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THE FEASIBILITY OF ESTABLISHING "SHOULD COST" AS A PERMANENT AIR FORCE CONTRACT MANAGEMENT DIVISION/AIR FORCE PROCUREMENT FUNCTION

Ralph E. Weida, et al

Air Force Institute of Technology
Wright-Patterson Air Force Base, Ohio

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The defense procurement environment has changed significantly during the past several years due to public and congressional criticism regarding large overruns and cost growth. In this respect the Air Force is experimenting with a specialized application of cost analysis called the "should cost" concept. The feasible location of a permanent application of the concept was examined--the AFCMD/AFPRO organization. The desirability of establishing an on-going capability in the AFCMD/AFPRO setting was concluded contingent upon the continued top level management's support of the concept. In addition, manpower increases and training programs would be needed to make the permanent application feasible and desirable.

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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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September 1972

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CHAPTER I

INTRODUCTION

Problem Statement

During the past several years, public and congressional criticism regarding large overruns and cost growth on many military programs has caused the Department of Defense (DOD) and the procuring services to take a closer look at their methods and procedures for procurement of large weapon systems. As a result, the defense procurement environment has changed significantly. One such change is the re-emphasis upon improved cost control in all areas of the weapons system acquisition process. In this respect, each of the services is experimenting with a specialized application of cost analysis called the "Should Cost" concept. Secretary Whittacker, the Assistant Secretary of the Air Force for Installations and Logistics, has formed the Air Force Systems Procurement Council which has as one of its selected items for development, the "Should Cost" Action Program (SCAP). The objective of SCAP is to assess the merits of "should cost" reviews, and if proven effective

establish an internal, on-going capability within the Air Force. (31:40) Initial research on the subject indicates that the concept will soon be fully accepted and permanently instituted. There still remains, however, the question of "where" and "how" to establish a permanent "should cost" function in order to best serve the needs of the Air Force weapons system acquisition process. The permanent application; i.e., the "where" and the "how," will be the underlying issue of this thesis.

Background

Today's defense environment is being forced into a somewhat paradoxical situation. Since the mid-1960s, rising inflation and the need for increasingly sophisticated weapon systems have considerably increased defense costs. At the same time there has been a growing demand for increased funding for important domestic programs. The Secretary of Defense has stated that for the FY 68-72 time period, defense spending has been decreased by a total of $23.9 billion. In the same period, other federal spending will have increased by $36.4 billion, and state and local government spending will have gone up some $29 billion. (25:21) At a time when weapon systems costs are going up and budgetary funds are being cut, the services are coming under greater

pressures to improve cost control in all areas of systems acquisition and management.

Historically, the services have used past experience and actual cost data from earlier contracts to estimate future costs of proposed weapon systems. Advancing technology, rising inflation, variations in defense priorities and a host of other factors which do not lend themselves to accurate forecasting, have produced a long record of over-optimistic cost estimates. Proponents of the "should cost" concept maintain that one of the most significant reasons for these underestimates of cost is inefficient operations and methods, a factor which heretofore has been regarded by the DOD and the services as an accepted part of the cost of doing business.

The concept of "should cost" is not particularly new; its recent specialized use is new, however. ASPR 3-807.2 (C)(1) defines "cost analysis" in terms of what the contractor's proposed contract efforts should cost, assuming reasonable economy and efficiency. (36) The most widely used and concise definition of the term "should cost" comes from the Comptroller General's May 1970 Report to the Congress, which states:

> The should-cost approach attempts to determine the amount that weapons systems or products <u>ought</u>

> to cost given attainable efficiency and economy of operation. (23:5)

It should be noted that the ASPR definition for cost analysis and the definition for "should cost," though sounding quite similar, have altogether different purposes. Traditionally, cost analysis has been accomplished under a "will cost" framework. Inefficient and uneconomical practices by the contractor were recognized, but accepted as part of the cost of contracting with that particular firm. The government, in effect, perpetuated these inefficiences by paying a higher price for that contractor's products or services. "Should cost," on the other hand, is an attempt to promote the true ASPR objective--that of determining ". . . what performance of the contract should cost, assuming reasonable economy and efficiency." (35:I-5)

The effectiveness of the "should cost" concept has been recognized in private industry for some time. A well-known nationwide consumer goods chain, for example, has used this technique for many years with considerable success. (35:I-5) Use of this technique has enabled them to establish fair and reasonable pricing from their suppliers. At the same time, the suppliers are provided with incentives toward more efficient methods of operation in order to retain the large orders of the retail chain.

All of the services have made use of the "should cost" approach to cost analysis, primarily through specialized ad hoc teams. Probably the most publicized of these special team efforts was the Navy Pratt and Whitney aircraft engine study in 1967, headed by Mr. Gordon Rule. This study was conducted over a three month period, utilizing some forty specialists and costing approximately $300,000. Their efforts resulted in a projected savings of over $100 million. (23:11) Since that time the Navy has conducted other similar studies, as well as the Army and the Air Force. Preliminary analyses of the results indicate that significant cost savings and long term management improvements will be realized from each of the efforts. The General Accounting Office (GAO) has also studied the "should cost" review technique, and in their reports published in May 1970 and February 1971, they found that measurable savings to the government through more efficient contractor operations amounted to some $6 million for the four contractors who were evaluated. (22:8) The GAO has continued to emphasize that the greatest benefit can be achieved if the "should cost" review is conducted by the contracting service as part of the pre-award analysis of contractor proposals.

Besides the "should cost" concept, some other interesting outgrowths from the changes taking place in the

defense procurement environment have been the DOD Resource Management Systems (RMS), which includes Selected Acquisition Information Management (SAIMS) and its sub-area, Cost/Schedule Control System Criteria (C/SCSC) and Probability of Incurring Estimated Cost (PIECOST). All of these systems, though having differing individual purposes, provide valuable information toward the attainment of the government's common goal in major procurements--reasonable quality at a reasonable cost. The word "reasonable" is highlighted here because all of the above concepts rely on judgmental precepts as their underlying rationale. Judgment and preciseness, therefore, may only be combined to the extent that reasonableness is maintained.

While SAIMS, i.e., C/SCSC, is a performance measuring tool which provides a means of measuring the contractor's performance during the contract life, PIECOST attempts to forecast the contractor's related overhead expenses through the use of statistical relationships between cost and the factors that cause cost incurrence. "Should cost," on the other hand, has a different role. "Should cost" is essentially a pre-negotiation analysis of a contractor's cost or pricing data in order to judge the predicted cost of a contract, assuming reasonable economy and efficiency. The

"should cost" concept is a before-the-fact activity, but its credibility rests to a great degree upon empirical data. It appears, therefore, that C/SCSC and PIECOST may have a definite complementary relationship to the emerging concept of "should cost."

The Air Force Contract Management Division (AFCMD) presently has Air Force Plant Representative Officers (AFPROs) located at some nineteen major defense contractor plants. Each AFPRO employs specialists in the areas of contracting, price analysis, production management and industrial engineering. AFCMD, the headquarters for the AFPRO system, similarly employs specialists in these disciplines. (32:1-0) In addition, each of the AFPROs now has the capability for measuring and forecasting contractor performance and overhead expense through C/SCSC, PIECOST, and daily surveillance. (6) Resident or area Defense Contract Audit Agency (DCAA) officers are also located at or near each AFPRO to provide financial information and advice on government contracts.

A possible solution, therefore, to the question of "where" and "how" to establish a permanent "should cost" function in the Air Force is to establish a capability within the AFCMD AFPRO organizational structure. Their

specialized make-up, augmented by C/SCSC and PIECOST data and resident DCAA personnel, essentially provides the elements required for a "should cost" analysis. On the surface the idea appears workable, but is it a feasible solution? A comprehensive study which compares the requirements of the "should cost" technique to capabilities within the AFCMD/AFPRO system may provide some insight as to the feasibility of the proposed solution.

Scope of Analysis

This study represents an effort to find a "feasible" location for the permanent application of the "should cost" concept. The term "feasible" was used to denote acceptance based upon the criteria established under the Data Analysis section of the study. In this regard, one possible location was examined--the AFCMD/AFPRO organization. Although the Army, and to some extent, the Navy are presently moving toward full acceptance of the "should cost" technique, conclusions and/or recommendations reached in this study were directed only to the Air Force.

This study concentrated on the aspects unique to a "should cost" analysis of a production oriented contract and did not take into account possible future applications such as Research and Development and Product Improvement

contracts. It was recognized, however, that a logical extension of the "should cost" technique lies in these two important and costly areas of Air Force procurement.

Assumptions

During the course of this study, the following assumptions were made:

1. The public demand for domestic program funds will continue to grow, resulting in a worsening, or at best, a continuance of the present defense spending limitations.

2. Inflationary pressures, increasingly complex technology, and other less tangible factors will continue to raise the cost of defense procurement.

3. Assuming (1) and (2) above, the Air Force will more than ever have a need for improved methods for conducting cost analyses. Consequently, the assumption was also made that the "should cost" concept will be accepted by the Air Force as an on-going technique for in-depth cost analysis.

Objectives

The principal objective of this report was to determine the feasibility of establishing a permanent "should cost" capability within the AFPRO organizational structure.

In addition, certain sub-objectives were accomplished including:

1. To provide a detailed description of the "should cost" concept and the criteria by which successful studies have been made in the past.

2. To analyze the functions and responsibilities of the Air Force Contract Management Division (AFCMD) and its subordinate AFPRO organizations.

3. To describe and analyze contractor overhead and performance measurement tools available to AFCMD and the AFPROs.

4. Compare and contrast the criteria for "should cost" analysis with the capabilities of the AFCMD/AFPRO organization.

Research Questions

In order to accomplish the objectives, this study addressed itself to the following research questions:

1. What are the methods and procedures employed by "should cost" teams to conduct an in-depth analysis of a contractor's operations?

2. What criteria are applicable to the "should cost" technique?

3. What are the functions and capabilities of AFCMD, and how could they support a permanent "should cost" function?

4. What are the functions and capabilities of AFPROs, and how could they support a permanent "should cost" function?

5. What are the variables which impact upon the effectiveness of "should cost" implementation within the AFCMD/AFPRO structure?

Procedures of Investigation

Literature Research. Investigation and study of the problem was begun through a literature search. It was found that very little published literature exists which specifically relates to the "should cost" technique. The same was true for AFCMD/AFPRO participation in "should cost" studies. This situation is due in part to the relative newness of the concept itself. Several articles from procurement oriented periodicals were located through the AFIT library, however, stemming mainly from the Army's experience within the past two years. It was noted that at the time of the research, no published work on the subject of "should cost" could be found having an Air Force origin other than one official document. Further, no Air Force Institute of Technology

(AFIT) theses were available on this subject. The Defense Documentation Center (DDC) search yielded no direct reference material, however, some indirect material was obtained which dealt with other similar cost analysis methods.

Official Documentation Research. Official DOD Hq. USAF, Hq. AFSC, and Hq. AFCMD documentation was studied to determine the nature and extent of the initial Air Force application of the "should cost" technique and its relevance as a permanent addition to the weapons system procurement process. In addition, U.S. Army Materiel Command (AMC) documentation was studied to delineate the unique characteristics of "should cost" from an organizational and criteria oriented viewpoint.

Empirical Research. Because of the limited availability of specific literature on the subject of permanent application of "should cost" within the Air Force, the interview technique was used to obtain supplemental information. An interview guide was developed in two parts. Part I was established and used to interview Air Force personnel who have participated in one or more "should cost" team studies. The objective here was to obtain pertinent information relative to actual Air Force experience with the technique. Part II was directed toward Hq. AFCMD and AFPRO

personnel. This set of questions was designed to gather operating level viewpoints as to the impact of adding "should cost" to the AFCMD/AFPRO system and to provide additional information as to capabilities. The interview guides are presented in Appendix A.

Time and travel constraints made it impractical to interview a large number of AFPROs in person. Fortunately, due to the splendid cooperation of General Nunn, Commander, Hq. AFCMD, and his staff, Part II of the interview guide was sent by mail to each of the 19 AFPROs. This effort was equally well received by the AFPROs, resulting in 100 percent response. By electing to mail the interview questions rather than attempt face-to-face interviews, we in effect traded off some detail and quality of a smaller sampling for a broader and numerically larger sampling of AFPRO opinions on the subject.

Since the number of "should cost" studies thus far conducted by Air Force teams was relatively small (less than a dozen all tolled) we were able to personally contact and interview either the team leaders, team members, or both for each of the studies completed. In all some fifty interview hours were spent with Hq. ASD, Hq. AFCMD, and SAMSO personnel who had actively participated in one or more Air Force

"should cost" studies. The views expressed by these sources were recorded utilizing the Part I format of the interview guide.

Data Analysis

Criteria Development. As previously stated, the principal objective of this study was to determine the feasibility of establishing a permanent "should cost" capability within the AFCMD/AFPRO organizational structure. Since virtually no published work has been done within the Air Force on the subject of "should cost" itself, a secondary objective was to provide such a work in order to publicize the efforts of the Air Force, and possibly generate more internal interest in the concept. By answering research questions number 1 and number 2, the first sub-objective was accomplished and, more importantly, by systematically studying the methods and procedures thus far employed in "should cost" efforts, certain unique factors were developed. These factors then became the yardstick by which AFCMD/AFPRO capabilities were measured in order to determine feasibility.

Establishment of AFCMD/AFPRO Capabilities. Once the criteria had been established, the next step was to analyze the functions and capabilities within Hq. AFCMD and the AFPROs. All nineteen of the AFPROs were found to be

structured along standardized lines; i.e., responsibilities, functions and types of manning. (32) The most significant variable which ran contrary to standardized structure was in the size of each AFPRO. The number of contract administration personnel at each plant location is determined by the number and size of the defense contracts in work there. (6) This particular variable became relevant to the study during the determination of feasibility.

The AFPRO's capability to measure contractor performance through C/SCSC and PIECOST was found to have a distinctively complementary relation to "should cost" concept. This relationship was then explored from the standpoint of both short term and long term effects. The presence of DCAA personnel at each AFPRO location was examined in a similar fashion. The establishment of AFCMD/AFPRO capabilities effectively answered research questions number 3 and number 4 and accomplished the corresponding sub-objectives of this study.

Evaluation. Having established the criteria on which a conclusion of feasibility could be based, and determining the capabilities of the AFCMD/AFPRO system, the final research question and sub-objective was developed. By comparing "should cost" criteria to the capabilities and

resources available to AFCMD and the AFPROs, conclusions as to the feasibility of a permanent application of "should cost" within the AFCMD/AFPRO structure were reached.

Organization of the Thesis

This chapter has presented the problem statement, background, scope of analysis, assumptions, objectives, research questions, and the methodology by which the data was acquired and analyzed. Chapter II will describe the "should cost" concept in terms of methods and procedures used and the criteria for successful completion. Chapter III will present background information, the role of Headquarters AFCMD and develop its functions and capabilities relative to "should cost" support. Chapter IV will develop the AFPRO functions and capabilities applicable to "should cost," including the significance of C/SCSC, PIECOST, and the DCAA. Chapter V will be devoted to the evaluation of the established criteria for "should cost" analyses as compared to AFCMD/AFPRO capabilities. The variables which emerge from this comparison will also be discussed in terms of the positive or negative effect that a AFCMD/AFPRO application will have upon the "should cost" concept. The final chapter, Chapter VI, will state conclusions and recommendations based upon correlation and comparison of findings in the previous

chapter. A provision for recommendations is included in order to provide the authors the opportunity to identify those areas considered worthy of future investigation or study.

CHAPTER II

THE "SHOULD COST" CONCEPT

Definition

The definitions expressed earlier relating to contract cost analysis in ASPR 3 - 807.2 (C)(1) and the Comptroller General's May 1970 Report to the Congress provide general representations of the "should cost" concept. While brief and concise definitions of complex concepts are at times handy to our processes of recall, such a practice when left unexplored sometimes leads to diverse interpretations. Our research into the subject has led us to believe that there are some differences of opinion as to what a true "should cost" study really is. For instance, the GAO, as we stated earlier, believes that the greatest benefits from "should cost" studies is through their use on a selective basis in pre-award evaluation of contractor price proposals. We found that the military services, primarily the Air Force and the Army, are conducting "should cost" studies mainly to establish a pre-negotiation position for a previously selected supplier of production hardware. The Air

Force has also used the technique as a post-negotiation method for determining a "cost-to-complete" status of contracts already underway. The Air Force's C-5A Program was subjected to such a study in mid-1971. Still other evidences of possible confusion on the subject came from the responses received from the AFPRO questionnaires. Several of the respondents stated flatly that "any analysis of a contractor's price proposal is a 'should cost' analysis." One AFPRO commander, noting the disagreement within his organization, was prompted to add a cover letter to the questionnaires explaining that in his opinion much of the confusion was caused by a continuing series of "cost-to-complete" studies which had been performed by the buying agency. One such effort had been called a "should cost" study.

What then is "should cost"? Basically, it is an approach to the method of pricing of military procured hardware in order to promote assurance that a contractor's estimates do not include the cost effect of past inefficient or uneconomical practices. The "should cost" concept is, therefore, an extension of the traditional cost analysis as defined in the ASPR. The traditional approach has been to accept the contractor's current mode of operations and then

to use the capabilities of the project manager's office, the AFPRO, the DCAA, the DCASR, and other DOD records to obtain audit and technical recommendations to support the negotiator. Generally, these records were based upon price history and incurred cost data. The negotiation then proceeded using the contractor's proposal as the base line for costs. This method resulted in projected costs which gave little consideration that the accepted base could contain inefficient performance.

"Should cost" differs from the traditional approach to cost analysis principally in the scope of its application. Scope of application refers to two distinctive characteristics; i.e., (1) the depth of the analysis, and (2) the extent to which the team challenges inefficiencies in the contractor's operation. (35:I-2) The "should cost" technique may be described as a coordinated analysis of a contractor's business management, cost estimating, and production engineering in connection with the evaluation of a non-competitive proposal. This approach assumes that the inefficiencies associated with non-competitive procurement may be identified through the coordinated effort of a government cost estimating, business management, and production engineering evaluation team, and that the cost impact of these

inefficiencies may be eliminated during contract negotiations.

The reader should note at this point that we are specifically limiting the definition of "should cost" for the purposes of this report to use when there is: negotiated non-competitive procurement, major on-going defense contracts, an imminent follow-on buy expected, and those firms heavily engaged in defense business. We have deliberately specified these limitations because this is the environment within which the AFCMD/AFPRO organization presently operates. We quickly point out, however, that these are also the areas to which the majority of military "should cost" efforts are conducted. In testimony before the Subcommittee on Economy in Government of the Joint Economic Committee of the Congress, Dr. J. Ronald Fox, the then Assistant Secretary of the Army, I&L had this to say:

> This technique (i.e., "should cost") will be used in major procurements when genuine price competition is not existent and when it is determined that such an in-depth analysis is necessary in preparing for contract negotiations. The determination will be based on an evaluation of the contractor's cost history, preponderance of Government business, dollar value of the procurement under review and the amount of other Government contracts to be awarded to the contractor concerned. In advertised or negotiated procurements in which genuine competition exists, it is generally assumed that the objectives of the 'should cost' philosophy are attained by competitive forces of the market

place. (35:I-7)

By the same token, the published Air Force "Should Cost" Guide states under general criteria that: "The 'should cost' analysis technique is considered to be most effective and applicable in noncompetitive procurement situations where, in the absence of competition, it is necessary to develop a negotiation pricing objective which most nearly reflects that price which may have been achieved in a competive award." (31:5) The guide goes on to state essentially the same factors for consideration of "should cost" appropriateness as those previously listed by Secretary Fox.

We find, therefore, that the definition of the concept as we have stated it is consistent with the purpose of the "should cost" approach as it is being conducted today. That purpose being to establish an independent base line for use by the government negotiator. (31:9) The end product of a "should cost" analysis is the establishment of an independent negotiation objective at which the contractor can effectively operate if he does so with reasonable economy and efficiency. It becomes clear, therefore, that by using the "should cost" technique, as opposed to the traditional practices, the government intends to challenge, where challenge is indicated, the contractor's basic costs, his

operation, and his management practices in a much greater depth than before.

Objectives

The primary objective of "should cost" is no different than that of traditional cost analysis techniques. From the government's point of view, the short range objective is to provide a basis for the negotiation of a realistic contract price. Moreover, it has always been the objective of the government to negotiate a fair and reasonable price for the timely delivery of required supplies and services. But more than that, the objective of a "should cost" team is to determine and identify those unrealistic costs and inefficient operations which could be minimized or eliminated. By eliminating or minimizing these excessive costs a realistic position on what the government "Should" pay, rather than what it "Will" pay, may be realized.

There is also another, more subtle, objective of the "should cost" concept. This is the long range objective of increasing efficiency of operations in defense contractor's plants. Reflective thought leads to the conclusion that "should cost" is really a self-eliminating exercise. By vigorously insisting upon efficient operation and realistic pricing, over a period of time the contractor is obliged to

think in terms of cost effectiveness rather than cost based on historical plant operations. After a time then, assuming that contractors do indeed respond this way, improved efficiency and economy of operation would necessarily reduce the need for "should cost" to an infrequent activity in the procurement process.

Criteria for Contract Selection

The Air Force "Should Cost" Guide identifies several factors relevant to the selection of a procurement or a contractor as an appropriate candidate for "should cost" analysis. Coincidentally, the Army "Should Cost" Guide lists essentially the same listing as criteria for selection.[1] Generally, both services limit the use of the "should cost" technique to those contractors who:

1. Have a major on-going system where the contractor's procedures for quantity production have been established.

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[1]It should be noted that the preponderance of "should cost" information gathered for this report was obtained from Air Force and Army sources. The Navy's efforts with regard to "should cost" are noticeably absent since their successful Pratt-Whitney study. It is known, however, that the Navy is pursuing "should cost" analysis on its Mark 48 and Mark 49 torpedo procurements. These related efforts are being conducted almost exclusively by contract consultants rather than government personnel. (14:A-4)

2. Have the possibility of an imminent follow-on buy wherein corrections of inefficiencies and uneconomical practices will result in both short and long term cost reductions.

3. Have a history of increasing costs.

4. Have a preponderance of government business where the forces of competition may not be sufficiently strong to encourage good cost controls. (31:5-6)

In addition, other factors which would influence the selection of a contractor are: high dollar value of the contract; cost effectiveness of the study itself with regard to the cost of performing the study against the savings which may be accrued; and finally, a contractor who has experienced a substantial cost overrun or a record of delinquent deliveries. (31:6)

Preliminary Preparation and Planning

The procedures presently used in structuring "should cost" analyses of the Air Force and the other services require extremely careful preparation and planning. The events which take place during the preparatory stages of the study can have a pronounced effect upon the success or failure of the effort. Generally, this phase begins with the selection of the "should cost" candidate based upon one or

more of the selection criteria previously stated. Next comes the appointment of the team leader and his deputy, and finally, the selection of the team members. (3)(15:3) According to our research, both in the literature and from personal interviews, this is possibly the most important phase of the "should cost" event schedule. The requirement that a contractor's business, cost estimating, and production engineering management be evaluated, and that identified inefficiencies be related with justification to excess acquisition costs requires a high order of capability in the team members. Moreover, detailed advanced preparation and planning is necessary to insure that an efficient and well coordinated evaluation is performed which results in a supportable and quantifiable negotiation objective.

The proper degree of preparation and planning is, of course, important to any group undertaking. But for a "should cost" evaluation it is of paramount importance, if not critical, to the outcome. For it is detailed preparation and planning which provides the very foundation of the entire effort. Gunther Lange, a prolific writer on the subject of "should cost" from the U.S. Army Logistics Management Center, Fort Lee, Virginia, said it this way: "The importance of the proper determination of procurement/

contractor candidates, and the criticality of having the 'right' people on the team, cannot be over-emphasized." (15:3) This same emphasis on planning was found to be prevalent in our interviews with Air Force "should cost" team leaders and members as well. A review of the event schedules for each completed Air Force study also verified this emphasis in that almost every study showed as much or more time devoted to preparation and planning as the in-plant evaluation itself.

In summary, the success of a "should cost" analysis effort has been found to depend upon four key elements of advance planning. First, the analysis must be performed on-site, and the findings of the specialists of the team should be developed on a coordinated basis. Second, the personnel chosen for this type of analysis must be thoroughly qualified, and capable of relating their findings to the total team effort--generalists with a specialized capability, in other words. Third, the pre-analysis planning must be thorough and complete, in order to concentrate the efforts of the team members in those areas which offer the most productive use of time and energies. And, finally, the consolidated findings of the "should cost" team analysis should be a useable negotiation tool, containing logically

quantified supportable results.

The "Should Cost" Team

Selection. The nature of the "should cost" concept requires that a wide variety of skills be included in the team make-up. In planning the manpower resources required for a particular study it is desirable to first select the key people that would normally be involved in the particular cost analysis and to augment that group with sufficient skilled resources to make up a special, unbiased "should cost" team. (31:11) The proper balance of the team will depend upon the "orientation" of the contractor whose proposal is about to be studied. We know from past experience that companies, like people, are different. Some are highly engineering-oriented; others production-oriented, while still others tend to lean toward accounting-oriented procedures and goals. The team make-up, therefore, must take into account not only the nature and complexity of the contract effort, but the nature of the contractor's organization as well.

The first selection to be made is that of the team chief. Our research revealed that one of the chief reasons accounting for "should cost" successes was largely due to their objectivity. The team chiefs and most of the members

were selected from sources outside of the procuring agency. This has essentially freed them from either defending or attacking the contractor for their own protection or gain. It was found to be essential, however, that the chief negotiator for the procurement be prominently included as a permanent team member. Basically, the team chief should possess both managerial and technical qualifications. He should be the "best man" in terms of planning, organizing, staffing, directing and controlling, and at the same time be entirely conversant with the guidelines of research methodology. He should have the characteristics of flexibility, yet tough-mindedness; be critical, yet understanding; be dedicated to the accomplishment of his task; and finally, be continually in search of the ideal, while retaining a knowledge of the limits imposed by reality.

The team chief has the primary responsibility for the team's mission. For this reason he should have a major voice in the selection of the deputy team chief and/or the subteam chiefs, as well as the team members. It is important also that he have the authority necessary to accomplish the task as he sees it. This includes the authority to dismiss and replace a team member who is not performing to the standards he has established. It is imperative that his

authority stem from the support of top management in his organization. He must have the feeling that when he makes a decision or takes a position, he can expect the backing he needs to carry it through. Without this authority and backing, he will continually be distracted from his true objective: a comprehensive "should cost" study.

The next step is the selection of the team members. The number of team members required will depend, as we said before, on the type and complexity of the proposal under study. Generally, we found that a team would range from 10 to 30 persons.

The Air Force's "Should Cost" Guide recommends that team members be selected from the following sources:

SPO. The SPO/Buying Agency should be represented by the PCO, technical specialists, and one or more price analysts as permanent team members.

AFCMD. Contract administration assistance is particularly important in the areas of industrial engineering and the analysis of overhead costs. They are able to draw resources from not only the headquarters itself, but from the AFPROs as well.

AFPRO. The AFPRO resources include technical, pricing, and ACO capabilities.

DCAA. Because of the greater depth of the cost analysis, DCAA participation is required to a greater extent than normally required in a traditional cost analysis. These members may be recruited from regional offices as well as the local plant offices.

Comptroller. Although strongly recommended, particularly by the Army, we have not found a great deal of participation by this particular organization.

Additional. Other team members may be requested, as needed, from interested agencies such as; AFLC, DCAS, or other military departments. (31:11-13)

Considerable care must be taken during the team selection to insure that a proper balance of skills is obtained. The skills generally include those of industrial engineers, design engineers, production specialists, accountants, cost analysts, management analysts, statisticians, and any additional specialists peculiar to the company's product line (e.g.: nuclear engineers, computer programmers, reliability engineers).

Education and experience of the team members is considered to be an extremely important asset to the successful completion of a "should cost" study. But equally important, we find, are characteristics such as those listed below:

a. The ability to express himself clearly and concisely, both orally and in writing.

b. The ability to work without close supervision.

c. The ability to produce under adverse conditions.

d. The ability to be unemotionally critical of the contractor and his operation.

e. Be motivated and believe in the value of his contribution to the team effort.

f. Be innovative and imaginative in making critical analyses.

g. Be dedicated to the team's success in such a way that extended absences from home and long hours of the job do not detract from his ability to produce top quality work.

Organization

The organization of the teams employed thus far has been derived primarily from the nature of the specific contractor organization under study. Many of the factors which influenced the team composition also have an effect upon the "should cost" team organizational structure. Factors which were found to be significantly considered are:

a. the contractor's organization
b. the work breakdown structure
c. the elements of the proposal
d. the extent of subcontracting involved
e. known or suspected problem areas

Figure 1 shows what is generally termed a "typical" team organization. It should be recognized that typical is not meant to imply that this is by any means the standard. As we cautioned earlier, each company is different in its own way from another, therefore, the team organization must retain sufficient flexibility to permit adaptation to a broad range of different organizational structures and methods.

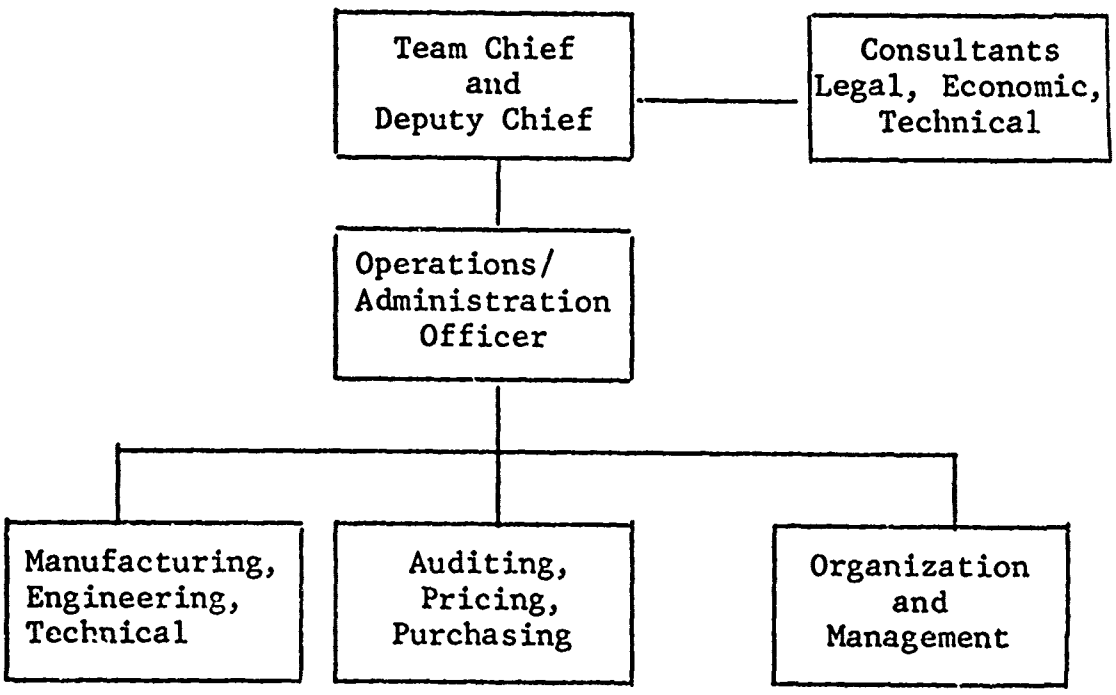

Fig. 1.--Typical "Should Cost" Team Organization

We find that this basic organizational structure has been followed with only minor variations within the basic subteams during the majority of the "should cost" studies conducted by the services to date. The assignments of team members to subteams and the appointment of subteam chiefs should be made on the basis of providing "the best man for the job," regardless of rank, position, or "apparent" qualifications. (15:14) As the team progresses through the study effort, some shifting of leadership and task assignments may become necessary to insure the "best man" objective.

A brief listing of the functions and responsibilities normally associated with the organizational structure presented in Figure 1 is as follows:

Team Chief. Provides general policy, guidance and direction; develops and approves the master plan for analysis; provides the primary interface with the contractor; coordinates policy matters with higher echelons; receives daily progress reports and redirects as necessary; reviews and approves the findings of the team.

Operations/Administrative Officer. Maintains an overall status and manning chart; prepares periodic status reports; resolves internal team problems as well as insuring

resolution of team/contractor problems; reviews subteam progress; prepares and arranges all correspondence and reports of the team's efforts in the required format.

Manufacturing, Engineering Team. Evaluates direct and indirect labor, labor standards, wage and salary scales; evaluates fabrication, assembly, testing, and inspection standards; evaluates space utilization, scheduling, and machine utilization/loading; evaluates costing factors; evaluates variance analysis and productivity standards.

Audit, Pricing and Purchasing Team. Reviews and evaluates usage factors, contractor's purchasing system, warehousing, distribution inventory control, make-or-buy, vendor management, scrap control, and various costing factors; prepares a final report for each task assigned; computes price objectives.

Organization and Management Team. Searches out areas of duplication and overstaffing; applies these results to both direct and indirect cost areas; develops interview techniques for all team members to assist in finding the areas of greatest potential savings.

These functions and responsibilities are by no means complete in their description of the various tasks of each group, but serve only as a starting point on which each

individual team effort may take away from or add to in order to perform their own unique effort. All of the services have used this basic structure as their departure point in the past with good to excellent results. We know of no way to develop this basic structure into a final detailed standard, nor is there evidence to support the need for such. The overriding need is for flexibility in the organizational structure to be able to mold the team to the differing requirements of each individual study.

Administrative Considerations

A great deal of data, memoranda, reports, and miscellaneous written information will be generated during the course of a "should cost" study. An important element of the study effort which is sometimes overlooked is the orderly administrative support requirement. The information gathered should proceed in an orderly fashion, according to a well thought-out plan. It is important that an orderly report system be established, maintained and filed so that each member of the team is aware of the system. Team members, of necessity, become so deeply involved in the work at hand that it sometimes becomes difficult, if not impossible, to redirect thinking on filing, reporting, formats and other administrative procedures. (15:16)

Without overly emphasizing the importance of administrative considerations for a "should cost" effort, let us simply state that in any undertaking such as this, some degree of planning and organization of administrative details must be done. In some instances, the administrative requirements may be handled informally; in others, more detailed organization of the data flow must be established. As the number of individuals engaged in the study increases and as the interorganizationl and interpersonal complexities increase, more formality is required to accomplish the required objectives. Based on the ideas expressed by Cleland and King, we find that certain key requirements apply to the organization of an administrative system for a "should cost" study:

1. Clear-cut requirements should be established to provide the framework of the objective.

2. The method of operation should be established.

3. The human and nonhuman logistical resources should be aligned to aid the overall operation.

4. Feedback techniques should be established such that the overall effectiveness of the operation can be sensed, and if necessary, modified to meet changing needs. (2:168-169)

We stated earlier that the team chief should be a manager and a generalist. It now becomes apparent that he must also be a competent administrator as well. Through continuous interaction with the team members and with the assistance of an able administrative officer, the study effort may be smoothly and effectively channeled toward the final objective; a well documented, supportable negotiation position.

Schedule

The Air Force "Should Cost" Guide states that a good rule of thumb for the time required to conduct a "should cost" effort, from the time of go-ahead to the completion of negotiations, is approximately twenty weeks. (31:18) We found that this rule of thumb was consistent with the Army's thinking and was generally adhered to in the study efforts completed thus far. Of course, the size and complexity of each individual study will dictate the length of the schedule, but this rule provides a fair reference point from which to start. Again, the importance of flexibility is observed as a vital element of the concept.

Ordinarily, a master plan is developed as part of the planning process by the team chief and the team members. A typical master schedule is shown in Figure 2. In general,

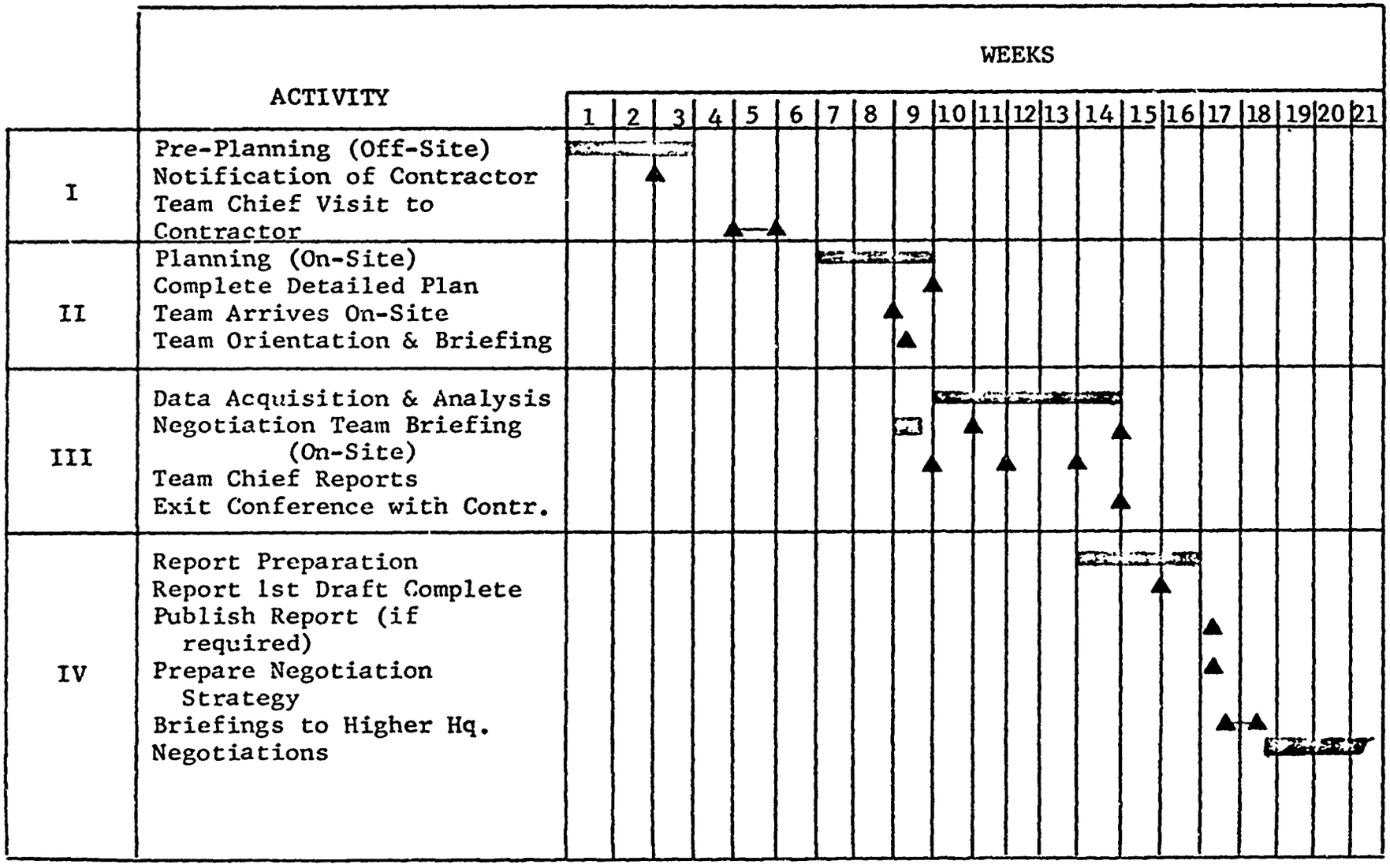

Fig. 2.--Typical "Should Cost" Master Schedule

the schedule is composed of four distinguishable segments:

First Four Weeks. Team selection, briefings to higher headquarters as required, team indoctrination and/or training, contractor notification, preliminary visit to contractor's facility, preliminary assignment of task responsibilities, logistical arrangements, and selection of contractor focal points.

Second Five Weeks. Initial tours and briefings by contractor and AFPRO as appropriate, complete in-plant review, and conferences with contractor.

Third Five Weeks. Analysis and documentation of pre-negotiation objectives and development of recommendations to the contractor, as applicable.

Final Six Weeks. Negotiations with the contractor and final briefings or reports to higher headquarters as required.

We found that, as a minimum, the "should cost" study should cover the four principle stages cited above. Of necessity, the major milestones shown in Figure 2 represent a generalized example of a "should cost" study master schedule. The final scheduled duration of the effort, and the time allotted to the major phases, will vary with the specifics of each individual study. The value of such an

outline, however, is in its use a starting blueprint on which to build.

Methodology

A centrally important technique stood out during the course of this research effort regarding methodology and application of the "should cost" concept. The importance of relating directly to the contractor's proposal on an element-by-element basis was constantly emphasized by all sources. Since the study involves a thorough investigation of all of the proposed elements of cost, the determination of what the costs should be is based upon and should be traceable to the contractor's own data and information, supplemented by appropriate industry standards and similar comparative measurement devices. The cost build-up and methodology used by the contractor should, therefore, be used by the "should cost" team as their guidepost for determining their own independent cost build-up. The maxim to be followed is that in every case the base data must be traceable to some contractor source. (31:20) The "should cost" approach starts with the contractor's proposal, then traces and analyzes the elements of the proposal down to the finest detail possible. In the process of selecting the activities for cost analysis the team develops these

basic data elements, and further, the type of analysis they will apply.

Some of the most common elements found in contractor proposals are briefly summarized as follows:

(1) Manufacturing and Engineering. This is possibly the most important element of any contractor's proposal. The direct labor estimate usually constitutes the foundation of the proposal and is the base upon which the overhead allocation is normally predicated. The "hands-on-the-product" labor, therefore, makes up not only a sizable portion of the contract cost in itself, but is highly leveraged due to the various multipliers applicable to this base during the construction of a cost proposal. Because of the multiplier effect on the direct labor base, it is extremely important that all possible elements of this portion of the proposal be analyzed as thoroughly as possible.

Many analytical approaches have been used in the conduct of "should cost" studies to attempt to determine accurate cost estimates of the direct labor contribution. Among these are: Industrial Engineering (IE) standards; industry averages; analysis of fabrication, assembly, and testing methods; learning curves; work break-down analyses; and past history. All of these techniques and others are

appropriate for use by "should cost" teams. The important consideration is that the team not only knows how to use any of the particular methods, but when to apply them as well. It goes without saying that much time and needless effort could be expended by applying an inappropriate analysis method.

(2) Material and Subcontract Costs. Quite often the proposed costs associated with material and subcontracts represent a sizable portion of the total contract cost. This has also shown to be a fruitful area for "should cost" analyses. In the context of the "should cost" study, the Army recommends two principle approaches:

1. Analyzing how the material, parts and subcontracts are procured.

2. Analyzing what is proposed to be bought and how much will be ordered. (35:V-24)

Within the material and subcontract area there are a number of broad guidelines by which the analyst may use for comparison with generally accepted practices. The contractor should be buying in large enough quantities to obtain the best price while attempting to avoid surpluses. His purchases should be made on the basis of competitive bidding, making as much use as possible of competition's effect on

price. The contractor himself should be engaging in "should cost" types of analyses for his major subcontractors, especially if they are in a sole-source category. He should also have established communication procedures between his engineering, production, and manufacturing functions in order to minimize the problems associated with design changes and fabrication and assembly errors. Finally, the contractor's make-or-buy practices should be based upon sound cost-oriented principles.

(3) Make-or-Buy. Included in any government procurement are many intangibles not directly related to the product or service itself. One of these intangibles is the contractor's management practices. It is expected that the prospective contractor's management policies and procedures are carried out in such a manner as to benefit not only himself, but the government interests as well. His ability to price and administer subcontracts at the lowest overall cost is an important consideration to the cost analyst.

The contractor's philosophy, procedures, and practices regarding make-or-buy should agree with those of the Department of Defense. Any analyst studying this area of a proposal should, therefore, be intimately familiar with the DOD policies, as stated in ASPR 3-900. In some cases

company policy may differ from that required by the government. In others, company procedures may not adequately implement government policy. In still others, the company policies and procedures may be adequately established, but not followed. There are a great many aspects of make-or-buy to consider, but to the analyst the main consideration is to be assured that the contractor's make-or-buy practices are in line with those of the government and they are actively being carried out. In sum, he must be assured that the government's interests as a "customer" are adequately considered in the contract under study.

(4) Wages and Salaries. Very seldom do two contractors use the same method to project wage rates for a particular contract. The variety of methods used depends upon plant capacity, volume of production, number of products, union relationships, and a host of other intervening variables. The analyst is obliged to concentrate his efforts on the specific method or methods used and look for consistency. (35:V-41)

Established wage rates are normally modified by certain adjustment factors to the latest actual rates. Such adjustments as salary increases, cost of living agreements, changes in average rates caused by new hires or lay-offs,

and changes resulting from anticipated union agreements should be analyzed for consistency and relevance to the proposed contract.

(5) Indirect Costs. Overhead costs are almost always included within a contractor's proposal, and moreover, are usually the largest single cost element. Generally, a contractor will employ more than one overhead rate, all of which are used to arrive at the indirect expense to a contract. Simply comparing one contractor's rate to that of another is not sufficient for analysis because efficiency and control are not directly compared. The analyst must, therefore, evaluate the overhead costs in terms of proper classification, method of allocation, and the most efficient level of indirect costs for the prevailing condition at the time of the study and beyond.

A recently implemented technique called PIECOST is being used at each of the AFPROs to assist in the forecast of overhead rates. This technique utilizes historical cost data as its basis and is proving to be worthwhile so long as the inherent constraints imposed by the statistical technique are not violated. It is imperative that the analyst be familiar with the uses and limitations of PIECOST when evaluating projected overhead rates.

(6) Company Organization. This is one of the most difficult areas for an analyst to pursue. The company's organizational impact on cost is often quite subtle and not easily stated in precise terms. This particular area is highly subject to judgmental precepts and as such is also difficult to enforce. The analyst may evaluate the organizational levels, span of control, work-to-supervisor ratios, duplication of efforts, and the general rationality of the organization structure, but the final agreement will most likely be a combination of trade-offs reached during the negotiation phase.

(7) Fee and Incentives. Ordinarily, this area of the contract will be left to the principal negotiator for the procuring agency. An in-depth cost analysis can have an impact, however, especially if as a result of the analysis, certain elements of the proposal are deleted, reduced, or transferred to another source. A detailed analysis can also provide the negotiator with a better feel for the application of weighted guidelines as covered in ASPR 3-808 and other pricing manuals. The same is also true for arriving at the government's position on the range of incentive provisions, if applicable to the contract.

Factors Relating to Effectiveness

When speaking of effectiveness, one must think in terms of a measure of success relative to predetermined objectives or goals. The origination of the "should cost" concept was based upon the recognized need for greater precision and realism in the forward pricing of weapon systems--precision and realism in terms of reasonable achievable economies and efficiencies. The "should cost" experience of the services over the past two years, in particular the Air Force and the Army, has shown that the explicitly stated short term objectives and the implied long term goals are being realized. Our interviews revealed that in each Air Force "should cost" study conducted, an independent supportable negotiation position was reached based upon the elimination of inefficient and uneconomical practices from the proposed contract. The measure of effectiveness, therefore, relates not only to immediate dollar savings but to the more lasting objective of instilling cost effectiveness into management thinking.

The primary instrument for implementing the "should cost" concept has been the team approach. The ad hoc team method has been exclusively used by all of the services since its inception in 1967. Any measure of success applied to

the concept must necessarily be attributable to the teams who have carried it out. In view of this, the development of criteria for measuring the effectiveness of the "should cost" concept must evolve from factors which measure the effectiveness of the team.

Turning again for help to some of the works of Gunther Lange, we find that the "should cost" team, hence the "should cost" concept, depends basically upon three distinct factors for measuring its effectiveness: (14:iv)

(1) Time. Each study effort must be allowed adequate time to perform a complete analysis. The time required is, of course, dependent upon the type and complexity of the contract under study. But the importance of this factor lies in its negative effect upon the quality of results if cut too short. By the same token, output quality will not increase above a certain achievable level if excess time is spent on the study. In short, a team depends upon having the "right" amount of time to devote to their assigned task. The determination of the time required rests with the team's own assessment. Forcing a team to perform "hit-and-run" or "quickie" studies will not only produce less than desired results but most likely alienate the team and the contractor to the concept as a whole. Whether

the study requires 20 weeks, 30 weeks, or as in some cases, fewer than 8 weeks, the team must be allowed to take the time they feel is needed. Unrealistic and restrictive schedules imposed by higher authority to attempt to retrieve the effects of poor planning is not the way to conduct an effective "should cost" study. Time, the "right" amount of time, is indeed money when applied to the framework of an effective "should cost" exercise.

In addition to the relationship drawn to time and the schedule, or duration of the study, time must also apply to the individual team members. Thus far, the ad hoc team approach has worked well because each member was assigned full-time to the assigned study, thus allowing him to devote his energies exclusively to the task. Each of the team leaders and members interviewed, including those from the AFCMD/AFPRO organization, expressed very strongly the need for full-time assignment to the specified task without distractions from the jobs they normally hold.

The amount of time required for each study effort will initially be determined during the planning phase. At times, however, during the course of the in-plant investigation, a team may find that less than the planned time is actually needed. In other cases, just the opposite may be

true. The point here is that the allotted time for a "should cost" study is a relative thing. The time factor cannot be tied to rigid standards of schedules to be met at the last minute, but rather to the specific details of the task itself. Team effectiveness is inherently related to the time made available for the study and must be allowed the flexibility to adapt to changing environments and conditions as they become known.

(2) Quality. The importance of quality in team personnel stood out rather obviously during our study of the "should cost" concept. It became apparent that the effectiveness of the team's effort was directly related to the talents and capabilities of the members themselves. It was found that quality, above all others, is possibly the most important criterion for success, and must not be sacrificed. (15:7)

One reason for stressing the importance of quality so strongly is due to the dual functions which a "should cost" team must perform. As we noted earlier, the team performs the functions of management as well as those of a researcher. In traditional organizations these two functions are discrete and specialized entities which operate separately and under different spheres of influence. The

"should cost" team, however, operates as a combination of these two functions, working toward a common team objective. This team effort requires that a wide variety of individuals work as one common body in order to evaluate and analyze the efficiencies and economies of a contractor's operations. In order to accomplish such a task, each member of the team must be uniquely qualified, highly motivated, and dedicated to the use of effective management and research methods.

(3) Quantity. The size and mix of a "should cost" team is a subjective determination thus far derived from experience. Generally speaking, the size and mix of the team is proportional to the specialized nature and the complexity of the contract being analyzed. We found no evidence of scientific or statistical relationships being established to determine team size. It was evident, however, that team size, along with the factors of time and quality, is not amenable to standardized development methods. It too depends upon the ability to adapt to the needs of the specific situation. The team must be able to meet the requirements of the study, in terms of team size and mix, according to their own determination of the need. Initial planning may indicate that a particular size and composition of the team is required. If after becoming engaged in the

study it is determined that adjustments are necessary, the team chief should have the capability to make these changes with a minimum of delay to the effort. Again, flexibility becomes the underlying characteristic for effective "should cost" implementation.

Summary

The "in-depth" feature of the "should cost" analysis is what makes this technique unique. Because it involves detailed coordination and analysis, the high quality performance and the true effectiveness of the concept evolves from specific factors relating to the effectiveness of the team. The team's effectiveness can be expressed in terms of three factors: time, quality, and quantity. Underlying these factors is a central thread of commonality--the flexibility to meet the specific task requirement.

CHAPTER III

THE ROLE OF HEADQUARTERS AIR FORCE CONTRACT MANAGEMENT DIVISION (AFCMD)

Historical Background

Air Force contract management, as it is known today, had its beginning in 1908 with the award of the first military aircraft contract. From that point on, the aircraft industry environment has grown in volume and complexity as has its products and procedures. This growth required the forerunner organizations to the United States Air Force to continuously adapt their operation to this dynamically changing environment.

The National Defense Act of 1918 decreed that all military aircraft would be obtained by employing the design, development and production efforts of private aircraft manufacturers. This was the starting point for industry-wide design competition and the weapon system acquisition process.

In the early post World War I period, quality inspectors were sent to major aircraft production plants on

an "as needed" basis. This proved to be unsatisfactory, resulting in the establishment of the first in-plant inspection office in 1920, at the Boeing Airplane Company, Seattle, Washington. (19:18) This was the pioneer form of the current AFPRO organization. Three years later a second plant inspection office was established at the Douglas Aircraft Company in Santa Monica, California. These plant inspection offices were controlled from Headquarters Air Service in Washington, D.C. until 1926 when they were placed under control of three regional procurement districts.

As the United States entered World War II, three additional procurement districts were added to the pre-war structure to handle the increased contract management requirements. At major defense plants, numerous representatives offices were established and Area Offices were set up in locations where work volume did not justify the creation of independent contract management offices. (12:47)

After World War II, the contract management environment changed significantly as peacetime normalcy was assumed. The Industrial Reserve Act was passed, establishing the legal right to maintain a nucleus of government owned plants and a reserve of machine tools and industrial equipment in order to provide the basis for any future mobilization. During

this time the contract management field organization was also significantly reduced.

The United States Air Force was created in 1947 as a separate branch of the Armed Forces with its own procurement and contract management activity. Six years later the weapons system concept was introduced for the management of weapons development and production. The new concept increased the role and the amount of funding available to major weapon contractors and required additional monitoring of the contractor by the contract management activities. Joint Project offices were created as intercommand organizations between Air Material Command (AMC) and Air Research and Development Command (ARDC). The contract management structure was now under the control of AMC Headquarters. There were six Air Procurement Districts with twenty Air Regional Offices plus 36 AFPROs at the major contractor facilities. The Air Procurement Districts were deactivated in 1953 with the AFPRO functions being assigned to the Air Material Areas. The Air Regional Offices were re-identified as Procurement Districts. (12:53)

In 1960 three Contract Management Regions (CMR) were created reporting directly to Headquarters AMC. The mission of the CMR was to supervise the contract management

activities of AFPROs, Air Procurement Districts, and Test Site Offices. AMC and ARDC were eliminated in 1961 with two new commands being created: Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC). The CMRs were transferred from AFLC to AFSC and, in 1962, were redesignated Air Force Contract Management Districts. The Air Procurement offices and plant AFPROs were assigned to the districts and redesignated Air Force Contract Management Offices. (19:67)

On 4 January 1965 authority to establish a new headquarters was granted and AFCMD was activated, eliminating the three CMRs. The new organization included the support offices of staff judge advocate, comptroller, plans and management, and information. Functional staff offices of contracts, production, quality assurance, development engineering and safety and flight operations were also established. Three months later plant offices, test site offices, and Missile Site Construction Detachments were officially transferred to AFCMD jurisdiction. The organizational variations within AFCMD have changed very little since that time. The current mission of AFCMD can now best be described in Air Force System Command Regulation 23-16.

Mission

The mission of AFCMD is to act as the primary Air Force agency performing field contract management functions at those contractor plants assigned to the Air Force by the DOD for plant cognizance to insure the government's interests while executing assigned and delegated contract administration functions.

Organization and Functions

The Air Force Contract Management Division is one of seven divisions and five development and test centers under the mission jurisdiction of Headquarters AFSC. (12:74) The division is organized into six directorates, 19 AFPROs and five Air Force Contract Management Offices (AFCMO). The current organizational chart of the division is included as Figure 3.

The manpower resources assigned to AFCMD total slightly over 3500 with the Quality Control and Production Directorates comprising forty-two and sixteen percent respectively. The remaining are in Contract Administration, Management, Developing Engineering, Comptroller and Flight Operations. A current manpower resources chart of the division is included in Figure 4. A description of the major responsibilities of the division's functional areas

CONTRACT [illegible] GEMENT DIVISION

ORGANIZATION CHART (RCS: 2-SYS-03)

1 SEPTEMBER 1971

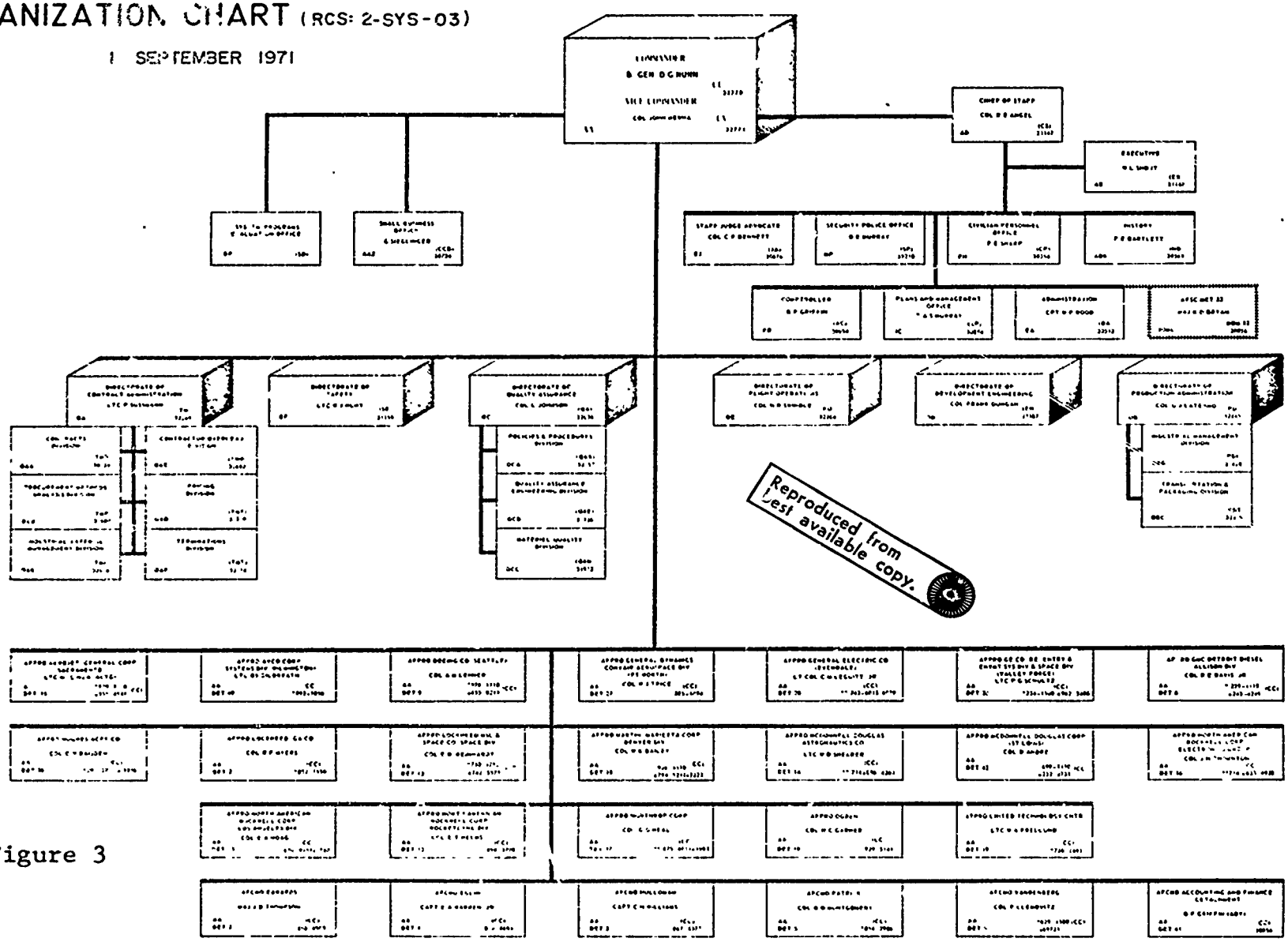

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Figure 3

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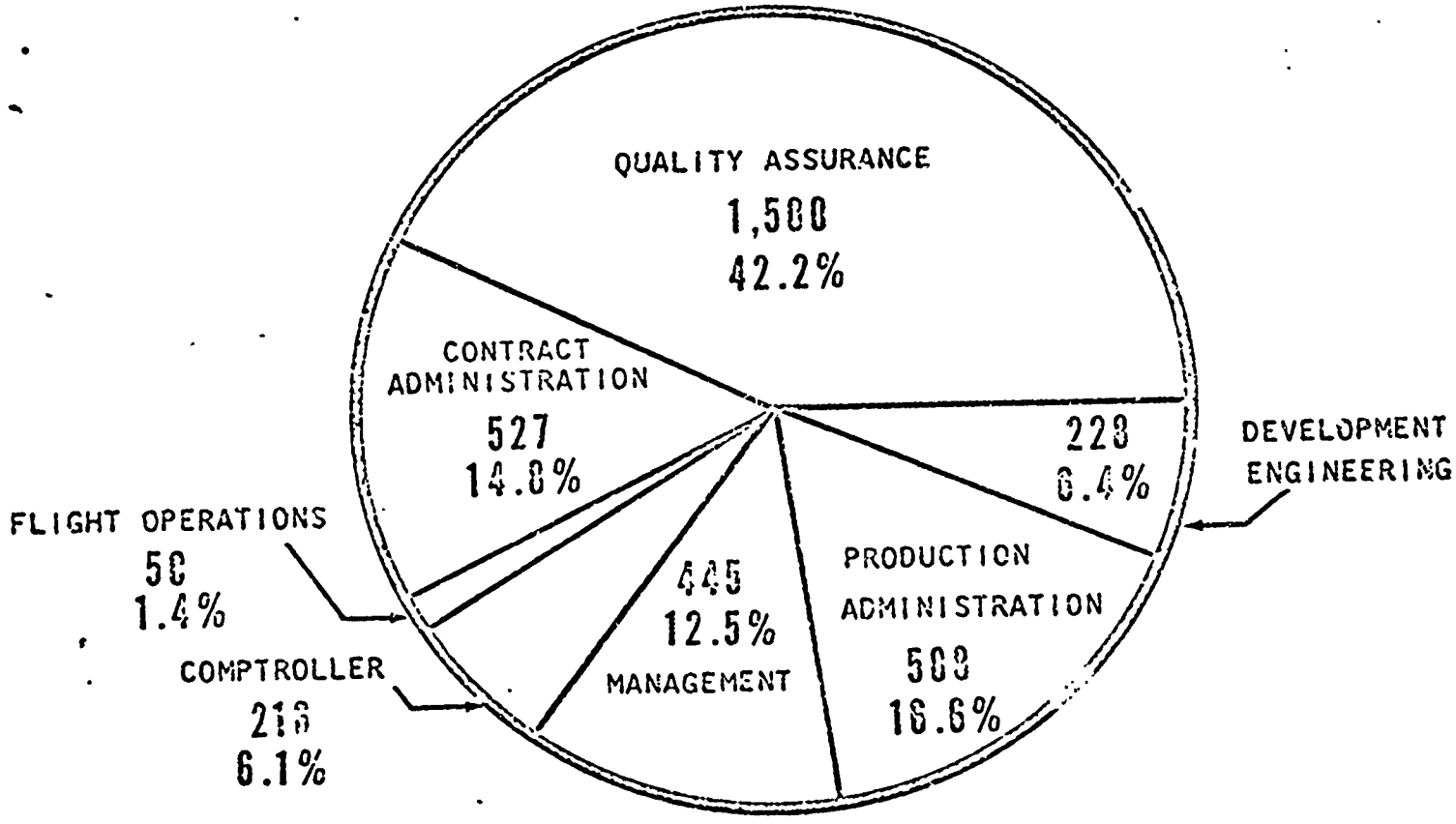
MANPOWER RESOURCES



TOTAL 3,554

Figure 4

follows:

Command Section. The AFCMD Command Section is responsible for executing command and management direction over AFCMD to insure its mission accomplishment.

Chief of Staff. This office supervises and coordinates the activities of assigned Staff Offices in support of AFCMD operations. They provide the Headquarters and the Detachments with support services. Subordinate to and co-located within this office are nine offices supporting the Chief of Staff.

System Program Evaluation Office. This office tracks important aspects of program progress, identifies potential problem areas, forecasts the impact and recommends alternate courses of action on a few selected priority programs.

Small Business Office. The Small Business Office establishes procedures and systems to ensure effective controls pertinent to the management of the program as they relate to provisions for, and achievement of a proper share of weapon system dollars to Small Business.

To aid in the AFCMD mission accomplishment, the commander has six directorates. They have the following responsibilities.

Contract Administration. The Directorate of Contract Administration exercises staff supervision of operational functions pertaining to contract administration, pricing, financial analysis, terminations, including contractor's purchasing, and other systems pertinent to the administration of contracts. It provides technical guidance and assistance to the Deputy AFPR for Program Offices, including development of functional plans describing AFPRO responsibilities for administration of major program contracts. It provides Selected Acquisition Information on Management Systems (SAIMS) surveillance functions; including Cost/Schedule Control System Criteria (C/SCSC), and Cost Information Report (CIR). They establish AFPRO-wide programs to evaluate, implement, and maintain close surveillance over price analysis functions and policy. In addition, they develop price objectives, perform cost and price analysis on Contractor's proposals and participate in negotiations and estimating reviews. This office implements AFCMD Should-Cost Review Programs at the AFPRO level in conjunction with the Production Administration Division. The Contracts, Procurement Methods Analysis, Industrial Material Management, Contractor Overhead, Pricing and Termination Divisions are all sub-units of the directorate and assure

proper execution of each area of Contract Administration.

Quality Assurance. The Directorate of Quality Assurance exercises staff supervision and technical direction over functions of AF Quality Assurance forces located in the AFPROs and AFCMOs to assure quality and reliability of material and services procured, installed and tested. This directorate is responsible for the implementation of higher headquarters policies into procedures and controls for detachment utilization in the quality assurance program. The policies and procedures, quality assurance engineering, and material quality branches within the directorate assist in the accomplishment of these tasks. (32:4-9)

Development Engineering. The Directorate of Development Engineering provides staff direction, guidance and assistance in the accomplishment of the AFPRO Development Engineering function to include surveillance of performance in all areas of engineering responsibility. The directorate serves as principal advisor to the System Program Directors and Buying Agencies on development engineering matters originating at plant level. They assist in analysis, fact finding, and negotiation of contractor engineering cost proposals. They also participate in reviews and surveys of contractor's Cost Estimating and Accounting Methods.

Production. The Directorate of Production Administration provides staff direction, guidance and assistance to the AFPRO detachments in the areas of industrial engineering, production, integrated logistics support, transportation, material handling and packaging. They make industrial engineering evaluations of contractor's proposals such as Make-or-Buy, Engineering Changes, Value Engineering, and Cost Reduction. Additionally, they implement higher Headquarters policies and establish procedures for the detachments to be utilized in the area of industrial operations. The directorate performs industrial engineering evaluations and makes recommendations on contractor's cost proposals as requested by the Contract Administration Division. Finally, they exercise production surveillance over research, development and production contracts.

Safety. The Directorate of Safety advises and exercises staff supervision over ground safety and contractor explosive safety programs. They also plan, establish, and evaluate the AFCMD Flying Safety Program.

Flight Operations. The Directorate of Flight Operations advises and exercises staff supervision over the functions associated with contractor related flight operations. They are responsible for implementing higher

Headquarters policy, defining objectives and performing necessary evaluations to insure adequacy of AFCMD detachment flight test programs.

Participation in "Should Cost" Studies

Headquarters AFCMD has been involved in "should cost" studies since they began in the Air Force almost three years ago. Specialists have participated as team members in virtually every Air Force "should cost" review conducted thus far. In fact, one study was completed recently utilizing all AFCMD personnel with only one exception--the contract negotiator representing the buying activity.

Specialists provided by HQ AFCMD include Development, Industrial, Mechanical, and General Engineers, Contract Price Analysts, Contract Specialists and Quality Assurance Specialists. Analyzing the "should cost" studies completed thus far, it was determined that thirty-five percent of assigned team members were from the AFCMD environment. Most of the specialists utilized, however, were industrial engineers. This specialty comprised forty percent of the total AFCMD representation.

Headquarters AFCMD participants have been most effectively used in analyzing contractor overhead rates, cost estimating and accounting methods. They have assisted

in pre-award surveys, analyzed equipment modernization and replacement policies as well as anticipated facilities expansion. They have managed C/SCSC activities and analyzed potential inefficient management practices. Industrial engineers have reviewed contractor proposals evaluated make-or-buy decisions as well as possible engineering changes.

Headquarters AFCMD has also worked very closely with the buying activities during "should cost" studies. Recently, a Memorandum of Agreement (MOA) was jointly issued by the Space and Missile Systems Organization (SAMSO) and AFCMD. (Appendix B) The purpose of the MOA is to coordinate "should cost" activities between the two organizations and to identify the areas of responsibility in each organization. The MOA, in part, states that the principle focal points for the "should cost" study will be the System Program Office (SPO). Focal point in AFCMD will be the Directorate of Production Administration and within the AFPRO at the contractor's facility. This Memorandum of Agreement serves to clarify the normal AFCMD/SPO/SAMSO "should cost" responsibilities.

Summary

Air Force contract management, as it is known today, underwent many changes since it began in 1908. Its growth

in the aircraft industry environment evolved into the establishment of the Air Force Contract Management Division. Officially activated in 1965, Headquarters AFCMD became the primary Air Force agency with the responsibility for performing field contract management functions at assigned Air Force contractor plants.

Headquarters AFCMD has been an active participant in the Air Force "should cost" program, and has demonstrated that assigned personnel can conduct and take part in these studies effectively. Specialists such as industrial engineers, contract price analysts and contract specialists have conducted a number of "should cost" reviews of contractor proposals for the purpose of identifying inefficient practices and procedures.

It is important to note that a Memorandum of Agreement was issued by SAMSO and Hq. AFCMD to aid in the coordination of activities between government organizations for selected SAMSO procurements. This MOA is a major step toward improving coordination of "should cost" studies conducted by the buying activity and the Contract Management Division.

By frequent participation in "should cost" reviews, Hq. AFCMD personnel are acquiring a capability for conducting

these studies effectively with only minor support from other government agencies.

CHAPTER IV

THE AIR FORCE PLANT REPRESENTATIVE ROLE

Organization and Functions

The in-plant administration of large government procurements with major defense contractors is carried out through a network of Air Force Plant Representative Offices (AFPROs) under the direction of Hq. AFCMD. The primary function of these offices is to insure that the terms and conditions of all government contracts in the plant are met and to protect the rights of the government. To perform this function, specialists are assigned within the AFPRO organization to monitor and evaluate contractor activities in: (1) Management Support, (2) Contract Administration, (3) Production Administration, (4) Quality Assurance, (5) Development Engineering, and (6) Flight Operations.

Although there is much commonality in AFPRO functions among the 19 detachments, certain basic differences should be mentioned before presenting the "standard" AFPRO. To begin with, each AFPRO must conduct its contract administration activities in such a way that it incorporates the

contract specifications, needs of the buying activity, and the contractor's management system. The nature and extent of each AFPRO's involvement with the contractor varies substantially depending upon the variations of contractual requirements and differing products. Secondly, the AFPRO may provide services for a number of buying activities with a wide range of contract types, sometimes requiring unique surveillance and evaluation techniques. It is important to understand the above situation before presenting the standard function of the AFPRO organization. Its omission could result in an erroneous conclusion that all AFPROs are exactly the same and can perform identical functions.

Individual AFPROs, though differing in size and scope of operation, are however fairly well standardized in organizational structure. The standard organizational chart for all AFPROs within AFCMD is shown in Figure 5. It should be noted here that virtually all major defense contractor plants have an AFPRO organization in residence. In addition, Air Force Contract Management Offices (AFCMO) are strategically located at the major test sites throughout the United States, as noted in Figure 6. Within each of the standard AFPRO organizations specific responsibilities are designated for each of the six divisions.

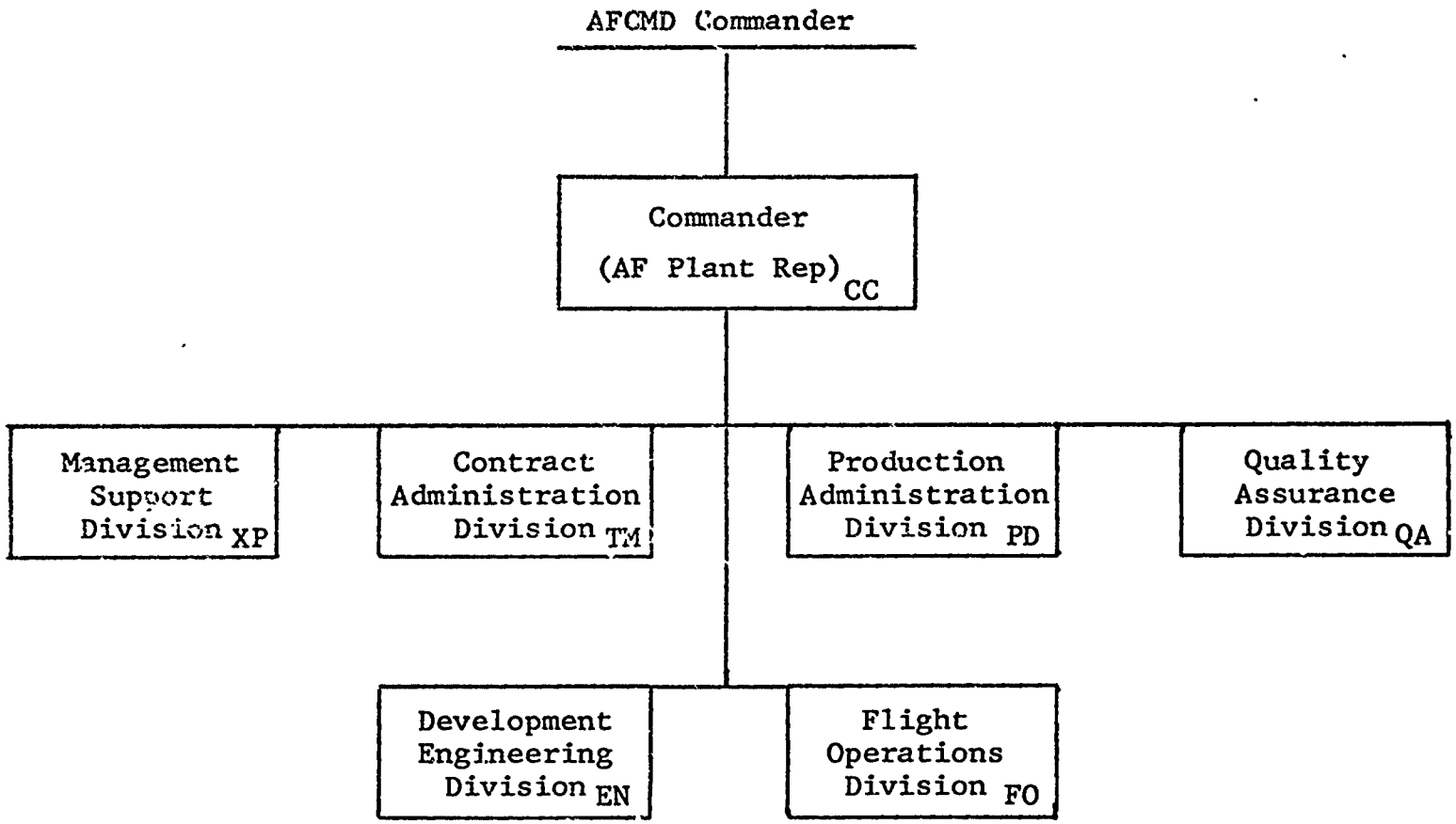


Fig. 5.--Standard AFPRO Organization

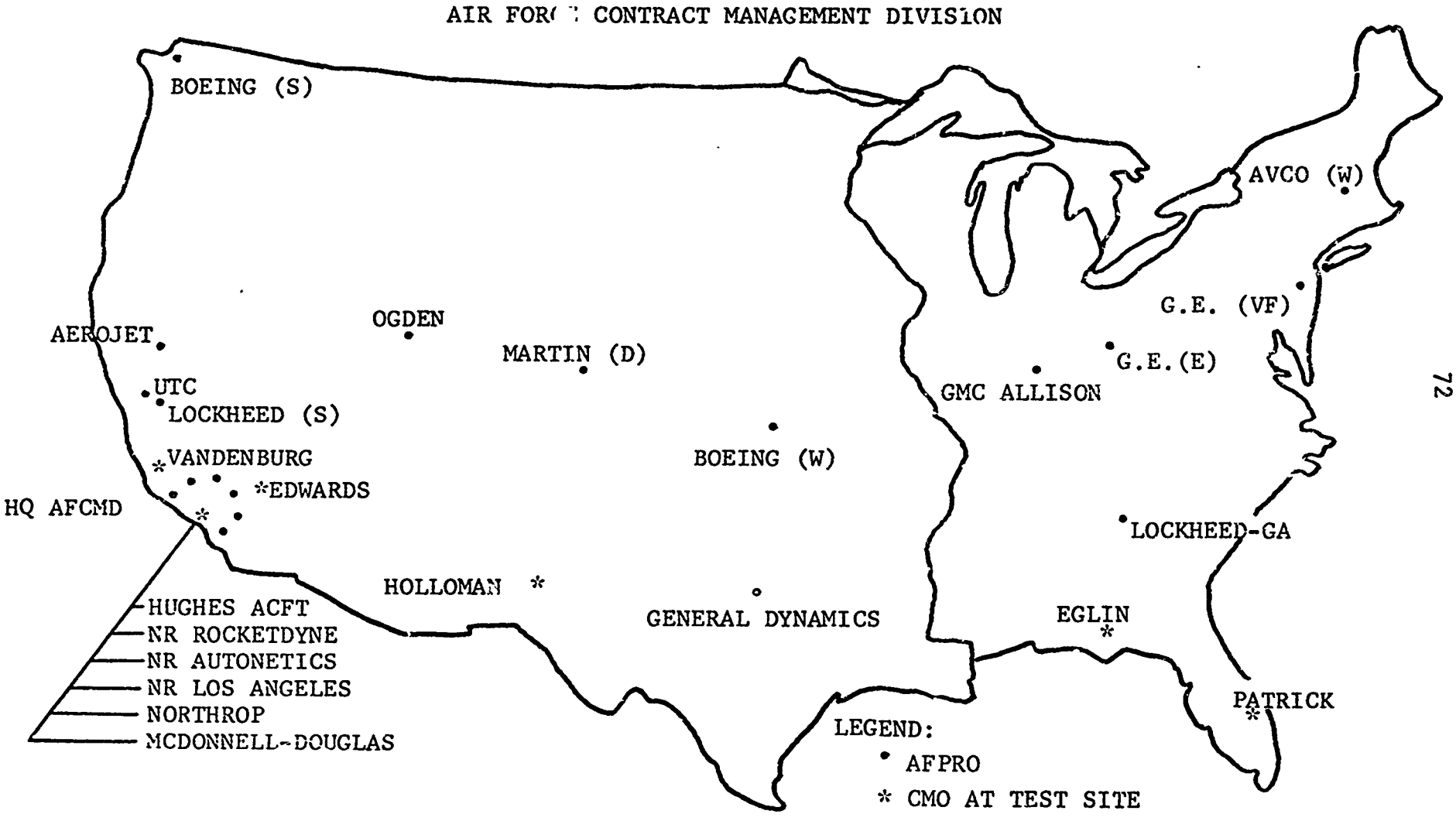


Fig. 6.--AFPRO and AFCMD Locations

Responsibilities

Contract Administration Division. The Administrative Contracting Officer (ACO) is responsible for assuring that the contractor performs in accordance with the written intent of the contract. On an as needed basis, he determines the requirements under the contract. The division provides policy guidance to contract specialists and price analysts in all matters pertaining to contract administration. They develop price objectives, perform cost and price analyses on contractors' proposals, and particiapte in contract negotiations. They also coordinate as well as participate in AFCMD initiated "Should Cost" Reviews at the AFPRO in conjunction with the Production Administration Division. In addition, they analyze, evaluate and approve contractors' systems, written procedures and actual practices for acquisition, control, utilization, movement and disposal of all government property to ensure conformance with contractual obligations. This division has primary monitoring responsibility for selected Acquisition Information Management System (SAIMS) including Cost/Schedule Control System Criteria (C/SCSC). Contracts, pricing, and industrial material management branches are established to accomplish the division's objectives.

Production Administration Division. The Production Administration Division performs systems analysis to determine the effectiveness of contractor production management systems in providing economical and timely delivery of items being procured. They perform industrial engineering evaluations of contractor proposals in areas such as Make-or-Buy, Engineering changes, Value Engineering, and manufacturing methods. They evaluate and make recommendations on contractor's proposals for acquisition, modernization and non-recurring maintenance of government-owned facilities and equipment. In addition, they perform industrial engineering evaluations and make recommendations on contractors' cost proposals as requested by the Contract Administration Division. They also coordinate with the Contract Administration Division in support of AFCMD Should-Cost Reviews at the AFPRO. The division is subdivided into the Industrial Engineering Branch and the Industrial Support Branch.

Quality Assurance Division. The Quality Assurance (QA) Division performs those functions concerned with the verification of quality and reliability for products and services furnished to the government. They review cost reduction proposals, make Quality Assurance evaluations of contractor proposals during pre-negotiations, negotiations,

pre-award surveys and contract performance. The division implements the contract management Quality Assurance Program. The policies and procedures, quality assurance engineering, and material quality branches are subunits of the division. Together, they implement the objectives of the quality assurance program.

Development Engineering Division. The Development Engineering Division serves as an extension of the buying activity to perform technical reviews and direct engineering support as required at the plant level. They provide surveillance of contractor's design, development, and product improvement engineering efforts. They provide detailed surveillance of contractor engineering practices with regard to selection and procedural control of sub-contractors. The division reviews engineering studies, designs and proposals, and makes recommendations to the procuring agency. They also participate in reviews and surveys of the contractor's cost estimating and accounting methods. Finally, they assist in analysis, fact finding, and negotiation of contractor engineering cost proposals as required. The division has the general responsibility for surveillance over the engineering management, configuration management, systems effectiveness, development, test, and evaluation

efforts made by the contractor in the technical areas of the contract.

Flight Operations Division. The Flight Operations Division is established in the AFPRO on an as needed basis. It provides assigned personnel with supervision and guidance for aircraft flight acceptance/safety and standardization/evaluation flight tests and acceptance of aircraft. (32:5-15)

In summary, the AFPRO serves as an on-site coordinated team of functional disciplines--a contract management extension of the government buying activity at the contractor's plant. It evaluates the contractor's management system and determines whether or not the contractor is actually using the system. The AFPRO monitors the contractor's performance, planned versus actual, from the quantity, quality, time and cost viewpoints, on behalf of the government. It serves as an indispensable communication and coordination bridge across the usual separations between the contractor and the government buying activity.

Should Cost Capabilities Within The AFPRO

The AFPRO with its specialized make-up, together with the resident Defense Contract Audit Agency (DCAA), contains essentially the expertise needed to conduct "should cost" studies. As has already been pointed out, AFPRO

personnel have participated extensively in "should cost" studies conducted thus far in the Air Force. In addition, certain tools are now available in most major defense contractor plants which provide needed information to conduct "should cost" studies. These tools, such as Cost/Schedule Control System Criteria (C/SCSC), and Probability of Incurring Estimated Cost (PIECOST), generate performance measuring information and forecast overhead expenses. These tools can provide much of the information needed to conduct "should cost" studies.

Production. Production normally accounts for the expenditures of more funds than all the previous phases in the life cycle. For this reason, production management must assure that contractors are specifically tasked and controlled to optimize production efficiency. They attempt to maintain this efficiency through surveillance of the schedule and continuous appraisals of the design versus manufacturing requirements.

Production management personnel participate throughout program planning, design, development and production to assure that production feasibility is properly assessed. This participation is meant to insure that preparations for quantity production results in the most economical and

efficient use of manpower, materials, machines, facilities and methods. The intended purpose of this type of surveillance of contractor production operations is to provide sufficient depth for full protection of the interests of the government.

Industrial engineers and production specialists continually survey industrial processes, techniques, and controls involved in manufacturing and delivery to determine if the program plan and milestones are being achieved. They strive to anticipate potential problems so that appropriate action may be taken to prevent or minimize possible adverse effects.

AFPRO production management tasks associated with the assessments of production operations include:

(1) Reviewing and assessing contractor prepared production plans, producibility analysis, make-or-buy plans and recommendations for improvement or approval.

(2) Providing technical support and assistance to engineering inspections, configuration control reviews, cost appraisals, pre-award surveys and negotiations.

(3) Monitoring production planning and production progress in sufficient depth to provide program management with visibility of production status, immediate advice

concerning production difficulty, and recommendations.

(4) Analyzing manufacturing methods and recommending the application of new technology as appropriate.

(5) Assuring the adequacy of the prime contractor's procedures and controls for the implementation of production management requirements for subcontractors and vendors. (43:4-5)

The above selected production tasks represent a sampling of the capabilities available within the AFPRO. Industrial engineers and industrial specialists implement liaison and operating procedures via these tasks to assure effective government involvement with the contractor. With the above capabilities, the AFPRO presently possess many of the needed skills required to conduct "should cost" reviews.

Contract Administration. Contract administration covers a multitude of functions and responsibilities as pointed out earlier in this chapter. Many of these functions are identical to those required during "should cost" studies. Although these functions may not normally be performed to the depth required in "should cost" studies, the capabilities nevertheless do exist in the AFPRO.

The Administrative Contracting Officer (ACO) is regarded as the head of the contract administration team and

is responsible for assuring that the contractor performs in accordance with the written intent of the contract. It is appropriate to present some of the ACO's responsibilities, which in turn reflects the capabilities of this particular area. Included in the area of contract administration are the primary tasks of cost and price analysis, financial analysis, negotiation of contract changes and administration of government-owned property.

Contract cost and price analysis is used to establish the basis for negotiating contract price when price competition is not adequate, lacking altogether, or if price analysis, by itself, does not assure a reasonable price. Contract cost analysis is the review and evaluation, element by element, of the cost estimate supporting a company's proposal. The analysis includes a review of the back-up cost or pricing data and the factors the contractor considered in projecting the data to develop his estimate of cost to perform specific tasks. After completing the analysis, the conclusion concerning what the contract performance should cost is used to develop the government objective for the contract negotiation. The ACO is responsible for performing cost analysis on selected proposals, striving to determine if the total cost estimates

approximate the dollars it actually should cost to perform the contract if the contractor operates with reasonable economy and efficiency.

The ACO i . so responsible for monitoring the contractor's financial status, and as such, depends heavily on the services of DCAA personnel in this area. Although their role is advisory in nature, their services are indispensable in the procurement system. DCAA agents, usually assigned in the contractor's facility, provide financial information and advice to those responsible for administering government contracts. Their primary interest is : the adequacy of the contractor's policies, procedures, pra : es and internal controls relating to accounting, estim ting and procurement. The auditors evaluate the contract r's management policies and decisions affecting costs. They analyze the financial capabilities of the contractor and the appropriateness of contractual provisions having accounting or financial significance. Additional services include the evaluation of the adequacy and reliability of the contractor's records for government-owned property. The services rendered by DCAA complement the ACO's activities in the fields of financial analysis and administration of government-owned property.

One of the prime responsibilities of the ACO involves the processing of contract modifications. The ACO has the responsibility for conducting negotiations and executing supplemental agreements to effect changes within the general scope of the contract. Negotiations are conducted under the authority of the ACO, with the assistance of engineers, cost and price analysts, auditors, packaging specialists, and other technical specialists, as appropriate. Upon completion of the negotiation and the mutual understanding between the ACO and the contractor, a supplemental agreement is prepared, executed and distributed. This combined effort constitutes a major requirement of the contract administration function and points up the ACO's continued involvement in negotiation methods and procedures.

Engineering. The engineering divisions provide surveillance of the contractor's design and development engineering activities. They review engineering studies, designs, and proposals making recommendations as needed. Development engineers evaluate engineering change proposals as well as contract changes to assess their impact on the entire program. They evaluate the contractor's management, planning, scheduling, and allocation of engineering resources.

The engineering division also has the capability and responsibility of evaluating contractor engineering disciplines such as his reliability, maintainability, systems safety and personnel subsystems programs. They review on a continuing basis the contractor's development test plans, and directives for compliance with contract terms, comparing milestones, progress, and cost against contract requirements. They also assist in analyzing, fact finding and negotiations of contractor engineering cost proposals as requested.

Quality Assurance engineers analyze product quality data and deficiency reports, investigate quality problems, perform trend analysis and obtain effective corrective action. They participate in pre-award surveys and pre-production conferences. Quality engineers collect, develop and analyze management data to assist in management of the total Air Force Quality Assurance Program. Finally, they assure that the contractor establishes and maintains an acceptable quality program and inspection system in accordance with contract requirements.

All in all, the AFPRO engineering disciplines provide surveillance of the contractor's design and development engineering activities, evaluate changes and participate in

negotiations as required. These capabilities, coupled with those of quality assurance engineering, provide the AFPRO with all the technical skills required for contract management and pre-negotiation analyses.

Probability of Incurring Estimates Cost (PIECOST). The PIECOST concept is a relatively new technique to the government acquisition process. Its use is still in the development stage, but is rapidly proving its worth. PIECOST is unique in that it can be used to some degree for performance measurement as well as a negotiation tool for forward pricing.

Contract costs may be identified as either direct or indirect costs. Direct costs are normally readily identifiable with the particular cost objective, whether a product or service. Due to their relative ease of identification, direct costs may be analyzed and evaluated with considerable precision. Indirect costs, however, are not as visible because they are rarely tied to specific objectives. Indirect costs are defined as any costs which cannot be traced directly to a contract requirement. Indirect costs, commonly referred to as overhead, includes a wide variety of expenses which have been incurred in support of a number of cost objectives.

In the past, indirect costs have never been seriously considered for rigid cost analysis because of their vagueness. Researchers have directed their efforts primarily toward the development of direct cost estimating techniques, expressing indirect costs simply as a percentage of a direct cost, usually direct labor hours. Traditionally, overhead rates; i.e., indirect costs have been calculated in this manner for defense contracts.

Colonel James R. Ourand, Director of Contract Administration at AFCMD, in a letter to all AFPROs at the completion of Phase I testing of PIECOST stated that "PIECOST . . . is a valuable tool for evaluating contractor's overhead proposals and assists in establishing the necessary framework from which the contracting officer can negotiate accurate Forward Pricing Rate Agreements . . . ." He goes on to say that PIECOST techniques have been successful in mathematically structuring indirect costs at two AFPROs resulting in sound tools for negotiating accurate forward pricing. With Phase III of the implementation plan being completed at Hq. AFCMD, soon all 19 AFPROs will have fully integrated PIECOST systems. The concept therefore is being accepted as a viable addition to the government's forward pricing methods for overhead analysis and determination.

Statistically, PIECOST is a state-of-the-art technique. The statistical tools used have been around a long time and are generally accepted as valid methods. What is unique however, is the application of these techniques in the PIECOST framework and in the procurement environment. The manager who will be using PIECOST as one of his tools in contract administration and negotiations does not need to be a statistician. He does, however, need to be familiar with the information that is presented from computer printouts.

The theory of the PIECOST concept, on the other hand, is somewhat complex. The complexity comes from an inherent reluctance to quantitatively relate indirect cost elements directly to other seemingly unrelated cost elements. The PIECOST model isolates ten separate areas of indirect cost (dependent variables) expressing each as a function of another cost incurring element (independent variable). In many cases the relationship between selected variables is not apparent, however information obtained from a substantial number of large defense contractors has verified these relationships with confidence factors (percent of explained variation in the dependent variable) ranging from 81 to 99 percent. Confidence factors of 90 percent or better are

considered excellent whereas 80 to 89 percent is considered acceptable.

PIECOST is an important tool in establishing the government's position for forward pricing rate negotiation, and an advancement toward putting the government on a near real time basis for surveillance of contractor cost incurrence trends. Its use in the pricing process focuses attention on the factors which drive indirect costs. PIECOST covers the total area of overhead, is amenable to rapid calculations and offers a uniform method for overhead determination. Within the AFPRO system the PIECOST method is rapidly becoming a proven technique to evaluate and negotiate the total overhead dollar value.

Cost/Schedule Control System Criteria (C/SCSC). Before discussing C/SCSC, it is important to understand how it fits into the Selected Acquisition Management Information System (SAIMS). SAIMS gives the AFPRO the same summarized information as the contractor's top management uses, showing how he budgets, what his milestone progress expectations are, and the actual results of his efforts. This information allows the government to incrementally follow the contractor's effort as he moves along a cost, schedule, and technical performance baseline toward program completion.

The data generated serves as a basis for determining funding and for effective cost control. It provides an audit trail for actual cost history and can be used in estimating future programs.

Every contractor has systems for budgeting, scheduling and authorizing work, and an accounting system for accumulating costs. In many cases however, these systems were developed independently and may even operate independently of each other. (8:44) One fundamental requirement of the C/SCSC is that these systems be integrated. This only means that a work authorization should contain an appropriate budget and schedule, and that cost should be accumulated on the same basis as the budgets, thus making it possible to compare planned costs with actual costs. Simply comparing actual costs to budgeted costs for work scheduled does not give a true picture of the status of a contract, however. It only tells whether or not money is being spent as fast as it was planned to be spent, and does not take into consideration the schedule conditions. The budgeted cost for work performed quantifies the schedule position in terms of planned cost providing a much more accurate cost picture. This cost information is a basic ingredient in evaluating cost proposals during "should cost" studies. (5:34)

The textbook definition of Cost/Schedule Control System Criteria is a broad set of five basic criteria which the contractor agrees or certifies contractually that he will utilize throughout the life of the contract. The criteria dictates no particular set system--only a framework for management planning and control. Its purpose is to achieve a single integrated planning and control system that fulfills both the contractor's internal management needs and the Air Force's needs for cost and schedule problem identification.

Each of the five areas of C/SCSC is concerned with a different aspect of the contractor's information system. Each provides the minimum framework the system must meet to generate the necessary information for control and reporting. The five areas together provide the entire set of minimum criteria for the system. The orientation and major provisions of each of the five areas of the criteria are as follows:

(1) Organization Criteria. Criteria in this area set minimum standards for the contractor to meet in organizing to perform the work required by the contract. During this phase, work elements and corresponding responsibilities are defined for integration into the contractor's internal

organizational structure. To accomplish this, the contractor must: (1) define all work to be done to support the contract, (2) identify the sub-contractor or element in his own organization that will be responsible for the work, and (3) provide for integration of the work into his organizational structure. The contractor's system is also required to provide for reliable performance measurement once the contract work begins.

(2) Planning and Budgeting Criteria. In this area the contractor is required to separately schedule and budget for the elements of work identified under the organization criteria. In addition, all contingency funds must be identified and assigned to specific managerial positions for control. Another provision requires the total of budgeted work and management reserves be used to establish a budget baseline for the contract. This is later used as the basis against which performance is measured.

(3) Accounting Criteria. This criteria establishes minimum standards for the contractor's accounting system. One requirement prohibits application of costs to contract cost accounts prior to the accounting period in which work is performed. All costs incurred--both direct and indirect--will be applied to the appropriate cost accounts. Finally,

the contractor's system is required to provide unit costs for completed units and provide a traceable audit trail that can be used to verify those costs.

(4) Reporting Criteria. This area consists of criteria establishing management analysis standards for the contractor's information and management systems. The basis for analysis is provided by requiring the contractor's system to generate monthly totals of costs in three categories: (1) total budgeted costs for work scheduled to be completed must be available for each work element, (2) total budgeted costs for work actually performed on each work package must be available, and (3) actual costs incurred in performing the completed work must be collected and totaled for each work package. The contractor is then required to analyze variances calculated from these totals. Actions to identify and correct problems that created the variances are also required.

(5) Revisions Criteria. The final area of the criteria deals with maintenance of the budget baseline established under the Planning and Budgeting Criteria. During actual contract performance, contract changes may alter work requirements. The contractor may then readjust the work schedules or assignments. The revisions criteria requires

that the contractor separately budget the effects of these changes and integrate them with the original budget. Changes requiring added work and cost are added to existing budgets and those reducing work are subtracted. The final requirement of the criteria is for the contractor to project the effects of changes and cost variances to give a revised estimate of the total contract price at the completion of all work.

The data generated by C/SCSC, if effectively utilized by the AFPRO, can prove very beneficial to the government. Since budgets are compiled from the accumulation of small work efforts, any schedule or cost deviation is quick to appear and is relatively easy to detect. If a determination is made that improved techniques or actions could eliminate the deviation, correction action can be taken to avoid further deviations.

In summary, C/SCSC establishes minimum standards and general guidelines for the contractor's own management information system to meet. It requires the contractor's system to be built on the same data base used for accomplishing the work. In this way the government can assess the contractor's management and the quality of his internal system. Variations detected through the system provide

possible indications where inefficient management practices are being used. In-plant government personnel can then assure that improvements by the contractor are initiated and fully implemented for future savings. C/SCSC is not a cure-all. It only shows symptoms of a problem. It is a tool designed for the AFPRO to aid in the task of achieving efficient contract management.

Defense Contract Audit Agency. The DCAA is organized as a separate agency of the Department of Defense under the control and direction of the Secretary of Defense. The agency is not part of the AFPRO although most defense contractors containing AFPROs also have in-plant DCAA representation. It is organized into an agency headquarters with seven regional headquarters and resident, branch and liaison offices as shown in Figure 7.

The agency headquarters furnishes representation and counsel for activities requiring contract audit participation. They prepare all directive material needed for the management of the duties and affairs of DCAA. The seven regional offices provide direct supervision over the branch offices and resident offices. The seven branch offices are located in the major metropolitan areas of the United States and audit the smaller defense contracts on a traveling basis.

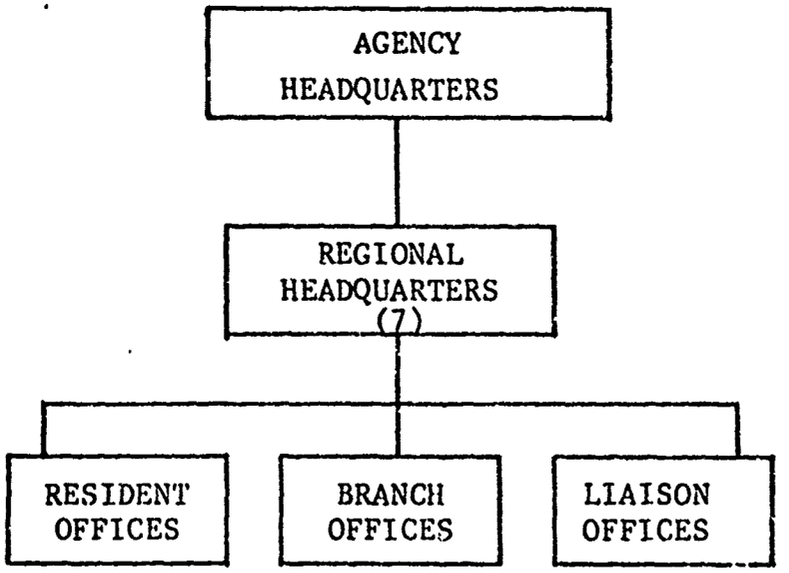


Fig. 7.--Defense Contract Audit Agency Organization

The resident offices, however, are permanently located at plants and offices of major defense contractors. Approximately 90 percent of all DCAA personnel are located in the resident and branch offices which cover almost every major defense contractor in the country. (24:3)

Basically, the role of DCAA is to provide financial information and advice to those responsible for procurement and the administration of government contracts. Their purpose is clearly stated in DOD Directive 5105.36, "Defense Contract Audit Agency," 9 June 1965. It states:

> The purpose of contract auditing is to assist in achieving the objective of prudent contracting by providing those responsible for procurement and contract administration with financial information and advice on proposed or existing contracts and contractors, as appropriate. Audit services of the Defense Contract Audit Agency shall be utilized by procurement and contract administration activities to the extent appropriate in connection with the negotiation, administration, and settlement of contract payments or prices which are based on cost (incurred or estimated), or on cost analysis. (38:2)

The purpose of the service therefore "is to assist in achieving . . . prudent contracting."

The auditor is not responsible for prudent contracting but is only responsible for providing a professional audit service which may assist in achieving prudent contracting. DCAA services are therefore primarily advisory

in nature. These advisory services will result in greater effectiveness and efficiency only to the extent that the service is utilized.

The DCAA role is not only important to the procurement system as a whole, but it is an essential part of any "should cost" study. The agency helps to provide answers to questions like:

(1) Is the contractor financially able to complete the contract?

(2) Will the contractor's accounting system and practices allow for identification and segregation of necessary cost data?

(3) Is the price fair and reasonable?

(4) How did the contractor arrive at his cost estimates? (38:5)

The DCAA provides pre-award services depending primarily on the nature of the item to be acquired and the amount of the competition available for the particular procurement. These services are designed to provide information to the ACO so that he may satisfactorily answer the above questions. If the resident office is located at the contractor's plant, the agency will have already made periodic reviews of the contractor's price estimating

system, accounting system and pricing system. They should have the historical data needed to determine if the contractor's accounting system and practices of accumulating costs are adequate and suitable for an anticipated contract.

The agency also assists in the review of a contractor's purchasing and subcontracting methods as well as determining the allowability of specific contract costs. These reviews and evaluations provide the contracting officer with much of the data needed for effective price negotiations.

The PIECOST system presented earlier in this chapter is greatly influenced by the nature and quality of the auditor's report. Almost any element of cost projection and forward pricing depends a great deal on the mechanics of the accounting system to which it applies. The DCAA's evaluation and advice in this regard helps to establish the base and subsequent accuracy and reasonableness of the contractor's cost picture.

The above brief description of selected DCAA audit services should demonstrate the need for these services in the pre-negotiation and pre-award phases of contract procurement and administration.

Participation in "Should Cost" Studies

The Air Force Plant Representative Office has been an active participant in "should cost" studies conducted in the Air Force. Numerous AFPRO personnel have taken part in these studies as either team members or by providing assistance to the teams during plant visits.

Headquarters, Aeronautical Systems Division (ASD) has completed six "should cost" studies thus far reflecting the highest number of completed studies in any one division in the Air Force Systems Command. Examining the data available for ASD conducted "should cost" studies, it was determined that over thirty-three percent of the team members on these studies were provided from the CMD/AFPRO environment (see Table 1). This percentage reflects only direct participation and does not include AFPRO specialists assisting during plant visits. The total involvement in these studies would obviously be much higher when considering both direct and indirect participation. Quite recently a successful "should cost" study was conducted using primarily specialists from AFCMD and the AFPRO. The buying activity was represented solely by the Procuring Contracting Office. This particular study, although conducted for another service, highlighted the fact that capabilities

TABLE 1

"SHOULD COST" STUDIES TEAM COMPOSITION

"Should Cost Studies	Contractor	SPO	AFCMD/AFPRO
F-5	Northrop	9	8
SRAM-72	Boeing	20	17
APQ-99/APQ-122 (V) 7	Texas Instruments	7	0
ACES II	McDonnell Douglas	5	4
T-43 Avionics	IT&T	12	2
Mark XII		14	5
	Totals	67	36

presently exist in the CMD/AFPRO environment to conduct "should cost" studies.

Specialists from most divisions in the AFPRO have been utilized in "should cost" studies, either directly or indirectly. The majority of AFPRO "should cost" team members, however, have been industrial engineers assigned to the Production Division. In fact, over 46 percent of the AFPRO team members in ASD studies were industrial engineers (see Table 2). Other specialists included development engineers, price analysts, contract specialists and quality engineers.

TABLE 2

AFCMD/AFPRO PARTICIPATION IN AIR FORCE "SHOULD COST" STUDIES

	Industrial Engineer	Price Analysis	Mechanical Engineer	Engrs. (Other)	Contract Spls.
AFPRO	12	3	3	5	1
AFCMD	2	1	2	0	0

Analyzing the questionnaires received from all 19 AFPROs, it was determined that 75 percent of the industrial engineers polled had previously participated in "should cost" studies. This high participation rate is not considered unusual in light of the fact that production efforts account for the expenditure of more funds than all previous phases in the life cycle. Maximum emphasis should therefore be placed in the industrial engineering areas. Their activities include the evaluation of the contractor's proposal in the area of make-or-buy, engineering changes, value engineering and industrial processes.

Next in the order of utilization were the price analysts. They were used on the "should cost" team to analyze the contractor's proposal, element by element, to

evaluate the cost estimates supporting the proposal. Cost analyses are required throughout all "should cost" studies and are an extremely important function of "should cost" studies.

As can be seen by examining past "should cost" studies, AFPRO personnel have actively participated in these studies both directly and indirectly. Judging from the past, specialists from most divisions in the AFPRO have taken an active part in "should cost" studies and will continue to do so in the future.

Summary

Large government procurements with major defense contractors are carried out administratively through in-plant Air Force Plant Representative Offices (AFPROs). Their main function is to insure that the terms and conditions of the agreed upon contract are carried out accordingly. To perform this function, specialists are assigned within the AFPRO organization to monitor and evaluate contractor activities in (1) Management Support, (2) Contract Administration, (3) Production Administration, (4) Quality Assurance, (5) Development Engineering, and (6) Flight Operations.

Specialists in the AFPRO include industrial, development, and mechanical engineers, contracting officers, and price analysts. These specialists, in conjunction with DCAA personnel and using the added capabilities provided by C/SCSC and PIECOST, make up a combined capability which can be compared to the criteria for "should cost" analysis.

CHAPTER V

CRITERIA AND CAPABILITIES COMPARED

Introduction

In the preceding chapters we have attempted to create a suitable framework for comparison of established "should cost" criteria to the capabilities of a permanent organization within the weapons acquisition process of the Air Force. The functions and capabilities of the AFCMD/AFPRO organization appear to be relevant to the established criteria. A preliminary examination indicates that a number of common characteristics exist between the two activities, even though their coexistence in the early stages of the procurement process may appear incongruent.

The desirability of early AFCMD/AFPRO involvement in a production procurement is obvious: (1) since the contractor's proposal represents the overall plan for the contract effort, detailed familiarity would provide cumulative benefits to contract administration; (2) early awareness of the contractor's specific operational and managerial strengths and weaknesses will enable the contract administrator to

concentrate his efforts on potential problem areas before they can create unnecessary cost impacts; (3) the close association with other specialists in a concentrated team effort, having cost effectiveness as its common goal, would foster continued efforts toward this goal; and (4) since "should cost" relates cost to efficiency and economy, a certain "spill-over" benefit could be realized in other non-production oriented contracts.

We established earlier that the focal point for determining the effectiveness of the "should cost" concept was in the team itself. It follows, therefore, that in order to determine the feasibility of permanently implementing the concept, the organization under study should be capable of providing a team which meets the effectiveness criteria established. The factors of time, team quality, team size and composition, in the context of the complexity of the task must be taken into consideration. We must now critically examine these factors and the interrelationships of the concept and the organization to determine if feasibility exists.

Time Factor

It was recognized very early in the process of compiling information for this report that the time factor

might present some serious roadblocks to the permanent implementation of the "should cost" concept. Time, that is its availability, for application to additional tasks is something that no organization normally has to spare. Time, of course, can be made available for additional tasks, but only at the expense of normal work priorities and quality of output. If time is to be made available within the AFCMD/AFPRO organization as it exists today, then we must assume that the quality and timeliness of the presently assigned contract administration tasks would suffer some degradation.

We specifically addressed this point in the questionnaire to each of the 19 AFPROs. The AFPRO members were queried as to their assessment of their normal job effectiveness while participating in a "should cost" study. Specifically, we asked if they could take part in a "should cost" analysis and still remain effective in their normal job. Responses came from four disciplines within the AFPRO: Pricing, Industrial Engineering, PIECOST, and C/SCSC (Table 3). The responses received clearly showed that our assumption regarding normal job degradation was indeed well founded.

TABLE 3. Relation of AFPRO Assessment of Normal Job Effectiveness While Participating in a "Should Cost" Study.

Question: "Considering your present workload, could you effectively participate in a 'should cost' study and still maintain effectiveness in your job?"

	Yes	No	Unknown	N
Pricing	1	18	0	19
Production	2	23	0	25
PIECOST	5	13	0	18*
C/SCSC	3	15	0	18*

*PIECOST and C/SCSC representatives were not specifically designated at two of the AFPROs.

To further assert the validity and the relevance of these responses, two pertinent points should be made. First, of the AFPRO members queried, 45 percent had participated in one or more "should cost" studies and therefore could form an assessment based on their own experiences. Second, the predominant reason given for the "No" responses was austere manning conditions now prevailing in the organization. The implication was that time could and, in fact, had been made available for special "should cost" studies, but without adequate manpower resources to fill the void left during absences, the normal job tasks were necessarily delayed or left undone. This finding is relevant in that it introduces a relationship between the availability of time and manpower

constraints.

Another question addressed to AFPRO members requested their appraisal of AFPRO manning with regard to the addition of a "should cost" function (Table 4). This question was originally intended for evaluation under the quantity aspects of "should cost" team participation, but it

TABLE 4. Relation of AFPRO Manning to the "Should Cost" Function.

Question: "Would you say the AFPROs are presently manned for a 'should cost' function? If not, what areas are inadequate?"

	Yes	No	Unknown	N
Pricing	1	18	0	19
Production	4	21	0	25
PIECOST	6	11	1	18
C/SCSC	4	14	0	18

soon became apparent that its relationship to time was equally appropriate. As Table 4 shows, 80 percent of those questioned indicated that they did not feel the AFPRO was presently manned for the addition of a "should cost" function. Previously, Table 3 showed that 86 percent felt that their present workload would be affected by such an addition, due principally to the lack of adequate manpower back-up. The significance of these two relationships lies in their

limiting effect upon the AFPRO members time for additional special projects. It appears, therefore, that any permanent implementation of the "should cost" function in the AFCMD/AFPRO structure would necessitate a consideration for additional manpower as well. Without such a consideration, the effectiveness of the function would be seriously hampered due to the lack of available time for comprehensive analysis. If the in-depth feature of the "should cost" study is allowed to deteriorate because adequate time is not available, then the true objectives of the concept cannot be obtained. Should this be the prospect we face from permanent implementation, then there is simply no point to it.

Our interviews with "should cost" study participants gave us reason to believe that limitations on the availability of time would not be a factor if and when the concept is permanently implemented. The Air Force's primary control group for "should cost" activity during the past two years has been coordinated and directed by the Procurement and Production Division of Hq. ASD. Interviews with the division director, Colonel James Coleman, and members of his staff, indicated that limitations on time were never imposed for any of their study efforts, and in fact, this was a key factor to their success. (3) This was found to be true of

the studies conducted by SAMSO and Hq. AFCMD as well. It was evident that the "should cost" efforts have in the past received the necessary priority and high level backing to enable them to assign full-time members and retain their services for the required duration of the study. If it can be assumed that the "should cost" concept will continue to enjoy this kind of priority, then the availability of time in a permanent application should not present a problem.

It becomes apparent that time is a critical factor to the success of a true "should cost" effort. It is important not only from the standpoint of adequate duration, but full-time availability of the team member's time as well. The AFCMD/AFPRO organization would have difficulty meeting this requirement if the concept were permanently implemented without consideration for additional manpower at the same time. The time could be made available, just as it has been in the past, but we know that this occurs at the expense of the normal day-to-day tasks assigned to the AFPROs.

Quality Factor

The term quality is not easily defined, primarily because its measurement is normally a matter of degree and perceived value relative to a product or service. In order to speak in terms of quality, therefore, one must assign a

framework within which the term will be assessed. For the "should cost" function, quality should be discussed within the framework of two distinct but necessarily complementary functions; that of management, and that of research. We discussed in Chapter II the need for uniquely qualified individuals, highly dedicated and motivated to the use of management and research methods. The AFCMD/AFPRO organization must be able to produce individuals who possess these qualifications for an effective on-going capability in "should cost" to exist.

(1) Management. Perhaps there is no more important area of human activity than management, since its task is to establish an environment for effective operation of people working in organized groups. The principles relating to effective management techniques and procedures is embedded in the AFCMD/AFPRO organization. As their title implies, they are managers of defense systems contracts. The function of a manager is essentially the same if he is a first-line supervisor or the top executive of an enterprise. The environment may differ, the scope of authority held may vary, the types of problems dealt with may be considerably different, but the fact remains that, as managers, all who obtain results by establishing an environment for effective groups

endeavor undertake the same functions. (11:1) Management of defense contracts is, of course, different from the management requirements of an in-depth cost analysis activity. The difference, however, is not so great as one might think. We know that a "should cost" study requires planning, staffing, coordinating, directing, and controlling; all of the basic principles of management. But these same principles apply to the management of defense contracts as well. To reiterate, the basic principles relating to the task of managing apply to any group enterprise.

The AFCMD/AFPRO organization is indeed in the business of management. We saw in Chapters III and IV that the organizational structure is composed of specialized divisions, both in Hq. AFCMD and each AFPRO. These divisions, representing the functions of pricing, contract administration, industrial engineering, quality assurance, and management support are managed in essentially the same environment as that required by a "should cost" study. The "should cost" team activities are largely those of a communicative, problem-solving nature utilizing specialists in the functions which now exist in the AFCMD/AFPRO structure. The AFCMD/AFPRO organization, like the "should cost" groups, operates as a coordinated team. Ideas, facts, and logical information

are communicated in such a way that they may be utilized by the team. In other words, both organizations, because of the complexity of their environment and their individual goal structure, depend on team efforts directed toward common objectives.

To be sure, management is not an exact science. We know of no universities which turn out pure managers, just as there are none who offer graduate leaders. The quality of managers must be judged by the results of past performance. During our research, we were interested to learn of the extent to which members of the AFCMD/AFPRO organization had participated in the management functions of "should cost" studies. Through our interviews with "should cost" team leaders we found that they all generally supported the view that the management functions could be accomplished by an experienced manager in the field of contract administration. We further noted that Hq. AFCMD, in particular, was already involved with many of the management functions of "should cost" as indicated by their close association with SAMSO "should cost" studies. (Reference the AFCMD/SAMSO Memorandum of Agreement, Appendix B.)

In summary, one must recognize that management expertise, while not always explicit or standardized in its

application, exists for the most part as a function of the results obtained. Managers in one environment can be successfully transposed to another environment. The environments we are addressing now have a great number of similarities, both in the management principles used and the functions utilized in their operation.

(2) Research. In addition to managerial functions, an effective "should cost" team must apply the principles of scientific research. We established in Chapter II that the "should cost" concept is based upon in-depth analysis as a basis for the decisions leading to a supportable negotiation position. Decisions based on feelings, intuition, and plain guesswork can provide little substantive support toward this end. The research function of a "should cost" team must therefore be accomplished by individuals who possess the intelligence, capabilities, and the drive to find and solve the problems within the tasks they perform.

Our questionnaires to the AFPROs provided us with some insight into their qualifications as they perceived them. Two questions were specifically aimed at fields of specialty and skill levels (Table 5 and Table 6).

The responses to the questions regarding specialties and skill level indicated little doubt, at least in the

TABLE 5. Relation of AFPRO Specialties to Those Required by a "Should Cost" Study.

Question: "'Should Cost' studies normally require specialists in the fields of manufacturing, industrial engineering, organizational management, pricing, and contracting. Do you feel that the AFPRO possesses the necessary skills to conduct a 'should cost' analysis?"

	Yes	No	Unknown	N
Pricing	14	5	0	19
Production	23	2	0	25
PIECOST	17	1	0	18
C/SCSC	12	5	1	18

TABLE 6. Relation of Skills, Education, and Experience to Those Required by a "Should Cost" Study.

Question: "Do you consider your present skills, education, and experience adequate for effective participation in a 'should cost' study?"

	Yes	No	Unknown	N
Pricing	17	2	0	19
Production	24	1	0	25
PIECOST	18	0	0	18
C/SCSC	15	2	1	18

minds of the respondents themselves, that they have the specialties and the necessary qualifications to carry out an effective "should cost" analysis. It should be remembered

at this point that of these respondents, almost half had had prior "should cost" experience.

Still another question asked for possible upgrading or training which they thought might be required to augment their present skills. The responses to this question fell predominately into two categories: (1) orientation training in "should cost" techniques, and (2) additional training in specialized analysis techniques. The comments made earlier in Chapter II pointing out that some relative confusion existed in a few AFPROs on the true "should cost" technique lends credence to the emergence of the first response. The second response surfaced also in our interviews with "should cost" team leaders and members, some of whom were from the AFCMD/AFPRO organization.

In our interviews with previous "should cost" team members, we also approached the question of potential AFPRO research capabilities. We first asked if the team member's specialty was represented in the AFPRO where his study was conducted. All except one of the interviewees stated that his specialty was represented. The single negative response was due to the fact that DCAS, instead of AFPRO specialists, participated in this particular study.

Another question asked if the team member felt that his analysis could have been conducted by an AFPRO member. The overall response here was a qualified "yes." After investigating further, we learned that the team member generally felt that the pricing function could be accomplished by the AFPRO with little difficulty. They expressed consistent doubts, however, as to whether the other AFPRO functions could at this time perform the technical analyses to the depth required by a true "should cost" effort. They further held doubts as to the degree of objectivity an AFPRO member could maintain in his own plant. Interestingly, the AFPRO members themselves questioned their capabilities for detailed technical analysis of the type required for a "should cost" study. (Recall the previous discussion regarding training and upgrading as perceived by AFPRO members.) The question of objectivity is a moot point, and one which has been argued before. We know of no way to treat the question of objectivity, except through speculation, and therefore leave it for future debate.

Quantity Factor

We have found that "should cost" studies produce the best results when they can be tailored to fit a specific task. Flexible response to changing team sizes and

composition will be a recurring requirement of any permanent "should cost" capability. We saw earlier that austere manning is currently a problem in the AFCMD/AFPRO organization (Ref. Table 4). We find, therefore, that both Hq AFCMD and the AFPRO organizations, while containing the spread of functional specialties required for a "should cost" study, presently lack the manpower necessary to insure a flexible application of the concept. Many of the same problems apply here as they did under the time factor discussion. Again, to overcome this difficulty, a certain priority would have to accompany the permanent application of "should cost" in order to maintain overall effectiveness.

The outlook, however, even in the face of limited human resources, is not as bad as it may seem. Recall that we earlier stated that a "should cost" study team could be expected to require between 10 and 30 people. While the manning level for each of the four phases we discussed holds fairly constant, fewer actively participating team members are required in some phases than in others. Pictorially, the "should cost" workload seems to follow along the lines of a bell-shaped curve, with low starting manpower requirements, a high peak in the center, and then tapering off toward the end of the study. (14:23) This means that the

manpower drain on the parent organization would not hold constant for the entire team during the 20 week period usually required for all four of the study phases. It appears, theoretically at least, that the full-time services of the bulk of the AFCMD/AFPRO specialists would be required only during the peak data-gathering and analysis phase. This, of course, does not completely solve the problem of limited manning, but merely serves to soften the effect.

The condition of limited manning, if allowed to continue after the addition of a "should cost" function to the AFCMD/AFPRO organization, would surely cause limitations in the quantity of available team members just as it had this effect upon the time factor. We repeat, however, that if adequate top-level emphasis and priorities accompany such a step then much, if not all, of this potential roadblock to effective implementation can be eliminated.

Variables to Effectiveness

The decision to provide a permanent, on-going "should cost" capability with the AFCMD/AFPRO organization would cause the emergence of a number of variables which would have to be addressed in terms of their effect upon either the organization or the concept. As we have seen so far, the "fit" between concept and organization is not a perfect one.

Like some of our modern wonder drugs, certain side effects may occur along with the relief we seek. It is these possible side effects of the imperfect fit that we wish to discuss now.

(1) Human factors. It is a common fact that very few people enjoy being away from their home environment. The time necessary for a comprehensive "should cost" effort requires the team members to spend several consecutive weeks in the contractor's plant. This would occur even in an AFCMD/AFPRO environment because there will be occasions when the local AFPRO would either of necessity or by design be augmented because of the complexity of the proposed study or due to inadequate resources in the local AFPRO. Long, and possibly frequent, absences would tend to reduce the morale and efficiency of the participants, particularly if psychological and/or physical incentives were not apparent. This becomes particularly important in an on-going, permanent operation. We saw during our interviews that morale of the ad hoc team members was considered to be very high in each case. At times it appeared that even a feeling of status was associated with being selected as a team member. These types of reactions, however, seem more likely to occur in single "one-time" efforts than in permanent on-going ones.

(2) Objectivity. This variable to effectiveness was purposely treated lightly earlier, but it cannot be dismissed from this study completely. One of the reasons for the success achieved by the "should cost" concept has been through the objective nature of the team. All of the studies were conducted by team members who came largely from outside the procuring organization. This was especially true for the team chiefs and sub-team leaders. It appears that from the interviews and our study of the available literature, the team chiefs and, for the most part, the sub-team chiefs should come from outside the buying agency, including the local AFPRO. (14:21) Not doing so may not only introduce some degree of bias, hence downgraded quality, but reduce the team's credibility as well.

(3) Aura of the Unknown. Here is a phenomenon which can only be explained through feelings based on one's experiences. The "aura" which is transferred from one individual or group to another is predicated on the lack of sensory information as to what the future holds. In other words, the aura one accredits to another can be developed from a perceived fear of the unknown. Cost analysis teams, management teams, almost any type of "inspection" team coming from outside the organization can generate this kind

of aura. A similar team staffed from within the organization cannot normally generate this kind of psychological advantage. The advantage derived from this form of social one-upmanship, though sometimes slight and very often susceptible to quick loss, can be used very effectively during in-plant visits of relatively short duration.

(4) Managerial Backing. This could possibly be the "make or break" determinant for the "should cost" concept, whether it remains as it now exists or is permanently implemented. The success of the "should cost" concept thus far can be accounted for by the quality of the produced results. This high quality is in turn a factor of the autonomy and flexibility afforded the teams by top management. This same degree of support must figure into any serious plans for permanent implementation of the concept. Anything less than full support from the upper echelons of Air Force management will, we feel, invite mediocrity to replace the current high quality of the "should cost" technique.

The other side of this coin is management cooperation by the contractor. This factor also plays an important part in the success of a "should cost" study. Without the contractor's cooperation a great deal of the data required for analysis would be difficult, if not impossible, to acquire.

During our interviews we inquired into the team's reception by the contractor. The consensus was that the contractor was in each case cool to the team at first, but later provided complete support. In one instance where "should cost" studies had been conducted for an initial production buy, and a year later on a subsequent follow-on procurement with the same contractor, the attitude displayed by the contractor during the second study was one of complete support from start to finish. It appears that contractor cooperation can be expected so long as the "should cost" concept maintains its objectivity toward economies and efficiency of contractor operations.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

After more than two years of experimental application by all of the military services, the "should cost" concept now appears to be approaching universal acceptance. Several factors may be cited to account for the success of this approach; the concentrated efforts of an ad hoc team, the insistence upon high quality performance and results, objectivity and a sense of dedication among the team members, and management support. All of these factors, however, relate to and emanate from the "should cost" team itself. Quality performance achieved through the team efforts of highly motivated and dedicated professionals, using modern management and scientific research techniques, is the goal to which a permanent on-going application of the "should cost" concept must aspire.

Three basic factors have been established as the criteria for "should cost" team effectiveness. These factors; time, quality, and quantity, were then examined in

light of the functions and capabilities of the AFCMD/AFPRO organization. We conclude from this examination that a permanent application of the "should cost" concept to the AFCMD/AFPRO organization is feasible. This conclusion, however, is not without qualifications. Moreover, any action upon a conclusion regarding the feasibility of a proposal such as this must be considered in terms of its desirability as well.

The desirability of establishing an on-going capability for "should cost" in the AFCMD/AFPRO setting is contingent upon top-level management's continued support of the concept. A "half-hearted" or "make do" approach cannot be expected to uphold the attributes of high quality and flexible response which have become the hallmarks of the "should cost" concept. In this regard, two principle areas of support will be needed; (1) additional manpower to insure flexible response and, (2) additional training programs dealing with the specific concepts and analytical methods pertaining to a "should cost" study. Assuming that these conditions would be recognized and met with sincere action on the part of Air Force management, an on-going capability for "should cost" in the AFCMD/AFPRO organization would be both feasible and desirable.

Recommendations

Having reached the conclusion that the AFCMD/AFPRO environment is a feasible location for a permanent application of the "should cost" technique, we would like to offer some suggestions as to "how" this might be accomplished.

During the course of this study we found that the heart of a production procurement "should cost" study was the industrial engineering analysis. (35:IV-38) Further, the objectivity found in an ad hoc team approach was vital to the concept's continued success. Taking these findings into account, we propose that a permanent "should cost" capability be considered in the context of an AFCMD/AFPRO function. Such a capability appears possible if built around the guidance, control, and direction of a centralized "core" group at Hq. AFCMD, preferably from the Pricing and Production Divisions. The Pricing and Production Divisions, both of which have been heavily represented on "should cost" studies of the past, have the ability and are rapidly gaining the experience needed to develop such a capability. As noted earlier, Hq. AFCMD is already jointly participating in "should cost" studies conducted by SAMSO and has successfully completed a study using only Hq. AFCMD and AFPRO personnel. In the latter, Hq. AFCMD personnel served in an

advisory role primarily, providing guidance in the planning and on-site analysis phases of the study. It seems apparent that this existing ability could be further developed and expanded to accommodate an on-going capability. By utilizing a Hq. AFCMD "core" group for management and direction, and drawing from the AFPRO specialties as needed, a flexible, ad hoc team approach is possible in a permanent environment.

The creation of such a capability would not only supplement and provide a valuable on-going aid to a procuring agency, but generate certain advantages to the contract administration process as well. For instance, active participation by Hq. AFCMD and AFPRO specialists will serve to broaden knowledge, provide cross-fertilization of ideas and methods, and generally create a better understanding of the defense industry. The benefits derived from a unified team approach, the variety of exposure, and increased self-confidence will provide greater capabilities within the AFCMD/AFPRO organization for both present and future management of defense contracts.

Apart from the recommendation for "should cost" implementation in the AFCMD/AFPRO organization, we wish to offer two additional recommendations which come from our

study of "should cost" experience. First, we recommend that published material and information relative to existing Air Force "should cost" experience be made available to all organizations who deal in the Air Force weapons acquisition process. There is a particular need for conceptual and "lessons learned" information. Many cost management problems tend to be of a recurring nature even though contractual environments may differ. Although each team works under somewhat different conditions, many of the basic problem areas will most likely be encountered by all. There is a need, therefore, for ready access to the distilled experiences of previous teams.

Secondly, we recommend that the Air Force give serious thought to establishing a "should cost" training and research capability similar to, or in concert with, the "Should Cost" Center at the Army Logistics Management Center, Ft. Lee, Virginia. For example, the Army's "Should Cost" Center performs functions such as:

1. The research effort concerning the use and expansion of the "should cost" concept.

2. Maintaining a bibliography and library of reference material for use by "should cost" teams.

3. Providing consultant services on an as required basis to assist field teams in planning or specific problems.

4. Preparing and maintaining the "Should Cost" Guide, keeping it up-to-date through close contact with all "should cost" efforts.

5. Serving as a general focal point for all matters concerning "should cost," including receipt, analysis, and distribution of field team reports, lessons learned, and related information.

6. Providing a training course which draws on DOD experience. (35:iii)

Action on both of these recommendations is needed to increase individual awareness of the concept at all levels, and to provide a systematic development of Air Force competence in the "should cost" area.

Hopefully, this report has made the point that "should cost" is not just a new title put to an old song, but a very real departure from cost analysis techniques of the past. "Should Cost," we feel, offers to the Air Force an opportunity to provide in-depth, high quality cost analysis results which will help to deter the rising costs of weapons acquisition. Successful implementation of a permanent capability will, however, require serious and

thoughtful planning by all levels of Air Force management. Although somewhat trite, it should be said that "if it's worth doing at all, it's worth doing well." This is to say that if the short term disadvantages inherent to the establishment of a new technique are allowed to overshadow derived long term gains, then no real improvements will take place. In order to work on a permanent basis, the "should cost" approach must be vigorously supported by all levels of the Air Force procurement process.

APPENDIX A

Interview Guide

Part I

1. What was the size of the "should cost" team of which you were a member?

2. What specialties were represented on the team?

3. Did you have an adequate number of specialists on the team to accomplish your objectives? If not, what specialties were lacking and were they, or could they, be provided by the AFPRO?

4. Did you have more people assigned to the "should cost" team than needed? If so, how did this effect the study effort?

5. Could you have conducted a more effective study if you had been allowed more time for plant visit?

6. Could your study have been completed in less time if you had been familiar with the plant's mode of operation before your visit?

7. How many days or hours were required to prepare for the "should cost" study before actually conducting the in-plant evaluation?

8. Did you find the advance preparation was worthwhile?

9. How much time was spent in actual fact finding and evaluation efforts in the plant?

10. How much time was required to write-up your findings, conduct exit interviews and complete the "should cost" report?

11. How were you received by the contractor's management personnel?

12. Did situations develop during your "should cost" study which indicated to you that the contractor was not fully supporting your analysis?

13. In cases where information was not made available by the contractor, was the information available through the AFPRO?

14. Were you aware of any specific plant inefficiencies before arriving at the plant? If so, how did you obtain this information?

15. Did you have any particular problems in identifying inefficient methods or practices during your "should cost" study?

16. Did you have the proper background and experience to complete your portion of the "should cost" study effectively?

17. Do you think there is a better way to conduct "should cost" analysis?

18. How would you compare the present "should cost" team approach to a possible permanent application within the AFCMD/AFPRO organization?

19. Was your specialty represented in the AFPRO where your study was conducted?

20. Could your analysis have been completed by an AFPRO member? Please give specific reasons if this were not possible.

Interview Guide

Part II

1. Have you ever participated in a "Should Cost" study? If so, in what capacity?

2. "Should Cost" studies normally require specialists in the fields of manufacturing, industrial engineering, organizational management, pricing, and contracting. Do you feel that the AFPRO possesses the necessary skills to conduct a "Should Cost" analysis?

3. Would you say the AFPROs are presently manned for a "Should Cost" function? If not, what areas are inadequate?

4. Considering your present workload, could you effectively participate in a "Should Cost" study and still maintain effectiveness in your job?

5. Do you feel that your familiarity with the contractor's plant and procedures would be an advantage or disadvantage with regard to your assessment of plant operations and methods?

6. Do you consider your present skills, education and experience adequate for effective participation in a "Should Cost" study?

7. Assuming that a permanent "Should Cost" function were to be established within the AFCMD/AFPRO structure, what type of upgrading or additional training (if any) would you consider to be required?

8. What would you consider to be the advantage(s) to the Air Force if a permanent "Should Cost" function were established in the AFCMD/AFPRO system? Consider the question in terms of: (1) availability of time, (2) quality of personnel, and (3) number of available personnel.

9. In the same context as the previous questions, what would you consider to be the disadvantages?

10. Can you think of any other advantages, disadvantages or problems that might develop from a permanent AFCMD/AFPRO application of "Should Cost"?

11. Is is likely that the contractor's management would fully support an AFCMD/AFPRO conducted "Should Cost" study?

12. Do you feel that the contractor performance information routinely supplied by C/SCSC and PIECOST would provide a continuing basis for "Should Cost" analysis?

13. In what way has the AFPRO (or AFCMD) participated in "Should Cost" studies in the past?

14. Do you think that HQ AFCMD has the capability now to establish, coordinate, guide and administer a permanent "Should Cost" function?

APPENDIX B

AFCMD/SAMSO MEMORANDUM OF AGREEMENT

APPENDIX B

MEMORANDUM OF AGREEMENT

Should Cost Reviews

Should Cost is a proposal review technique using several analysis methods and the talent of several organizations to challenge contractor cost positions. The purpose is to preclude inclusion of the cost effects of past or potential future marginal performance and management practices in forthcoming contracts. To use this technique, a Should Cost Review is performed at some point after RFQ issuance to provide factual data for the development of an Air Force negotiation objective.

Application of the Should Cost technique is a joint SAMSO/AFCMD responsibility. The overall focal point for Should Cost within SAMSO is the Directorate of Procurement and Production (PP) and within AFCMD is the Directorate of Production Administration (PD). The principal focal point for specific Should Cost Reviews will be SAMSO/SPOs. The focal point for AFCMD support at prime and associate contractor locations will be the AFPROs.

SAMSO/AFCMD personnel will be utilized to the maximum extent possible, supplemented by any other personnel deemed necessary. In every instance, support from the Defense Contract Audit Agency will be required.

SAMSO/AFCMD Operating Procedures will be used in the performance of Should Cost Reviews. Changes to the Operating Procedures will be approved by both SAMSO and AFCMD prior to their implementation.

This agreement will become effective upon signature by the respective organizations and will continue in effect until modified or rescinded by mutual agreement.

DONALD G. NUNN
Brig General, USAF
Commander
AF Contract Management Division

Date: 19 AUG [illegible]

SAM C. PHILLIPS
Lt General, USAF
Commander
Space and Missile Systems Organization

Date: 19 AUG 1971

BIBLIOGRAPHY

1. Carter, W. E. and J. R. Fox. "Cost Planning and Control in Weapons Acquisition." Armed Forces Comptroller, Vol. 10, No. 2 (June 1965), pp. 9-11.

2. Cleland, D. I. and W. R. King. Systems Analysis and Project Management. New York: McGraw-Hill, Inc., 1968.

3. Coleman, James E., Colonel, USAF. Director of Procurement and Production Headquarters Aeronautical Systems Division. Personal Interview, 14 December 1971 and 13 July 1972.

4. Extension Course Institute. "The Environment of the Administrative Contracting Officer." Contract Administration. Course No. 6606, Vol. 1, Air University, 1969.

5. _____. "Postaward Activities and Contract Closeout." Contract Administration. Course No. 6606, Vol. 5. Air University: 1970.

6. Hernandez, C. A., Major, USAF. Staff Engineer, Air Force Contract Management Division. Telephone Interview, 22 November 1971.

7. Kast, F. E. and J. E. Rosenzweig. Organization and Management--A Systems Approach. New York: McGraw-Hill, Inc., 1970.

8. Kemps, Robert R., Major, USAF. "Contractor Performance Measurement." Defense Industry Bulletin, Summer 1971.

9. Kircher, Paul. "Government Procedures to Dictate Management Practices." Financial Executive, Vol. XXXV, No. 10 (October 1967).

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10. Klima, Otto. "Program Visibility Through C/SPCS." Aerospace Management, 1969, Vol. 4, No. 2.

11. Koontz, H. and Cyril O'Donnell. Principles of Management. New York: McGraw-Hill, Inc., 1964.

12. Kozuma, R. T. and Dehner, F. T. "The Role of the Air Force Plant Representative Office in the Weapon System Acquisition Process." Master's Thesis, School of Engineering, Air Force Institute of Technology, September 1969.

13. Krieger, H. L. "Observations On 'Should Cost.'" National Contract Management Association Newsletter, Vol. 11, No. 2, February, 1971.

14. Lange, Gunther. The Should Cost Team: Size and Composition, Phase I. U.S. Army Logistics Management Center, June 1971.

15. _____. Should Cost: Lessons Learned. U.S. Army Logistics Management Center, November 1970.

16. Lee, Lamar, Jr. and D. W. Dobler. Purchasing and Materials Management. New York: McGraw-Hill, Inc., 1971.

17. Margulis, H. J. and H. B. Yoshpe. Procurement. Washington: Industrial College of the Armed Forces, 1964.

18. Martinson, Otto B., Major, USAF. Classification System for Indirect Costs of Defense Contractors in the Aircraft Industry. U.S. Air Force Academy, 1969.

19. McVeigh, D. R. and F. E. Bartlett. "Sixty Years of Contract Management." Vol. I, SSD Historical Division, January 1967.

20. Middleton, C. J. "How to Set Up a Project Organization." Harvard Business Review. Vol. 45, No. 2 (March-April, 1967).

21. Nucci, E. J. and A. L. Jackson, Jr. "Work Breakdown Structures for Defense Materiel Items." Defense Industry Bulletin, February 1969.

22. Report to Congress. "Application of 'Should Cost' Concepts in Review of Contractor's Operations." By the Comptroller General, February 26, 1971.

23. _____. "Feasibility of Using 'Should Cost' Concept in Government Procurement." By the Comptroller General, May 20, 1970.

24. Robertson, Kenneth W. "Defense Contract Audit Agency (DCAA)." Unpublished Report, School of Systems and Logistics, April 1971.

25. Seiwert, Robert. "Budget Squeeze Necessitates Stretching the DOD Dollar." Defense Industry Bulletin. Winter 1972.

26. Staff Article. "GAO Urges Industry Cooperation With 'Should Cost' Efforts." Federal Contracts Report, No. 386, Washington: 19 July 1971.

27. _____. "Should Cost." Federal Contracts Report, No. 388. Washington: 2 August 1971.

28. Tucker, S. A. A Modern Design for Defense Decision. Washington: Industrial College of the Armed Forces, 1966.

29. U.S. Departmentof the Air Force. Air Force Contract Management Division. Summary of Phase I (1 Feb 70-31 Jan 71) of the AFCMD PI"COST Implementation Plan, (Case Study No. 00-3100), 26 February 1971.

30. _____. Air Force Contract Management Division. Regulation 170-4. Selected Acquisition Information Management Systems. 27 June 1969.

31. _____. Headquarters Air Force Systems Command (AFSC), Guide for Coordinated In-Depth Procurement Cost Analysis--"Should Cost." June 1971.

32. _____. Air Force Systems Command. Organization and Functions Chart Book Air Force Contract Management Division. Los Angeles, 1 September 1971.

33. _____. Air Force Systems Command, Pamphlet 173-3. Cost/Schedule Control System Criteria (Implementation Guide). July 7, 1969. Washington: AFSC Printing Service, 1969.

34. _____. Air Force Systems Command, Pamphlet 800-3. A Guide For Program Management. Washington: U.S. Government Printing Office, 14 May 1971.

35. U.S. Department of the Army. Headquarters, U.S. Army Materiel Command. "Should Cost" Analysis Guide. AMCP 715-7. Washington, November 1970.

36. U.S. Department of Defense. "Armed Services Procurement Regulation." Washington, D.C., 1969.

37. _____. Contract Audit Manual. DCAAM 7640.1, Washington, D.C., 1965.

38. _____. Defense Contract Audit Agency. Department of Defense Directive 5105.36. Washington, D.C., 9 June 1965.

39. _____. Directive Number 7000.1. Resource Management Systems of the Department of Defense. 22 August 1966.

40. Wright, Donald D. "The Cost/Schedule Control System Criteria." Master's thesis, School of Systems and Logistics, Air Force Institute of Technology, August 1971.

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Major Ralph E. Weida, a native of Enid, Oklahoma, was commissioned through the AFROTC program in 1956 after receiving a Bachelor of Science degree in Biology from Oklahoma State College. He came to his current assignment from the Air Force System Command's Electronic System Division (ESD) where he was Chief of the Procurement Management and Operations Group. While at ESD he also held positions as instructor navigator and flight examiner in the C-118 aircraft. Previously he servied as Chief, Combat Operations and as a combat crewmember in RB-66 aircraft while stationed at Takhli, Thailand. Upon graduation his next assignment will be Chief, Procurement Management Office at Headquarters, Army and Air Force European Exchange Service in Munich, Germany.

BIOGRAPHICAL SKETCH

Major George M. Sloan, a member of the Graduate School of Systems and Logistics Class 72B, is a graduate of the United States Naval Academy where he majored in Military Science and General Engineering. He came to his current assignment from the Air Force Systems Command's Contract Management Division (AFCMD) where he was Chief of the Test Analysis Branch, Air Force Plant Representative Office, Lockheed-Georgia Company. Previously he has served as a combat crewmember on B52-G aircraft, Program Control Officer for the Agena Space Vehicle Program, and has held positions as instructor, flight examiner, and chief navigator at squadron and group levels within Air Force Systems Command (AFSC) and the Pacific Air Force (PACAF). Upon graduation, Major Sloan will be assigned to the Aeronautical Systems Division at Wright-Patterson Air Force Base as a System Program Staff Officer.