security assistance accounting center designated herein, accompanied by such initial deposit or other payment as may be required by the Terms herein. In addition, Purchaser will concurrently return three copies properly signed to the U.S. Military Department or Defense Agency making the offer. When properly accepted and returned as specified herein, the provisions of this Offer and Acceptance shall be binding upon the USG and the Purchaser.

2. It is understood that implementation of the Offer and Acceptance cannot proceed without a proper acceptance. Failure to comply with Terms and Conditions required for acceptance, as, for example, delay in submission of any required initial deposit or payment of full estimated cost, as the case may be, may require revision or reissue of the Offer and Acceptance.

3. Unless a written request for extension is made by the Purchaser and granted in writing by an authorized representative of the appropriate U.S. Military Department or Defense Agency, this Offer and Acceptance shall terminate on the expiration date set forth herein.

E. ENCLOSURES:

Enclosures attached hereto are, by this reference, incorporated herein and are made a part hereof as though set forth in full.

F. PUBLIC INSPECTION:

This Offer and Acceptance will be made available for public inspection to the fullest extent possible consistent with the national security of the United States.

EXPLANATORY NOTES

1. The item or reference numbers appearing in the "ITEM OR REF. NO." column may not correspond with references used in Purchasers' original request. However, this number, together with the case identifier shown should always be used as a reference in future correspondence.

2. Availability leadtime quoted is the estimated number of months required to complete delivery of the item(s) in accordance with the terms of delivery after receipt of acceptance of this Offer pursuant to Section D. of the Conditions, and the conclusions of appropriate financial arrangements. Phased deliveries are shown by quantity and leadtime for each increment, where applicable. Items for which delivery leadtime is not shown are noted in column headed "Item Description" as items to be installed in the applicable end item prior to shipment.

3. The planned source of supply for each item is expressed in the following codes:

S	(*)	Service Stocks
P	(*)	Procurement
R	(*)	Rebuild/Repair/Modification
X	(*)	Stock and procurement, e.g., initial repair parts
E	(*)	"Mimeo" major items on long supply or excess

*Availability is stated in months.

4. Condition of the defense articles shown in the "AVAILABILITY AND REMARKS" column is expressed in the following codes:

A1	–	Items to be provided in existing condition without repair, restoration or rehabilitation which may be required. Condition indicated in item description.
M	–	Articles of mixed condition (new, reworked, and rehabilitated) may be commingled when issued. Example: repair parts, ammunition, set assemblies, kits, tool sets and shop sets.
B	–	Serviceable defense articles.
O	–	Obsolete or non-standard item in an "AS IS" condition for which repair parts support may not be available from DOD.
S	–	Substitute. Suitable substitutions may be shipped for unavailable defense articles unless otherwise advised by the Purchaser.
U	–	Reworked or rehabilitated defense articles possessing original appearance insofar as practicable; including all Modification Work Orders and Engineering Change Orders as applied to such defense articles when issued but defense articles should not be considered as having had total replacement of worn parts and/or assemblies. Only parts and components not meeting US Armed Forces serviceability tolerances and standards will have been replaced, in all instances such defense articles will meet US Armed Forces standards of serviceability.

5. Training notes:

AP	–	Annual Training Program.
SP	–	Special Training designed to support purchases of US equipment.
NC	–	This offer does not constitute a commitment to provide US training.
SC	–	US Training concurrently being addressed in separate Offer and Acceptance.
NR	–	No US training is required in support of this purchase.

6. For meaning of delivery codes, see Military Assistance Program Address Directory (MAPAD).

7. The use of Offer/Release Codes "Y" and "Z" will incur a storage fee of .125% per month for shipment delays in excess of 15 days.

UNITED STATES DEPARTMENT OF DEFENSE
AMENDMENT TO OFFER AND ACCEPTANCE

(2) PURCHASER'S REFERENCE	(3) AMD'T NO.	(4) CASE IDENTIFIER	(1) PURCHASER *(Name and Address) (Zip Code)*

OFFER TO AMEND

Pursuant to the Arms Export Control Act, the Government of the United States (USG) hereby offers to amend the above case for the purchase of defense articles and defense services subject to all other terms and conditions of the original case remaining unchanged.

(5) _____ *Signature (US Dept./Agency Authorized Representative)*	(10) _____ *Countersignature (Office of the Comptroller, DSAA) (Date)*
(6) _____ Typed Name and Title	(11) _____ Typed Name and Title
(7) ADDRESS:	
(8) DATE:	
(9) THIS OFFER TO AMEND EXPIRES:	

NOTE This Amendment to Offer must be accepted not later than the date shown in block 9. Within five (5) days of its acceptance, you must so notify the Office of the Comptroller, DSAA. Otherwise, this Amendment to Offer is cancelled and retension of initial deposit by offeror pending disposition instructions shall not be deemed a waiver of such cancellation. Request prompt notification if this offer is rejected.

(12) DESCRIPTION AND REASON(S) FOR AMENDMENT:

ITEM OR REF. NO. (13)	ITEM DESCRIPTION *(Including Stock Number if applicable)* (14)	QUANTITY (15)	UNIT OF ISSUE (16)	ESTIMATED UNIT COST (17)	ESTIMATED TOTAL COST (18)	AVAILABILITY AND REMARKS (19)	OFFER RELEASE CODE (20)	DELIVERY TERM CODE (21)

	(a) PREVIOUS COST	*(b)* AMENDED COST
(22) ESTIMATED COST	$	$
(23) ESTIMATED PACKING, CRATING, AND HANDLING COSTS	$	$
(24) ESTIMATED GENERAL ADMINISTRATIVE COSTS	$	$
(25) ESTIMATED CHARGES FOR SUPPLY SUPPORT ARRANGEMENT	$	$
(26) OTHER ESTIMATED COSTS *(Specify)*	$	$
(27) ESTIMATED TOTAL COSTS	$	$

(28) TERMS

ACCEPTANCE OF AMENDMENT

(29) I am a duly authorized representative of the Government of _____ and upon behalf of said Government accept this offer to amend under the terms and conditions contained herein (30) this _____ day of _____ 19____

(31) TYPED NAME AND TITLE	(32) SIGNATURE

DD FORM 1 MAR 79 1513-1 PREVIOUS EDITIONS MAY BE USED UNTIL EXHAUSTED. PAGE 1 OF PAGES

UNITED STATES DEPARTMENT OF DEFENSE
NOTICE OF MODIFICATION OF OFFER AND ACCEPTANCE

(1) PURCHASER *(Name and Address) (ZIP Code)*		
(2) PURCHASER'S REFERENCE	(3) NOTICE NO.	(4) CASE IDENTIFIER

NOTICE OF MODIFICATION

Pursuant to the Arms Export Control Act, the Government of the United States *(USG)* hereby notifies the purchaser of modification of the above designated case. All other terms and conditions of the original case remain unchanged.

(5) SIGNATURE *(US Dept./Agency Authorized Representative)*	(9) COUNTERSIGNATURE *(Office of the Comptroller, DSAA)(Date)*
(6) Typed Name and Title	(10) Typed Name and Title
(7) ADDRESS:	
(8) DATE:	

(11) DESCRIPTION OF AND REASON(s) FOR MODIFICATION

ITEM OR REF NO. (12)	ITEM DESCRIPTION *(Including Stock Number, if applicable)* (13)	QUANTITY (14)	UNIT OF ISSUE (15)	ESTIMATED UNIT COST (16)	ESTIMATED TOTAL COST (17)	AVAILABILITY AND REMARKS (18)

RECAPITULATION OF TOTAL DD FORM 1513 *(Or 1513.1)*	*(a)* PREVIOUS COST	*(b)* REVISED COST
(19) ESTIMATED COST	$	$
(20) ESTIMATED PACKING, CRATING AND HANDLING COSTS	$	$
(21) ESTIMATED GENERAL ADMINISTRATIVE COSTS	$	$
(22) ESTIMATED CHARGES FOR SUPPLY SUPPORT ARRANGEMENT	$	$
(23) OTHER ESTIMATED COSTS *(Specify)*	$	$
(24) ESTIMATED TOTAL COSTS	$	$

ACKNOWLEDGEMENT OF RECEIPT

(25) I am a duly authorized representative of the Government of _____ and upon behalf of said Government acknowledge receipt of the notice of modification (26) this _____ day of _____ 19____

(27) TYPED NAME AND TITLE	(28) SIGNATURE

DD FORM 1 MAR 79 1513-2 PREVIOUS EDITIONS MAY BE USED UNTIL EXHAUSTED PAGE 1 OF PAGES

(29) CONTINUATION

REMARKS

1. DD Form 1513-2 is utilized to record modifications to an existing DD Form 1513 and any related amendments thereto, but only for those modifications which do not constitute a change in scope. Modifications appropriate for DD Form 1513-2 include all notifications of price increases and related changes in payment schedules.

2. Changes in scope of a DD Form 1513 require a formal amendment, utilizing DD Form 1513-1. Such changes are those which affect the type or number of major items and/or services to be provided or which significantly alter system configuration or functions. Such changes must be made by utilization of DD Form 1513-1.

3. DD Form 1513-2 does not require acceptance by the recipient country *(customer)* but merely acknowledgement of receipt. *(DD Form 1513-1 does require acceptance).*

4. All terms and conditions of an existing DD Form 1513 and any related amendments thereto not specifically noted to be modified by a DD Form 1513-2 are understood to remain unchanged and in effect.

APPENDIX D

INTERVIEWS

Introduction

One means of determining an acceptable level of price estimate accuracy (research question #1) was to interview people in the USAF and in foreign air forces who work with FMS programs. The people interviewed were Foreign Liaison Officers (FLOs) from Australia, Canada, Thailand, Venezuela, and Indonesia who are stationed at Wright-Patterson AFB. In addition, people working in the Office of Assistant to the AFLC Commander for International Logistics, the Office of Deputy for Operations/International Logistics Center, and Defense Institute of Security Assistance Management were interviewed. The object of the interviews was to learn the opinions of these people. The interviews were informal, with a list of questions used primarily as a framework to guide the discussion. We made no statistical study of the answers to the questions. For the purpose of this thesis, the most important question was one which asked the respondents to give their opinions of an acceptable level of accuracy of price estimates on defined order cases. The other questions were used to focus the interviewee on the topic and to gain some understanding of their attitudes toward FMS and problems experienced both by USAF managers and foreign customers when dealing with FMS price estimates.

Questions

These are the questions asked of the FLOs:

1. How long has your country been buying defense articles from the U.S.?

2. How would you evaluate the logistics support provided by the DOD on firm order cases?

3. What is your opinion of the accuracy of price estimates given on a DD Form 1513?

4. Assuming price estimates cannot be 100 percent accurate, how accurate should initial price estimates be? What level of accuracy is acceptable to your Air Force?

5. How does your Air Force prepare for price changes?

6. How seriously does your Air Force take the prices on the DD Form 1513?

7. If there is a change in the material value of a DD Form 1513, does this cause any problems for your Air Force?

8. How is a price change handled by your Air Force? What must be done to approve a price change?

9. What impact do price changes have on your budget?

10. Has your Air Force ever cancelled requirements because of price changes?

These questions were asked of USAF personnel:

1. How would you evaluate the logistics support provided by the USAF on defined order cases?

2. What is your opinion of the price estimates given on the DD Form 1513?

3. Assuming price estimates cannot be 100 percent accurate, what is an acceptable level of accuracy?

4. What are some factors which impact AFLC's ability to make price estimates?

5. How can AFLC improve its price estimates?

6. What can foreign purchasers do to help AFLC improve its price estimates?

Summary of Comments

In addition to helping us answer research question #1, our interviews were useful in gathering other comments relevant to price estimates on the DD Form 1513. Following is a summary of what we learned. While these comments were collected in an informal manner, they provide a glimpse into the real-world effects of AFLC price estimates and, as such, may suggest areas for further research. The comments are the personal opinions of the people interviewed and may not represent the official view of AFLC or of a foreign air force. It was not within the scope of this thesis to investigate the price estimating policies and procedures referred to by the people who were interviewed.

Therefore, this thesis did not attempt to learn whether present policies and procedures are adequate or whether they are being properly applied.

In the opinion of many of the Foreign Liaison Officers (FLOs), logistics support provided by the USAF is generally good, but to be really effective it must be coupled with preparation by the foreign purchaser and experience in working with FMS programs. The general opinion among the FLOs was that price estimates on DD Forms 1513 were low. Ideally, they would like estimates to be as accurate as possible, but could tolerate accuracies of ±10 percent of the estimate. Some purchasers are skeptical of the prices quoted on DD Forms 1513 and try to adjust the estimate using their own experience and interpretation of factors such as the inflation rate. Many try to budget for an amount greater than that shown on the DD Form 1513. The problem is that at times the entire amount requested in a budget will not be approved. Among the problems involved in having a price increase on an FMS case is the problems of dealing with bureaucratic procedures in order to get additional funds. Depending on the country involved, cancellations or reductions in quantity are sometimes made to manage price increases. However, many times this is not a practical solution since the items involved are valid requirements.

From the USAF point of view, logistics support provided on defined order cases is generally good because the terms of delivery are specified on the DD Form 1513 and most items are understood to be procurement lead time away. The quality of support provided is dependent on the Purchaser providing correct specifications and providing sufficient lead time. In giving their opinions of the accuracy of price estimates, no one thought they were completely accurate, but there was no consensus as to whether the tendency was to over- or underestimate. All agreed that ±10 percent of the established price was an acceptable level of accuracy. Among the factors impacting AFLC's ability to estimate prices, these were the most significant:

1. Inflation varies with the items and technologies involved, but AFLC uses a uniform rate.

2. AFLC often does not have a good idea of the contract cost until after the DD Form 1513 is implemented. In fact, in many cases policy does not allow AFLC to get a contractor's estimate before case implementation.

3. Special factors, such as tooling-up costs, may not be known at the time of the price estimate.

4. Pricing data systems are not always current. There are also problems with the software and hardware used and with the interfaces between various systems.

5. Price estimates are often not checked for reasonableness or human error; in other words, there is little quality control.

6. AFLC doesn't use available data now in the system, including procurement history and price trends.

7. Inflation factors used are not always accurate and may be improperly applied.

8. The people making the price estimates are not experts in this field; this problem is compounded by the rudimentary methods of price estimation used.

When asked what could be done to provide better price estimates, it was suggested that spending more time or providing more people to do this work would make the estimates more reliable, but the need for greater accuracy and cost of attaining it were questioned. Many of the respondents felt that given a choice, many foreign purchasers would prefer that we overestimate on the initial price estimate so they wouldn't have to go back through their budget channels for additional funds. All agreed that there isn't very much a foreign customer can do to get a better estimate on their DD Forms 1513.

APPENDIX E

SAMPLE DATA

CASE-NO	CT	TYP	SEQ	SRCE	EC	TDV	ACC
1	NE	L	DR	SA	305.	306.	1.003
2	NE	V	AT	SA	2201.	96.	22.927
3	NN	V	AB	SM	1465.	1197.	1.224
4	PE	A	BC	OO	265091.	121995.	2.181
5	PE	C	BN	OO	475.	357.	1.331
6	PE	M	AC	SA	6547.	3542.	1.848
7	PI	L	AU	SA	44135.	44136.	1.000
8	PI	L	AY	OO	134857.	118827.	1.133
9	PI	L	AX	SA	417.	417.	1.000
10	PK	C	AT	OO	10751.	9241.	1.164
11	PK	L	JS	SA	2655.	1980.	1.341
12	PK	L	KC	WR	79435.	57220.	1.388
13	PK	M	BW	SA	80300.	100513.	.804
14	PK	M	BY	SA	51545.	52770.	.621
15	PT	R	RU	IL	427.	427.	1.000
16	KS	M	RF	OC	597810.	669152.	.893
17	KN	B	SR	IL	1113.	279.	3.989
18	KN	B	TN	SA	2500.	4300.	.581
19	KN	B	UN	WR	595.	335.	1.776
20	KN	B	US	WR	595.	506.	1.354
21	KN	B	UT	WR	5730.	4800.	1.204
22	KN	B	UW	SA	1298.	1288.	1.000
23	KN	B	VW	IL	149.	129.	1.155
24	KN	B	XP	IL	10541.	9252.	1.159
25	KN	B	XS	IL	159.	132.	1.137
26	KN	P	AR	OT	1500.	1500.	1.000
27	MO	L	DG	OT	39250.	38250.	1.000
28	NE	A	DN	OO	451.	450.	1.000
29	NE	C	AT	OO	855.	589.	1.452
30	NE	L	CX	SA	8005.	3397.	2.357
31	AT	A	EX	OO	22223.	19220.	1.157
32	AT	A	EW	OO	25971.	24360.	1.107

SAMPLE CASE DATA

33	AT	A	ET	00	5321.	1654.	4.184
34	AT	A	EM	00	13501.	13536.	.997
35	AT	A	EG	00	5001.	6000.	1.000
36	AT	A	DZ	00	5315.	5477.	.971
37	AR	C	CA	00	259.	219.	1.183
38	AR	C	BX	00	1104.	960.	1.150
39	EC	C	AC	00	1725.	3919.	.441
40	EC	A	AE	00	571.	582.	.981
41	AT	L	DJ	00	2135.	1696.	1.259
42	AT	-	DX	OC	591.	691.	1.000
43	AT	G	BA	OT	3971.	3342.	1.158
44	IS	C	AY	00	902.	792.	1.139
45	BR	G	AH	OT	544.	544.	1.000
46	HO	J	AA	OT	2954.	2954.	1.000
47	CN	B	EM	SA	124312.	117888.	1.054
48	AT	C	AY	00	30232.	20418.	1.481
49	EC	B	AA	OT	53286.	53285.	1.000
50	AT	C	AZ	00	28258.	42626.	.663
51	GY	G	HT	00	6400.	12164.	.526
52	IN	L	AN	SM	13857.	13926.	.996
53	DE	L	CG	00	1155.	1080.	1.079
54	DE	H	AC	WR	57370.	54306.	.901
55	ET	L	AZ	SA	45752.	1162.	39.373
56	GY	L	FN	SA	88135.	90435.	1.095
57	AT	C	BT	00	2745.	447.	6.141
58	GY	C	AG	00	19451.	16550.	1.176
59	GY	M	CF	SM	175000.	168781.	1.037
60	AT	L	EE	SM	45203.	23285.	1.984
61	PT	L	BX	SA	15803.	10671.	1.575
62	SP	A	BH	00	455.	456.	1.000
63	SP	A	BJ	00	123.	128.	1.000
64	SP	A	BK	00	903.	1000.	.930
65	SP	A	BL	00	348.	297.	1.172
66	SP	C	AU	00	2984.	2966.	1.007

SAMPLE CASE DATA--Continued

57	SR	A	BF	OO	7057224.	7267127.	.971
58	SR	L	GA	OO	75211.	46029.	1.656
59	SW	A	AK	OO	4600.	4000.	1.000
70	TH	A	AM	OO	20934.	17842.	1.177
71	TU	L	AC	SA	29704.	25735.	1.074
72	TU	L	AD	SA	56955.	56955.	1.000
73	TU	-	AH	SA	92713.	92710.	1.000
74	TW	C	AJ	OO	173527.	115710.	1.483
75	TW	L	RN	SA	955.	759.	1.260
76	DE	A	DA	OO	450.	450.	1.000
77	IS	A	EX	OO	13125.	13125.	1.000
78	CN	A	KD	OO	1329.	1329.	.939
79	CN	A	KE	WR	383233.	383290.	1.000
80	DE	G	AZ	OT	130000.	112431.	1.156
81	CN	C	AZ	OO	123435.	55218.	1.893
82	CN	B	FE	IL	539.	563.	.957
83	GY	G	HK	SM	220000.	201428.	1.092
84	BR	G	AE	OT	548.	470.	1.379
85	AR	A	BB	OO	33824.	33862.	.999
86	CN	A	JS	OO	42697.	37128.	1.150
87	GY	B	AO	WR	2277.	1282.	1.776
88	CN	B	EW	IL	813.	650.	1.251
89	CN	B	EY	IL	4355.	4007.	1.087
90	PR	P	BK	IL	1012.	1138.	.889
91	AT	C	BJ	OO	1179.	3249.	.363
92	BR	G	AC	OT	1512.	1509.	1.068
93	CN	A	JH	OO	5079.	6078.	1.000
94	CN	A	JN	OO	101975.	86599.	1.167
95	DE	C	AJ	OO	5530.	4050.	1.390
96	EC	P	AB	OT	934.	934.	1.000
97	FR	P	BL	OT	239.	238.	1.004
98	IS	L	JT	WR	377.	341.	1.106
99	JA	P	BJ	OT	1186.	1186.	1.000
100	KN	B	SU	SA	4535.	2666.	1.701

SAMPLE CASE DATA--Continued

101	KN	B	TP	SM	531.	553.	.960
102	KN	B	TV	WR	124.	124.	1.000
103	KN	B	UM	SA	355.	282.	1.294
104	KN	B	UY	IL	883.	706.	1.251
105	KN	B	VA	OO	134.	132.	1.015
106	BR	A	CB	WR	10150.	10150.	1.000
107	AR	C	BW	OO	153.	121.	1.264
108	AT	M	AV	OT	12080.	1445.	8.360
109	AT	M	AW	OC	1345.	710.	1.896
110	GP	L	VF	OT	6960.	6960.	1.000
111	AT	M	AN	SM	45603.	39933.	1.137
112	AR	L	DA	OT	444.	444.	1.000
113	BR	L	CA	WR	23400.	23400.	1.000
114	BR	L	BJ	SM	50000.	50000.	1.000
115	BE	L	EF	OO	237.	288.	1.031
116	IT	L	HT	WR	225337.	212805.	1.059
117	JA	L	CN	WR	32134.	45991.	2.003
118	JO	P	AZ	OT	940.	940.	1.000
119	KS	L	CE	OT	52932.	52932.	1.000
120	KS	M	AZ	OO	122523.	122529.	1.000
121	KN	B	VB	SM	416.	395.	1.053
122	KN	B	WE	IL	903.	768.	1.184
123	KN	V	AF	SM	3561.	610.	5.738
124	MF	L	AP	OC	39823.	8170.	4.849
125	SR	L	FC	SA	39347.	43778.	.899
126	PE	C	BH	OO	514.	534.	1.150
127	NO	C	BU	OO	172.	202.	.851
128	NO	A	DA	OO	390383.	394742.	.989
129	TW	A	BR	OO	570873.	405638.	1.407
130	TW	A	BT	OO	12364.	15716.	.772
131	TW	A	BU	OO	72674.	24230.	2.999
132	CN	A	KU	OO	519.	433.	1.199
133	AT	B	CD	IL	270.	305.	.885
134	AT	A	FD	OO	25045.	20998.	1.133

SAMPLE CASE DATA--Continued

135	AT	A	FA	00	451.	396.	1.164
136	ET	L	AH	00	119853.	104089.	1.151
137	AU	C	AA	00	333.	290.	1.148
138	GY	G	HV	OT	215135.	158497.	1.358
139	GY	G	JJ	OT	190501.	171052.	1.114
140	GY	G	JK	00	25374.	13125.	1.971
141	GR	C	AY	00	28807.	14256.	2.021
142	DE	A	CW	00	381.	328.	1.162
143	CM	Y	AA	OC	73300.	73300.	1.000
144	CN	V	BH	WR	117.	312.	.375
145	CN	M	AY	SM	14478.	17610.	.822
146	CN	M	AU	00	44742.	20887.	2.142
147	CN	L	HH	OT	1344070.	1344170.	1.000
148	CN	L	HC	WR	2913.	2873.	1.016
149	CN	L	GM	WR	42193.	31608.	1.335
150	CN	R	ES	IL	115.	101.	1.149
151	GR	A	HA	00	855.	545.	1.571
152	IS	C	BA	00	4745.	4127.	1.150
153	AT	L	EK	SM	9087.	9087.	1.000

SAMPLE CASE DATA--Continued

154	IN	L	AP	SA	7501.	7600.	1.000
155	IR	H	AS	OT	1374158.	1374168.	1.000
156	IR	L	UC	SA	299485.	277100.	1.081
157	IR	L	UG	OC	5815.	5817.	1.199
158	IR	R	AV	OT	107309.	78970.	1.366
159	IR	A	RM	OO	1044.	1392.	.750
160	IR	H	AP	OT	462893.	462893.	1.000
161	IR	H	AT	OT	234253.	234258.	1.000
162	BE	L	EA	SA	18840.	18840.	1.000
163	BE	C	AL	OO	3401.	2796.	1.216
164	GY	L	FE	WR	195.	255.	.769
165	CN	A	JR	OO	21593.	21593.	1.000
166	TW	L	RY	SA	30951.	26580.	1.165
167	UK	C	AK	OO	1942.	1266.	1.534
168	UK	L	CC	OT	437.	840.	.520
169	UK	L	CG	OT	3556.	1315.	2.704
170	NZ	C	AC	OO	193.	161.	1.118
171	IR	L	UE	OC	35521.	35770.	.996
172	PA	B	AF	IL	323.	266.	1.205
173	AT	W	AG	WR	158935.	158996.	1.000
174	KS	B	AC	SA	338.	232.	1.457
175	JA	L	DL	OO	158000.	106790.	1.573
176	JA	A	BF	OO	3027.	3166.	2.851

SAMPLE CASE DATA--Continued

CASE-NO	CT	TYP	SEQ	SRCE	EUC	DUC	ACC
1	CN	B	EY	IL	43.55	40.16	1.086
2	CN	B	EW	IL	15.25	13.00	1.250
3	CN	B	FE	IL	23.29	36.21	.643
4	CN	A	KD	00	35.00	35.00	1.000
5	SP	A	BJ	00	12.30	12.80	1.000
6	SP	C	AU	00	15.58	13.96	1.116
7	PE	A	BC	00	12.41	8.45	1.469
8	PE	C	BN	00	19.77	14.86	1.330
9	KN	B	UW	SA	45.59	45.69	1.000
10	KN	B	XS	IL	14.32	11.94	1.199
11	IR	L	UE	OC	65.00	66.00	1.000
12	IR	L	UE	OC	65.00	66.00	1.000
13	IR	L	UE	OC	65.00	66.00	1.000
14	IR	L	UE	OC	65.00	66.00	1.000
15	IR	L	UE	OC	65.00	66.00	1.000
16	IR	B	AV	OT	51.00	51.00	1.000
17	PA	B	AF	IL	24.75	21.52	1.150
18	PA	B	AF	IL	29.14	29.14	1.000
19	PA	B	AF	IL	33.42	33.42	1.000
20	PA	B	AF	IL	31.79	31.79	1.000
21	NO	A	DA	00	33.00	34.43	.961
22	NO	A	DA	00	29.81	25.29	1.179
23	NO	C	BU	00	14.26	16.86	.846
24	PE	C	BH	00	37.54	32.73	1.150
25	PE	C	BH	00	43.33	37.68	1.150
26	MF	L	AP	OC	43.55	43.00	1.015
27	KN	V	AF	SM	50.10	8.55	5.848

SAMPLE ITEM DATA

28	KN	B	VB	SM	41.54	39.49	1.052
29	CN	V	BH	WR	11.55	31.20	.373
30	CN	L	HC	WR	19.30	15.40	1.286
31	KN	B	VA	OO	12.03	11.69	1.029
32	KN	B	VA	OO	10.30	10.30	1.000
33	KN	B	UY	IL	58.35	47.08	1.250
34	KN	B	UM	SA	16.53	12.84	1.292
35	KN	B	TV	WR	31.00	31.00	1.000
36	KN	B	TP	SM	37.34	39.49	.961
37	KN	B	SU	SA	59.35	51.35	1.343
38	DE	C	AJ	OO	29.15	20.25	1.390
39	BE	L	EA	SA	35.00	35.00	1.000
40	CN	A	JR	OO	12.41	12.41	1.000
41	TW	A	BU	OO	10.15	9.53	1.065
42	TW	A	BU	OO	12.41	12.41	1.000
43	TW	A	BT	OO	38.31	40.64	.772
44	KN	B	WE	IL	39.49	38.39	1.029
45	SR	L	FC	SA	14.25	17.33	.823
46	SR	L	FC	SA	38.03	31.91	1.192
47	SR	L	FC	SA	51.30	71.95	.860
48	SR	L	FC	SA	11.55	8.44	1.368
49	SR	-	FC	SA	25.32	23.08	1.156
50	SR	L	FC	SA	27.28	30.16	.905
51	AT	B	CD	IL	27.30	10.37	2.681
52	GY	L	FE	WR	65.29	85.04	.768
53	BE	C	AL	OO	23.18	20.88	1.105
54	BE	C	AL	OO	39.33	31.69	1.249

SAMPLE ITEM DATA--Continued

55	IS	C	BA	00	45.48	39.55	1.150
56	IS	C	BA	00	41.20	35.83	1.150
57	GR	A	HA	00	27.35	77.91	.359
58	AR	C	CA	00	21.52	18.25	1.179
59	AT	A	DZ	00	17.30	18.44	.971
60	AT	C	BJ	00	21.63	21.63	1.000
61	AT	C	BJ	00	19.50	19.50	1.000
62	AT	A	ET	00	13.31	3.18	4.186
63	IS	L	JT	WR	13.10	13.00	1.000
64	IS	L	JT	WR	37.32	37.32	1.000
65	IS	L	JT	WR	11.38	10.73	1.061
66	IS	L	JT	WR	64.23	47.90	1.341
67	IS	L	JT	WR	25.56	26.56	1.000
68	IS	L	JT	WR	18.97	18.97	1.000
69	CN	L	GM	WR	40.50	30.29	1.337
70	AU	C	AA	00	41.51	36.17	1.150
71	ET	L	AZ	SA	44.73	35.82	1.249
72	IS	C	AY	00	14.74	14.74	1.000
73	AT	C	AY	00	10.53	10.53	1.000
74	AT	C	AY	00	48.89	48.89	1.000
75	NZ	C	AC	00	11.22	10.06	1.115
76	CN	B	EM	SA	42.46	38.60	1.100
77	CN	B	EM	SA	42.45	41.30	1.028
78	CN	B	EM	SA	39.82	41.70	.955
79	CN	B	EM	SA	49.34	52.30	.955
80	CN	B	EM	SA	49.34	45.58	1.096
81	TW	A	BR	00	13.80	20.00	.690

SAMPLE ITEM DATA--Continued

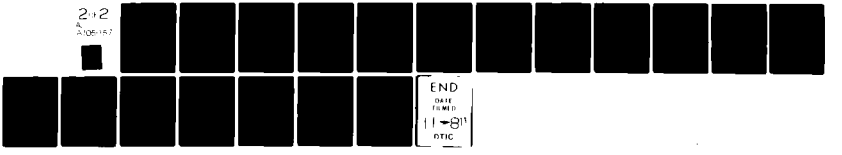
82	KN	B	XP	IL	35.47	30.84	1.150
83	CN	A	JH	OO	10.72	10.72	1.000
84	CN	C	AZ	OO	58.25	37.86	1.803
85	CN	C	AZ	OO	37.54	32.73	1.150
86	CN	C	AZ	OO	43.13	27.03	1.598
87	CN	C	AZ	OO	43.96	20.88	2.101
88	MO	L	DG	OT	51.00	51.00	1.000
89	MO	L	DG	OT	51.00	51.00	1.000
90	MO	L	DG	OT	51.00	51.00	1.000
91	MO	L	DG	OT	51.00	51.00	1.000
92	MO	L	DG	OT	51.00	51.00	1.000
93	MO	L	DG	OT	51.00	51.00	1.000
94	MO	L	DG	OT	51.00	51.00	1.000
95	MO	L	DG	OT	51.00	51.00	1.000
96	IR	B	AV	OT	51.00	51.00	1.000
97	IR	B	AV	OT	51.00	51.00	1.000
98	IR	B	AV	OT	51.00	51.00	1.000
99	IR	B	AV	OT	51.00	51.00	1.000
100	IR	B	AV	OT	51.00	51.00	1.000
101	CN	A	JN	OO	40.79	40.79	1.000
102	AT	C	BJ	OO	19.30	212.00	.089
103	CN	B	EM	SA	41.75	41.75	1.000
104	CN	L	GM	WR	39.18	35.33	1.109
105	AT	L	DJ	OO	36.52	31.35	1.168
106	CN	B	EM	SA	35.37	20.04	1.809
107	AT	A	EM	OO	30.00	30.08	.997
108	CN	B	FE	IL	44.05	38.30	1.150

SAMPLE ITEM DATA--Continued

APPENDIX F

CROSS-TABULATION OF SAMPLES: SOURCE BY CATEGORY

AD-A105 057 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL--ETC F/G 5/3
AN ANALYSIS OF THE ACCURACY OF PRICE ESTIMATES FOR FOREIGN MILI--ETC(U)
JUN 81 K A DUS, K P KNAPP
UNCLASSIFIED AFIT-LSSR-15-81 NL



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11-81
DTIC

	COUNT / ROW PCT / COL PCT / TOT PCT	A 1.	R 2.	C 3.	G 4.	H 5.	L 6.	M 7.	P 8.	V 9.	OT 10.	ROW TOTAL
DO	1.	35	1	25	2	0	7	2	0	0	0	72
		48.6	1.4	34.7	2.8	0	9.7	2.8	0	0	0	40.9
		94.6	3.4	100.0	20.0	0	14.9	18.2	0	0	0	
		19.9	.6	14.2	1.1	0	4.0	1.1	0	0	0	
DC	2.	0	0	0	0	0	4	2	0	0	1	7
		0	0	0	0	0	57.1	28.6	0	0	14.3	4.0
		0	0	0	0	0	8.5	18.2	0	0	33.3	
		0	0	0	0	0	2.3	1.1	0	0	.6	
WR	3.	2	5	0	0	1	8	0	0	1	1	18
		11.1	27.8	0	0	5.6	44.4	0	0	5.6	5.6	10.2
		5.4	17.2	0	0	25.0	17.0	0	0	25.0	33.3	
		1.1	2.8	0	0	.6	4.5	0	0	.6	.6	
SM	4.	0	2	0	1	0	4	3	0	2	0	12
		0	16.7	0	8.3	0	33.3	25.0	0	16.7	0	6.8
		0	6.9	0	10.0	0	8.5	27.3	0	50.0	0	
		0	1.1	0	.6	0	2.3	1.7	0	1.1	0	
SA	5.	0	6	0	0	0	17	3	0	1	0	27
		0	22.2	0	0	0	63.0	11.1	0	3.7	0	15.3
		0	20.7	0	0	0	36.2	27.3	0	25.0	0	
		0	3.4	0	0	0	9.7	1.7	0	.6	0	
IL	6.	0	13	0	0	0	0	0	1	0	0	14
		0	92.9	0	0	0	0	0	7.1	0	0	8.0
		0	44.8	0	0	0	0	0	16.7	0	0	
		0	7.4	0	0	0	0	0	.5	0	0	
OT	7.	0	2	0	7	3	7	1	5	0	1	26
		0	7.7	0	26.9	11.5	26.9	3.8	19.2	0	3.8	14.8
		0	6.9	0	70.0	75.0	14.9	9.1	83.3	0	33.3	
		0	1.1	0	4.0	1.7	4.0	.6	2.8	0	.6	
	COLUMN TOTAL	37	29	25	10	4	47	11	6	4	3	176
		21.0	16.5	14.2	5.7	2.3	26.7	6.3	3.4	2.3	1.7	100.0

CROSS-TABULATION OF CASES

		TYPX										ROW TOTAL
	COUNT ROW PCT COL PCT TOT PCT	IA		B		C		L		V		
			1.		2.		3.		6.		9.	
SRCEX												
	1.		16		2		23		1		0	42
OO			38.1		4.8		54.8		2.4		0	38.9
			1.2.9		5.9		100.0		3.0		0	
			14.8		1.9		21.3		.9		0	
	2.		0		0		0		6		0	6
OC			0		0		0		100.0		0	5.6
			0		0		0		18.2		0	
			0		0		0		5.6		0	
	3.		0		1		0		11		1	12
MR			0		8.3		0		83.3		9.3	11.1
			0		2.9		0		30.3		50.0	
			0		.9		0		9.3		.9	
	4.		0		2		0		0		1	3
SM			0		66.7		0		0		33.3	2.8
			0		5.9		0		0		50.0	
			0		1.9		0		0		.9	
	5.		0		10		0		8		0	18
SA			0		55.6		0		44.4		0	16.7
			0		29.4		0		24.2		0	
			0		9.3		0		7.4		0	
	6.		0		13		0		0		0	13
IL			0		100.0		0		0		0	12.0
			0		38.2		0		0		0	
			0		12.0		0		0		0	
	7.		0		6		0		8		0	14
OT			0		42.9		0		57.1		0	13.0
			0		17.6		0		24.2		0	
			0		5.6		0		7.4		0	
	COLUMN TOTAL		16 14.8		34 31.5		23 21.3		33 30.6		2 1.9	108 100.0

CROSS-TABULATION OF ITEMS

APPENDIX G

BREAKDOWN OF SAMPLE DATA

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ACC
BROKEN DOWN BY SRCEX

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
FOR ENTIRE POPULATION			232.8489	1.5639	3.4159	11.6752	(	176)
SRCEX	1	OO	95.5146	1.3260	.8050	.6496	(	72)
SRCEX	2	OC	11.3233	1.6890	1.4344	2.0574	(	7)
SRCEX	3	MR	21.3620	1.1701	.3903	.1523	(	18)
SRCEX	4	SM	15.1034	1.5486	1.3633	1.8587	(	12)
SRCEX	5	SA	91.7090	3.3966	8.3261	69.3234	(	27)
SRCEX	6	IL	13.3489	1.3106	.7809	.6099	(	14)
SRCEX	7	OT	35.1875	1.3918	1.4667	2.1513	(	26)

TOTAL CASES = 176

BREAKDOWN OF CASES BY SOURCE

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ACC
BROKEN DOWN BY TYPX

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
FOR ENTIRE POPULATION			292.8489	1.6639	3.4163	11.6752	(	176)
TYPX	1	A	47.1697	1.2749	.6884	.4739	(	37)
TYPX	2	B	37.0838	1.2777	.5827	.3395	(	29)
TYPX	3	C	34.3972	1.3963	1.0555	1.1142	(	25)
TYPX	4	G	11.9223	1.1822	.3625	.1314	(	10)
TYPX	5	H	3.9515	.9754	.9493	.0024	(	4)
TYPX	6	L	93.3175	2.0655	5.5954	31.3202	(	47)
TYPX	7	M	23.9206	1.8928	2.1995	4.8380	(	11)
TYPX	8	P	5.8935	.9822	.3456	.0021	(	6)
TYPX	9	V	30.2637	7.5659	10.5077	110.4128	(	4)
TYPX	10	OT	3.0000	1.0000	0	0	(	3)

TOTAL CASES = 175

BREAKDOWN OF CASES BY CATEGORY

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ACC
BROKEN DOWN BY SRCEX

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			124.5364	1.1531	.6169	.3806	(108)
SRCEX	1	OO	49.5666	1.1587	.5745	.3300	(42)
SRCEX	2	OC	5.0151	1.0025	.0062	.0000	(6)
SRCEX	3	WR	12.2744	1.0229	.2641	.0698	(12)
SRCEX	4	SW	7.8606	2.6202	2.7957	7.8158	(3)
SRCEX	5	SA	20.1315	1.1184	.2347	.0551	(18)
SRCEX	6	IL	15.5681	1.1991	.4724	.2232	(13)
SRCEX	7	OT	14.0000	1.0000	0	0	(14)

TOTAL CASES = 198

BREAKDOWN OF ITEMS BY SOURCE

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ACC
BROKEN DOWN BY TYPX

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			124.5364	1.1531	.5159	.3806	(108)
TYPX	1	A	13.6478	1.1655	.8377	.7018	(16)
TYPX	2	B	38.1983	1.1235	.3278	.1075	(34)
TYPX	3	C	25.8216	1.1662	.3858	.1345	(23)
TYPX	5	L	34.6473	1.0499	.1425	.0203	(33)
TYPX	9	V	5.2214	3.1167	3.8711	14.9854	(2)

TOTAL CASES = 139

BREAKDOWN OF ITEMS BY CATEGORY

APPENDIX H

CALCULATIONS FOR TEST OF HYPOTHESIS

H_0: $\mu = 1$; The mean accuracy equals 1;

H_1: $\mu \neq 1$; The mean accuracy does not equal 1.

The decision rule is:

If $A_1 \leq \bar{x} \leq A_2$, conclude H_0 ($\mu = 1$);

If $\bar{x} < A_1$ or $\bar{x} > A_2$, conclude H_1 ($\mu \neq 1$).

where,

$A_1 = 1 + z(\alpha/2)s(\bar{x})$;

$A_2 = 1 + z(1-\alpha/2)s(\bar{x})$.

For all calculations,

$\alpha = .10$ and $z(\alpha/2) = -1.645$, $z(1-\alpha/2) = 1.645$.

Cases; Overall:

$s(\bar{x}) = .258$, $\bar{x} = 1.664$, $n = 176$;

$A_1 = 1 - (1.645)(.258) = .576$;

$A_2 = 1 + (1.645)(.258) = 1.424$;

$\underline{.576 \leq \bar{x} \leq 1.424}$; conclude H_1.

β: $z = \dfrac{\bar{x} - \mu}{s(\bar{x})} = \dfrac{1.424 - 1.664}{.258} = -.9302$;

$z(\beta) = -.9302$; $\underline{\beta = 1 - .8238 = .1762}$.

Cases; Source, Ogden (00):

$s(\bar{x}) = .095$, $\bar{x} = 1.328$, $n = 72$;

$A_{1,2} = 1 \pm (1.645)(.095) = 1 \pm .156$;

$\underline{.844 \leq \bar{x} \leq 1.156}$; conclude H_1.

Cases; Category, A:

$s(\bar{x}) = .113,\ \bar{x} = 1.275,\ n = 37;$

$A_{1,2} = 1 \pm (1.645)(.113) = 1 \pm (.186);$

$\underline{.814 \leq \bar{x} \leq 1.186}$; conclude H_1.

Cases; Category, L:

$s(\bar{x}) = .816,\ \bar{x} = 2.086,\ n = 47;$

$A_{1,2} = 1 \pm (1.645)(.816) = 1 \pm 1.342;$

$\underline{-.342 \leq \bar{x} \leq 2.342}$; conclude H_0.

Items; Overall:

$s(\bar{x}) = .059,\ \bar{x} = 1.153,\ n = 108;$

$A_{1,2} = 1 \pm (1.645)(.059) = 1 \pm .097;$

$\underline{.903 \leq \bar{x} \leq 1.097}$; conclude H_1.

β: $z = \dfrac{\bar{x} - \mu}{s(\bar{x})} = \dfrac{1.097 - 1.153}{.059}$

$z(\beta) = -.9492;$

$\beta = \underline{1 - .8289 = .1711}$.

Items; Source, Ogden (00):

$s(\bar{x}) = .089,\ \bar{x} = 1.159,\ n = 42;$

$A_{1,2} = 1 \pm (1.645)(.089) = 1 \pm .146;$

$\underline{.854 \leq \bar{x} \leq 1.146}$; conclude H_1.

Items; Category, B:

$s(\bar{x}) = .056$, $\bar{\bar{x}} = 1.123$, $n = 34$;

$A_{1,2} = 1 \pm (1.645)(.056) = 1 \pm .092$;

$\underline{.908 \leq \bar{\bar{x}} \leq 1.092}$; conclude H_1.

Items; Category, L:

$s(\bar{x}) = .025$, $\bar{\bar{x}} = 1.050$, $n = 33$;

$A_{1,2} = 1 \pm (1.645)(.025) = 1 \pm .041$;

$\underline{.959 \leq \bar{\bar{x}} \leq 1.041}$; conclude H_1.

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Karen Dus was born in Buffalo, New York. Her family later moved to Cleveland, Ohio where she attended the Cleveland State University and earned a Bachelor of Science degree in Elementary Education. In 1976, she began working for the Air Force Logistics Command (AFLC) as an FMS case manager. Upon leaving AFIT, she will be working at HQ AFLC, in the Directorate of Security Assistance Management and Policy, Resources Division (HQ AFLC/MIYP). Karen shares her home with Spot and Boots--two lovely cats who demonstrate little or no understanding of Foreign Military Sales.

First Lieutenant Kenneth P. Knapp is a native of Johnstown, Pennsylvania. He graduated from the United States Air Force Academy in 1978 with a Bachelor of Science degree in International Affairs. Prior to attending AFIT, Lieutenant Knapp was stationed at McConnell AFB, Kansas, where he was Chief of the Re-Entry Vehicle Maintenance Branch of the 381 Missile Maintenance Squadron. After graduation he will serve as a Weapons Staff Officer in the Nuclear Weapons Branch, Headquarters AFLC, Wright-Patterson AFB, Ohio. Lieutenant Knapp is married to the former Miss Mary Jo Weatherly and they have one son, Kenneth John.