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THE APPLICABILITY OF "SHOULD COST"
TO THE PROCUREMENT PROCESS

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March 1974

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The Applicability of "Should Cost"
to the Procurement Process

by

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) As major weapons systems become more complex, it becomes increasingly more difficult to accurately estimate the cost. Various costing techniques have been utilized in an attempt to accurately estimate the contract price of modern weapon systems with varying degrees of success. "Should cost" analysis has become increasingly more important, in the eyes of some, as the best approach in a noncompetitive procurement situation.		

Currently, the Army, the Air Force, the Navy and GAO all conduct "should cost" studies using various approaches. In this paper, an attempt is made to gain the feelings of Defense contractors concerning the application of Government "should cost" analysis. The author of this paper has made several recommendations, based upon data available, concerning the limitations of and the application of "should cost" analysis.

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TABLE OF CONTENTS

I. CHAPTER I INTRODUCTION	5
A. BACKGROUND	5
B. THE PROBLEM	7
C. METHODOLOGY	11
D. THESIS OUTLINE	11
II. CHAPTER II "SHOULD COST" ANALYSIS	13
A. WHAT IS "SHOULD COST"?	13
B. THE "SHOULD COST" REVIEW	14
III. CHAPTER III ATTITUDES OF THOSE WHO ARE ENGAGED IN "SHOULD COST" STUDIES	25
A. THE NAVY	25
B. THE ARMY	26
C. THE AIR FORCE	27
D. THE GENERAL ACCOUNTING OFFICE	27
E. INDUSTRY	28
F. SUMMARY OF ATTITUDES	29
IV. SUMMATION OF DATA	30
A. INDUSTRY'S FEELINGS TOWARD GOVERNMENT "SHOULD COST" STUDIES	30
B. TEAM SIZE AND COMPOSITION	31
C. FLEXIBILITY VERSUS STANDARDIZATION OF APPROACH	32
D. METHODS OF MOTIVATING GOVERNMENT CONTRACTORS TO BE MORE EFFICIENT	32
E. DESIGN-TO-COST	33
V. SUMMARY AND RECOMMENDATIONS	35
A. SUMMARY	35

B. RECOMMENDATIONS	35
C. CLOSING STATEMENT	38
APPENDIX A Questions used during interviews to stimulate a free exchange of ideas	39
BIBLIOGRAPHY	40
INITIAL DISTRIBUTION LIST	43
FORM DD 1473	44

CHAPTER I INTRODUCTION

A. BACKGROUND

At no other peace time period in the world's history has the need for proper allocation and effective utilization of resources been more critical than it is at present. The nations of the world are currently all too aware of the need to successfully manage petroleum products and some areas have a more critical problem in shortages of such essentials as paper products. Maximum utilization of resources pervades our national policy, especially in the Department of Defense.

Within the Department of Defense (DOD), resources can be broadly defined by three categories: manpower, material, and money. Although all three of these categories are of major importance (i.e., the reduction in the manpower levels of the Armed Forces, shortages of essential raw materials, and close scrutinization of the spending of the Defense dollar), only the effective use of procurement dollars in acquiring weapons systems will be addressed in this paper. It must be realized that manpower and material are highly dependent on money, the third resource, and that effective use of procurement dollars must anticipate manpower and material needs. However, the scope of this paper will be limited to dealing solely with procurement dollars as used in acquiring major weapons systems.

Although the procurement dollars of the Defense budget have been relatively stable for the past few years, the increases in military pay, allowances, and retired pay are taking a much larger portion. Figure I shows a graphical comparison of military and retired pay, procurement, and research, development, test and evaluation estimated obligated authority for the fiscal years 1972 through 1975 as obtained from the Federal budget (Ref. 2).

ESTIMATED DOD OBLIGATED AUTHORITY FOR MILITARY ACTIVE AND RETIRED PAY,
 PROCUREMENT, AND RESEARCH, DEVELOPMENT, TEST AND EVALUATION FOR THE
 FISCAL YEARS 1972, 1973, 1974, AND 1975

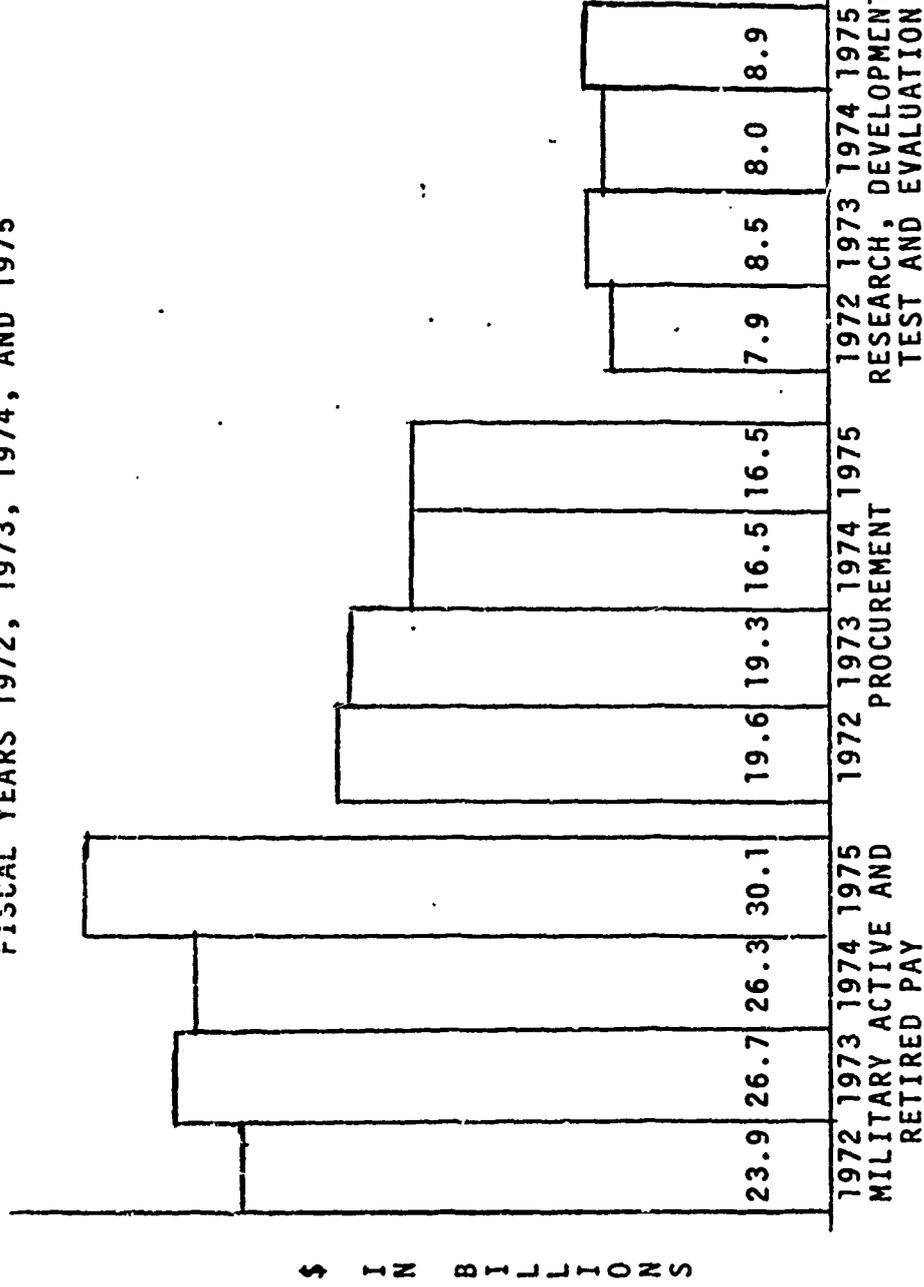


FIGURE I

A stable procurement budget impacted by inflation (nearly 9% for the calendar year 1973) decreases the purchasing power and it is therefore necessary for DOD to make every effort to effectively utilize the procurement dollars that are available.

The unpopularity of the Viet. Nam War and a shift in national priorities mean DOD can no longer spend its appropriations without the close scrutiny of the Congress and the criticism of the general public. Because of such critics of Defense spending as Senator William Proxmire (Report from Wasteland; America's Military-Industrial Complex) and A. Ernest Fitzgerald (The High Priests of Waste), the general public is aware of recent cost growth of weapons systems. Some people, as pointed out by The Commission on Government Procurement (Ref. 6), feel that some of the national budget that is currently being spent by DOD should be applied to pressing social-economic problems. It is therefore necessary for DOD and all Government agencies to effectively utilize the taxpayers' dollar by improved cost estimating.

B. THE PROBLEM

As the complexity of today's weapons systems increases, it becomes more difficult to accurately estimate their costs, especially in the early development stages. Faulty cost estimates, coupled with inflation, are blamed as causing numerous projects to experience tremendous cost growth. Representative Les Aspin (Democrat-Wisconsin) reported (Ref. 22) that the costs for the current 47 major weapons projects (see Table I) had been estimated at \$110.9 billion, but actual costs will be \$131.9 billion. He added that "we pay more and more and get less and less in real defense." Caution must be observed when reacting to such statements as that of Aspin because it is necessary to know what baseline is being used in the determination that a

Distribution of Cost Growth for Major Weapons Systems as of September 30, 1973 (\$ in Millions)

<u>WEAPONS SYSTEM</u>	<u>GROWTH</u>	<u>WEAPONS SYSTEM</u>	<u>GROWTH</u>
<u>ARMY</u>		<u>NAVY</u>	
LANCE (Battalions)	\$ 129	A-7E	\$1,058
Imp. HAWK (Battery Sets)	298	AV-8A	-
SAFEGUARD (Sites)	2,046	E-2C	290
SAM-D (Tac. Fire Sec.)	- 324	F-14A	1,227
HLH (Componet Dev.)	-	P-3C	224
UTTAS	58	S-3A	442
MICV	7	AEGIS (R&D only)	56
ARSV (SCOUT)	- 1	CONDOR	233
AAH	11	HARPOON	28
XM-1	1	PHOENIX	561
		POSEIDON	348
<u>AIR FORCE</u>		SIDEWINDER AIM-9L	10
A-7D	263	SPARROW III F	547
A-10	-	MK-48 MOD 1	236
B-1	2,487	SSN-668	570
C-5A	1,742	DD-963	224
F-5E	12	DLGN-38	14
F-15	503	LHA	241
F-111	4,053	PF	-
AWACS	- 276	PHM	1
AABNCP	-	CVAN-68 Class	274
MAVERICK	97	AN/BQQ-5	121
MINUTEMAN II	597		
MINUTEMAN III	1,633		
SRAM	821		
SIDEWINDER AIM-9L	46		
SPARROW III F	214		
<u>SUMMARY</u>			
ARMY	2,225		
NAVY	6,705		
AIR FORCE	12,192		
TOTAL	\$21,122		

Source: Federal Contracts Report (No. 515) 28 January 1974

TABLE I

cost growth exists. In a report to the House Committee on Armed Services (Ref. 33), the General Accounting Office (GAO) pointed out that there are three major causes of cost growth: inflation accounts for 30%, changes in requirement about 45%, and 25% is attributed to estimating errors. These figures seem to be somewhat in contradiction as it is difficult to believe that accurate estimates can be made when the requirements are not certain. The question that must be asked is that if the requirements change, was the estimate faulty or was the estimate right for that for which it was made. Effective use of the correct estimating technique in the right procurement situation can be used to protect the Government and the taxpayer against unnecessary future cost growth.

The present day arsenal of cost estimating includes, but is not limited to the following:

1. The historic method where the estimate is based on previous procurements of similar items;
2. The engineering or building block approach which entails an examination of separate items of work at a low level of the work breakdown structure¹ with detailed estimates developed for functional costs of engineering, manufacturing, quality control, etc., which are in turn broken down by labor, material, and other elements of cost for each item;²
3. The parametric costing technique predicts costs by means of explanatory variables such as performance characteristics, physical characteristics,

¹DOD Instruction 7000.2 dated December 22, 1967, defines the work breakdown structure as a product-oriented family tree division of hardware, software, services and other work tasks which organizes, defines, and graphically displays the product to be produced as well as the work to be accomplished in order to achieve the specified product.

²See page 173, Ref. 1 for additional information.

and characteristics relevant to the development process as derived from experience on logically related systems,³ and

4. The "should cost" or industrial engineering approach which consists of a team effort to determine the amount that weapons systems (or other major items) ought to cost given attainable efficiency and economy of operations. It could be inferred that in an effort to determine a fair and reasonable price that a determination be made for each procurement of what the item should cost by whatever means considered available.

Each of the various costing techniques is appropriate for certain types of procurements, but it is felt by many, especially the Army and the Air Force, that for major complex weapons systems procured under a noncompetitive situation, "should cost" is the best approach. A problem with this type of attitude is that "should cost" is highly product oriented and has little or no justified application during the early stages of the system life cycle when the requirements are not yet certain. Some of the basic problems with the "should cost" approach are that it is time consuming, disruptive of contractor operations, and many contractors feel that it interferes with their management prerogatives. Contractors dislike a Government team inspecting their plant, tying up operations for months, and then telling them how they ought to run their business. So it would be advantageous, to both the Government and industry, if it were not necessary for the Government to conduct "should cost" studies. In the words of Gordon Rule (Ref. 24), " .. a 'should cost' study conducted by the Government is, in essence, the Government having to do something that the contractor should do for himself."

The author's concern for cost estimating raised several questions:

(1) is "should cost" appropriate for all noncompetitive procurement

³Ibid.

situations and, if not, when is it most applicable; (2) is industry in favor of "should cost" and, if not, how could they be "turned on" to the technique; and (3) what qualitative and quantitative techniques comprise a "should cost" study. This paper is aimed at answering these and other questions, updating the literature as to the attitudes of the services, GAO, and industry relative to "should cost." Additionally, it tests industry's attitude toward the recommendations of the Commission on Government Procurement, and, in general, ties together many of the loose ends left by the literature.

C. METHODOLOGY

Three basic techniques of research and data collection were used for information contained in this paper. Literary research was used extensively for background information, the current policies and attitudes of the Government agencies and industry, and the techniques of the "should cost" study itself. Personal interviews were conducted with various prominent and knowledgeable individuals, both in industry and DOD. The criteria for selecting interview candidates included selection of people who were no lower than the third level of the corporate structure, but still directly involved with product pricing. Candidates were about equally split with contractors who did predominantly Government business and those who did little Government trade. Appendix A contains the basic questions used in the interviews, but it must be understood that these questions were used only to stimulate the conversation and the interviews were not limited to these question areas. Based upon the literary research and the data gained through interviews, recommendations have been made.

D. THESIS OUTLINE

Chapter one of this paper contains basic introductory information, the statement of the problem to be addressed, and the methodology used to gain

information toward the possible solution of the problem. Chapter two contains information concerning the actual methods of conducting a "should cost" study; the planning and scheduling involved and a brief presentation of some of the methods employed. The third chapter deals with the attitudes of the services, GAO, and industry concerning "should cost" studies. Chapter four contains a summary of the data, and the fifth, and final, chapter contains a summary and recommendations.

CHAPTER II "SHOULD COST" ANALYSIS

A. WHAT IS "SHOULD COST"?

"Should cost" is the determination of the amount that a product ought to cost, not will cost, based on attainable efficiency and economy of operations. This amount is obtained through a very detailed industrial management study which examines all phases of a contractor's manufacturing process, managerial capabilities, and his financial situation. The "should cost" review has as its objectives the identification, selection and implementation of improvements in a contractor's method of managing and operating his business thereby leading to increased efficiency and economy of operation. The review consists of an in-depth look at not only historical data, but a thorough look at the contractor's facilities and tooling, its manufacturing capabilities, and assembly lines, the working interface between various plant operations. A "should cost" review considers all activity in a contractor's plant and is not directed at one program or product.⁴

Care must be taken to distinguish between "should cost" and Government "should cost" analysis. Every efficient contractor conducts, in essence, "should cost" every time that he prices an item. In the view of some contractors, a Government "should cost" study involves a Government team, either independent consultants or DOD employees, invading the contractor's plant and disrupting operations for a long period of time in an attempt to arrive at a negotiation position or in support of an earlier position. This approach, when used by the Government, is not to be viewed as a cure-all to all cost growth problems, but as a potent analytical tool for use in

⁴Ref. 13 has a detailed description of the "should cost" concept.

appropriate cases. The objective of "should cost" should be the negotiation of a "fair and reasonable" price; attempts to negotiate "ideal" prices are officially eschewed.

The appropriate timing for the application of "should cost" is a matter of discussion, but since the technique is highly product oriented it is suggested that it becomes more justified as the product advances through the system life cycle and the number of uncertainties decreases. Figure II is a graphical interpretation of the degree of applicability as a function of uncertainty. Intentionally, the axes have no scale and no exact relationship is intended.

B. THE "SHOULD COST" REVIEW

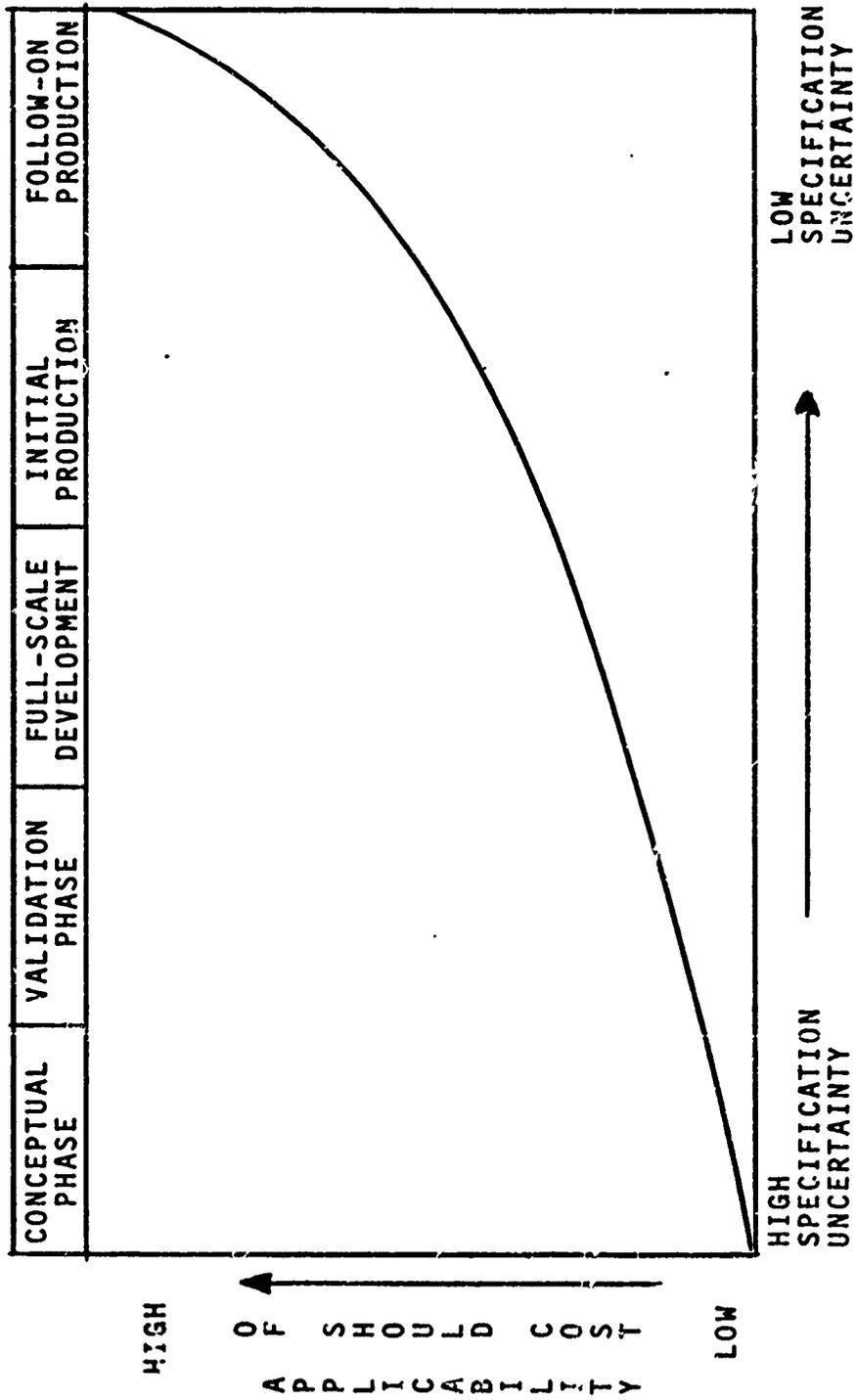
The exact techniques of data collection in a "should cost" analysis are unique to the review to be conducted. Because of this uniqueness in methods, the impetus of this section will be the planning and scheduling involved in such a study. Although each of the Government agencies have different approaches toward "should cost," there are several items in common. Lange (Ref. 18) points out six basic phases of a "should cost" review.

1. Phase 1: Preparatory Efforts

This phase is conducted off-site and is by far the most important phase of the "should cost" event schedule. The first step in this phase is the selection of a candidate for a "should cost" review. Some of the items to be considered in the selection of a candidate are:

a. Lack of price competition - in advertised procurements, or negotiated procurements in which genuine competition exists, it is generally assumed that objective or realistic prices are obtained by the forces of the market place. Competition does not necessarily rule out the use of "should cost" techniques, especially in the cases of "fly before you buy" or when

APPLICABILITY OF "SHOULD COST" AS A FUNCTION OF TECHNOLOGICAL CERTAINTY



MATURITY OF TECHNOLOGICAL CERTAINTY

FIGURE II

one price quotation is drastically lower than other bids which may indicate a buy-in. In such situations, the technique can be used to assure that the contractors are putting forth a realistic cost basis upon which the contract award can be based.

b. Percentage of Government business - if the contractor does very little Government business, he will be forced to be efficient by the pressures of the competitive market. It may be assumed that this efficiency will carry over into the Government business, but this assumption is not justified if his work is predominantly Governmental.

c. Probability of follow-on business - "should cost" studies have both short-term and long-term benefits. In the short run, the Government has an initial negotiation position. In the long run, the contractor applies the recommendations of the study group and becomes more efficient in all of his operations and the Government will benefit by doing future business with the contractor. It is appropriate to point out that the original "should cost" study was completed during the performance of one contract (Pratt and Whitney) in order to ascertain what the next incremental quantity of production items should cost. It is possible that this could have been determined by means other than "should cost," but this was the decision at that time.

d. Sufficient time to complete the "should cost" analysis before negotiations - to be effective, the study must be thoroughly planned and completely administered. Without sufficient time, the study would have to be hurried or abbreviated and the results of the study would be questionable.

e. Procurement expected to be of a high dollar value - the Government must believe that the expected benefits derived by the study will be worth the expense encountered in conducting a "should cost" study.

f. Required special skills are available to the team - depending on the activities of the contractor, special skills such as industrial

engineers, procurement specialists, statisticians, legal personnel, and accountants may be required to properly evaluate the operations. Such personnel must be available for the long period of time required to conduct the study.

g. Previous business experience - a "should cost" review may be warranted if a sole producer has experienced precipitous and unsubstantiated increases in costs and is projecting substantial additional increases.

Lange (Ref. 18) suggests a check list for selecting "should cost" candidates. (See Table II). Several items on this check list can easily be challenged. As mentioned earlier, the degree of certainty is a very important factor in determining if a "should cost" study is appropriate and it is believed that the factor concerning technical, quantity, and schedule changes should be a go/no go factor.

Once that it has been determined that a "should cost" analysis is needed, the next step in the preparatory phase is the selection of team leaders and members. The size and composition of the team must be suited to fit the magnitude and complexity of the "should cost" task. The U.S. Army Logistics Management Center has printed a document (Ref. 19) which describes four different approaches to the team size and composition. Objectivity of the study can best be achieved by selecting the team leadership from outside the activity responsible for the negotiations. With the chief negotiator on the team, the contractor may become very defensive and cooperation would be lacking. Continuity of the study is also desired and this is best accomplished by having the team leaders remain as such throughout negotiations, thus being able to defend their own, rather than someone else's position. There is a delicate balance between objectivity and continuity; therefore, the selection of team leaders and members is instrumental in the degree of success of the "should cost" study.

SUGGESTED "SHOULD COST" RATINGS FOR CANDIDATE CONTRACTORS

A. Go/No Go Considerations

1. Lack of adequate price competition
2. Sufficient time to complete "Should Cost" analysis
3. Procurement exceeds dollar value
4. Required special skills available
5. Tasks sufficiently well-defined

B. Weighted Considerations

1. Potential for significant follow-on business
2. Known or suspected specific problems to be solved or reduced
3. History of increasing costs, or improvements needed in cost controls
4. Probability of shifting cost risk to contractor by improving contract type or cost-incentive sharing arrangement
5. Preponderance of Government business
6. Probability that "should cost" benefits will extend into other effort (e.g., development to production, other programs, etc.)
7. Existence of a good base of historical data to benefit the "should cost" analysis
8. Manufacturing conditions not likely to change
9. Program not subject to excessive technical, quantity or schedule change
10. Lack of confidence in current cost estimates
11. Government will have strong bargaining position
12. Potential for improvement in contractor's efficiency of manufacturing operations
13. Other factors (As appropriate)

SOURCE: Gunther Lange, Should Cost Lessons Learned, U.S. Army Logistics Management Center, Fort Lee, Virginia, November 1970

TABLE II

The final step in the preparatory phase consists of having the team leaders assemble at the plant as a preplanning group. This allows a small group to review the overall plant layout, to determine what data is available, to establish the ground rules with the contractor, and to identify any peculiarities of the contractor's facility.

2. Phase 2: Preliminary Efforts

Once the preparatory phase has been completed, the full team assembles at the plant and begins an orientation and planning period. The first step in this phase is orientation briefings, held to acquaint the team with the contractor's operations, management systems, control procedures, and the locations of sources of data. These briefings are normally conducted by the contractor, Government plant personnel, and the Defense Contract Audit Agency (DCAA). The goal of this step is for the team to get a good feel for the overall plant operation.

The next step which consists of forming subteams and appointing subteam leaders is usually based upon the findings of the preparatory phase and plant orientation during which time the team leader has a good idea of the qualifications of his team members. The subteam leaders must be assigned strictly on the basis of having the best man for the right job. This is also the point of time that all team members must be or become familiar with sampling and interviewing techniques to ensure the maximum benefit of the "should cost" study being undertaken.

The final step of the preliminary efforts phase involves adequate administrative planning. This involves such support requirements as the establishment of a report system, control of flow documents being furnished to or reproduced for team members, establishment of a filing system, arrangement for office equipment and supplies, and arrangements for other logistical support for the team.

3. Phase 3: Fact Finding and Analysis

A very thorough and careful review of the contractor's proposal is necessary in establishing the methodologies for the study. An initial review should have been made prior to arrival at the plant, but additional information may have been gained during the orientation period. A comparison of the proposal with other proposals and related data of the contractor gives the team members an understanding of the relative values of all data proposed by the contractor.

It is almost inevitable that much of the methodology of the study will include sampling because of the limited time available. The sampling techniques must be planned so as to quantify the results (i.e., how are the results to be related to the proposal costs). Careful planning is also required to develop task lists which are further subdivided into subtasks. This subdivision is to ensure that every item in the cost proposal is covered, all aspects of the cost element are carefully researched, and to encourage discussions among the team members.

Once the planning stage is completed and the subteams formed, it is time to start gathering data; an important, but difficult task that requires the establishment of rapid and direct access to contractor data. To do this, the cooperation of the contractor is essential and every effort must be made to convince the contractor selected that, in the words of Stolarow (Ref. 28), "...we are wearing our 'white hats' when we schedule a 'should cost' review, and hopefully, significant benefits can accrue to both the Government and the contractors."

In gathering contractor furnished data, the team must decide what data is needed, get the data from the contractor and then maintain it. The team must constantly be prepared for attempts of the contractor to limit the

data made available. A ruling must be made as to what are the legitimate limits of data that is requested by the team. Limiting the data available must not be confused with withholding justified confidential data. In obtaining contractor data several guidelines should be followed: (1) obtain a list of every periodic report that the company prepares so that the team knows what data is available; (2) request the data in writing and maintain a "tickler file" to remind the contractor when the data is due; (3) use one central control point to receive and control all data, and (4) maintain a file of all data received to avoid duplicate data requests.

Throughout the data acquisition period, a free exchange of ideas between team members and team leaders is extremely important. This can be accomplished through informal meetings and through written reports or journals of the team members made available to the other team members.

The focal point of the data analysis is to specifically identify areas where improvement is needed in the contractor's operations. Although the methods of data collection vary, Stolarow (Ref. 28) points out ten areas that are usually examined in a typical "should cost" study: (1) plant layout, (2) labor standards, (3) material control, (4) machine loading and utilization, (5) production scheduling, (6) make-or-buy practices, (7) subcontracting procedures, (8) quality control procedures, (9) indirect cost controls and allocations, and (10) accounting and cost estimating procedures. The exact techniques used to gather data depend on the idiosyncrasies of the contractor and the product involved, but may include any or all of the following:

a. Work sampling (sometimes called ratio-relay study) is an observation, at irregular time intervals, of what is actually taking place in daily operations. This method can be used to find out how often minor job elements of factory jobs occur and so provide the information needed to

incorporate time for these minor jobs into production standards. Since this sampling takes place at irregular intervals, the employee doesn't have the opportunity to dress up his performance for the study and therefore a true-to-life situation is presented.⁵

b. Plant layout study embraces the physical arrangement of the industrial facilities, either in existence or proposed. The objectives of the plant layout work include: (1) over-all integration of all factors affecting the layout, (2) material moving a minimum distance, (3) work flowing through the plant, (4) all space effectively utilized, (5) satisfaction and safety for workers, and (6) a flexible arrangement that can be easily adjusted. An effective plant layout is an arrangement of productive men, materials, machines, and their supporting activities that will produce a product at a cost low enough to sell at a profit in a competitive market.⁶

c. Linear programming has become one of the most commonly used operations research techniques and it is especially useful in situations where there are several sources of scarce resources and where it is difficult to see how to best allocate these limited resources. Linear programming is a mathematical method for selecting the most effective of many possible solutions and, with the use of modern-day computers, the variables which can be handled are almost limitless. To use linear programming, it is necessary to first precisely define the problems and place the restrictions on the variables and then manipulations are done quantitatively and all solutions are compared simultaneously to maximize or minimize the result

⁵Ref. 20, pages 3-62 to 3-76 contains additional information on work sampling techniques.

⁶Ref. 20, pages 7-26 to 7-73 contains detailed information on plant layout analysis.

or goal. In the cast of "should cost," the goal is usually an attempt to minimize the cost, but care must be taken in case of a buy-in.⁷

d. Monte Carlo simulation is an attempt to imitate a business situation so that various policies can be tested and evaluated. This is a technique whereby the system and its associated possible sequences of events are produced, usually by a computer, on a make-believe basis. This allows the investigation of changes in systems and results without incurring the costs of manipulating real systems.⁸

Once the data has been collected and evaluated, and assuming that the contractor adopts all the recommendations of the study team, the team develops its estimate of what the final product should cost.

4. Phase 4: Report Writing

The importance of the report cannot be over-stressed as it serves several functions. The report, which is the summation of the various team members' analysis and findings, serves as a tool to be used during negotiations; it could serve as the vehicle for follow-up action in terms of review and surveillance, and it can be extremely beneficial in communicating lessons learned to future study teams. Lange (Ref. 18) points out that since "should cost" teams operate under tight schedules and with limited resources they need ready access to the distilled experiences of previous teams and that as time goes on and more areas of commonality are discovered sufficient experience may be gained to warrant more routine and standardized approach.

⁷Ref. 20, pages 8-287 to 8-291 further describes linear programming.

⁸Refs. 20 and 23 contain several examples of the use of the Monte Carlo simulation technique.

The format of the report must be developed early in the planning stage and this format should be the controlling factor for the method in storing and retrieving data. The team members should be "thinking" the report as soon as they start fact-finding.

5. Phases 5 and 6: Preparations for and Conduct of Negotiations

Once the report writing has been completed, the team chief and selected key team members must now prepare for negotiations. As mentioned earlier, it is necessary to maintain continuity by having team members remain through negotiations. They should prepare strategies, review the strengths and weaknesses of these strategies and anticipate the contractor's negotiation position.

With the preparations completed, the negotiator should establish realistic time schedules for the negotiations and adhere to them. Since in the past, contractors, as a general rule, didn't want the "should cost" team in his plant and didn't fully cooperate while the study was in process, it should not be expected that negotiations be anything less than an adversary proceeding.

CHAPTER III ATTITUDES OF THOSE WHO ARE ENGAGED
IN "SHOULD COST" STUDIES

"Should cost" studies have been or are being conducted by the three major branches of the Armed Forces, the General Accounting Office and industry. Although the desired results and general principles of the study are basically the same, the different needs and the uniqueness of the procurements involved have caused variations in the methods used.

A. THE NAVY

Although the Department of the Navy was the pioneer in Government "should cost" (Pratt and Whitney Division of United Aircraft in 1967), it has recently been criticized by GAO (Ref. 11) as having a negative attitude toward the use of "should cost" studies. GAO supports this conclusion by pointing out that the Army and the Air Force have each completed over 20 studies and have others underway or planned while the Navy has performed only three studies, has none underway and none planned.

Mr. Gordon Rule (Ref. 24), a member of the Pratt and Whitney team, believes that "should cost" findings have little use in affecting the terms and conditions of fully definitized contracts. Mr. Rule feels that "should cost" has real application at the time of definitization of letter contracts and fixed price incentive successive target contracts. In such cases the contracting officer is able to unilaterally determine the final definitive price if mutually agreeable prices cannot be negotiated. Of course, this determination is subject to appeal under the disputes clause, but the contractor is required to continue contract work until the appeal is settled.

Rear Admiral Rowland G. Freeman III, former Deputy Chief of Naval Material (Procurement and Production) said (Ref. 9) that he thought "...it is

an inherent characteristic of our approach to contracting in the DOD that we hold the contractor primarily responsible for his own efficiency." He further stated that "...our position in the Navy is that 'should cost' is just one method of pricing which is available to the contracting officer and it is applicable only when we have reason to believe that a predominantly sole source contractor is not meeting the test of reasonable economy and efficiency."

B. THE ARMY

The Department of the Army was the second of the Armed Services to adopt use of the "should cost" technique and has completed over 20 studies. The complexity of Army weapons systems normally is far less than those of the Navy and the Army is therefore in a position to more carefully monitor the progress of the systems that are being acquired. In 1970, the Army was reported (Ref. 26) to have "...plans to use the 'should cost' approach with every major weapons production contract for which there is no competitive bidding..." To accomplish this, it was reported (Ref. 26) that "...the Army is considering the use of small 'should cost' teams of six to ten members to conduct truncated 'should cost' type analysis in support of smaller contracts." The cost and staffing problems prohibit the application of full-scale reviews.

Whereas the Navy believes in flexibility in the application of the "should cost" technique because of the uniqueness of each procurement, the Army is much more regimented in their studies and has published guide books such as the Should Cost Analysis Guide (Ref. 14) to assist team members. The Army has a "should cost" center under its Logistics Management Center at Fort Lee, Virginia, where it maintains a library and offers a five-day course for prospective team members.

C. THE AIR FORCE

Like the Army, the Air Force is said (Ref. 26) to feel that "... 'should cost' reviews involve an integrated team approach to intensify and coordinate the otherwise sequential or simultaneous but separate reviews of individual functional disciplines such as pricing, audit, contract administration, and technical. They will normally be conducted on a plant-wide basis and will expressly challenge historical costs." Being the last of the services to adopt "should cost," the Air Force had the advantage of observing the techniques of the Army and the Navy and decide upon which approach that it would pursue; the Air Force approach is very similar to that of the Army.

The "should cost" effort of the Air Force is organized and managed by the procuring activity and the effort is directed toward the evaluation of a particular proposal on a major project. The major benefit is the establishment of a negotiation objective. Although the Air Force supplement to the Armed Services Procurement Regulations (ASPR) states that "should cost" is to be conducted only when individual cost analysis techniques seem inadequate, it also says that the decision not to employ "should cost" must be justified in sole source Determinations and Findings; there is no requirement to justify the decision to use "should cost" despite the expense and effort involved.

D. THE GENERAL ACCOUNTING OFFICE

GAO entered the "should cost" picture when it was asked by the Joint Economic Committee, through its Subcommittee on Economy in Government, to study the feasibility of applying "should cost" analysis in its audits and reviews of Government procurement. GAO reviews have a different emphasis than those of the executive agencies in that GAO is primarily concerned with evaluating the results of the performance of the procuring activities. Since

GAO uses "should cost" as a monitoring device, its studies are normally conducted in a post-award environment.

In its report on the feasibility of "should cost" (Ref. 34), GAO said that although "should cost" can be applied either during prenegotiation or postnegotiation, it believes that the most effective use would be obtained before the award of a contract. This allows maximum effectiveness in assisting the Government negotiator in awarding a fair and reasonable contract and, more importantly, a contractor would be more likely to accept the study findings and to implement corrective procedures. GAO also believes that the Government agencies should employ a capability to perform selective "should cost" reviews to accomplish the objectives of negotiating a fair and reasonable price, establishing specific definitions of the scope of work, and conducting thorough, well coordinated negotiations.

E. INDUSTRY

As reported by GAO (Ref. 34), various industry officials have said that the use of "should cost" concepts during the procurement process helps to ensure a fair and reasonable price for the item being purchased. This in no way can be interpreted that industry is in favor of the Government conducting "should cost" as is pointed out by the Commission of Government Procurement (Ref. 6) that "with a few exceptions, contractors who have been through a (Government) 'should cost' review state that the savings realized as a result of the review have been overstated by the Government and that many achievements claimed by a 'should cost' team give an imprecise picture of the true accomplishments of the team."

Mr. W. P. Gwinn, Chairman of United Aircraft Corporation, points out (Ref. 13) that "the 'should cost' technique is an extremely useful tool for studying and improving the efficiency of any manufacturing business," but

he cautions that "when the aim of a 'should cost' study fixes on current pricing, the contractor's personnel, for very obvious and very human reasons, become defensive, and at the same time the Government negotiator, in striving to reach a cost-production goal, even if only self-imposed, can for equally obvious and equally human reasons, very easily lose his objectivity. Under these circumstances, the atmosphere is not conducive to the kind of dialogue which, in the long run, could be of great benefit to both, and ultimately to the entire defense-industry relationship."

F. SUMMARY OF ATTITUDES

The Navy feels that the application of "should cost" techniques is very limited and is therefore oriented toward selective major projects. The Army and the Air Force share the same philosophy and believe in conducting "should cost" on a much wider basis than the Navy. GAO's main concern is to evaluate the effectiveness of the Armed Services and uses "should cost" after the award of the contract. While not being opposed to the concept, industry is against the use of Government studies.

CHAPTER IV SUMMATION OF DATA

The sources of data are literary research and information gained through interviews. Literary sources included recent periodical articles, papers presented by individuals directly involved with procurement policy and rebuttals to this policy, studies conducted on various aspects of the "should cost" concept, and previous theses on the subject. Informal interviews were conducted in the interviewees' offices to establish a face-to-face relationship and encourage a free exchanges of ideas. The people interviewed expressed their own opinions, not necessarily that of their company, and some, therefore, desire to remain anonymous. With this in mind, no individual or company names will be mentioned in the presentation of data. Because of geographical limitations, time constraints, and the current energy crisis, the number of interviews is small. It is realized that a limited number of interviews has weaknesses, but those interviewed represented contractors that rated in the top 100 of Navy suppliers and the data gained is believed to be representative of major industries.

To better understand the responses of those interviewed, a brief explanation of the economic and political atmosphere is in order. The interviews were conducted during January, February, and March, 1974, a time when inflation was rampant and a great deal of political uncertainty was present. DOD continued to be under fire concerning its procurement practice during the period of time that the interviews were conducted.

A. INDUSTRY'S FEELINGS TOWARD GOVERNMENT "SHOULD COST" STUDIES

Government "should cost" studies are not well received by industry.

The majority of those interviewed feel that the concepts of "should cost" are excellent and equivalent techniques are used in the course of normal operations or their companies would not succeed. One individual interviewed claimed that his company frequently forms internally staffed teams consisting of members with management capabilities to conduct studies in departments other than their own. The purpose behind this is that someone can walk into an area and see something wrong that has been overlooked by those who work there. Another contractor admits that they have a "do better" team similar in operation to that of a "should cost" team.

As to the application of Government studies, one interviewee says that he "feels fear" that the team will tell the company to do something that, in their judgement, may be "detrimental to the best interest of the program." It is claimed that industry is looking at the long range and may take a profit loss now so that the project moves on. While industry is looking at the long run, it feels that the Government "should cost" team is looking only at the short run and, therefore, may endanger the program. In addition some interviewees expressed concern that the team doesn't understand the modern technology and, therefore, the whole purpose of the study is suboptimized.

Simply stated, industry agrees with the "should cost" concept, but not with the application by the Government.

B. TEAM SIZE AND COMPOSITION

If Government "should cost" studies are to be imposed upon industry, small teams made up of independent members are preferred.

It is generally agreed that the team should consist of independent consultants and thereby remove any parochialism that would exist had the team been made up of personnel from the activity responsible for the procurement.

More cooperation between the team and the contractor would be gained if the contractor were fairly sure that the team was completely objective.

The team size desired by industry favors the approach of the Army and the Air Force. The main reason given for favoring small teams is that large teams cause the contractor to respond and this administrative burden "drives the overhead out of sight." No mention was made of the fact that small teams are easier to manipulate than are large teams, but a large team does not insure that manipulation will not take place.

In summary, small teams made up of independent members are preferred by industry.

C. FLEXIBILITY VERSUS STANDARDIZATION OF APPROACH

No consensus was expressed by those interviewed as to whether industry desires firm or flexible guidelines for the application of "should cost."

Those favoring firm guidelines used the argument that they didn't know what to expect before the team's arrival at the plant. Those favoring flexibility feel that "every contractor and program are unique and firm guidelines tend to submerge this uniqueness."

D. METHODS OF MOTIVATING GOVERNMENT CONTRACTORS TO BE MORE EFFICIENT

"Profit is strong within the contractor."

Few will deny that profit (in the long run) is foremost the minds of every contractor, but most argue that they are also highly concerned with the quality of their product. One individual interviewed said that he wants a "fair price and risk factor" and a profit potential which is gained or lost based on performance. There are several possible methods of using profit to motivate the contractor to conduct his own study. One method might be to grant a higher fee percentage (within the statutory limits) for

a contractor who has conducted a "should cost" study and this percentage based on how recently the study was made. Another method would be sharing the cost and benefits of the study. The exact share ratio is not suggested, but it should have some relationship to the percentage of Government business that the contractor performs. Another method might be to make "should cost" a below-the-line item in the weighted guidelines where the more recent the study the higher the rating. The last method to be discussed is suggested by Mr. W. P. Gwinn (Ref. 13) that "the Government could encourage this continuing self-examination and improvement by reviewing contractors' capabilities and procedures for the internal application of the 'should cost' technique, and the contractors' utilization of the technique, and by withholding any 'should cost' studies by the Government upon a finding that the contractors' capabilities in this field were adequate."

E. DESIGN-TO-COST

The concept of design-to-cost shows a great deal of promise in the procurement process and is being enthusiastically received by industry.

Although it was not intended, the subject of design-to-cost came up in numerous interviews. Most contractors seem to be highly in favor of this technique and feel that much more can be accomplished through this concept than through the application of "should cost." It should be brought out that every "should cost" doesn't necessarily involve design-to-cost, but every design-to-cost effort should involve "should cost." As identified by James McCullough (Ref. 21), the birth of design-to-cost within DOD was manifested in DOD Directive 5000.1, Acquisition of Major Systems, dated July 13, 1971, which states:

Cost parameters shall be established which consider the cost of acquisition and ownership; discrete cost elements (e.g., unit production cost, operating and support cost) shall be translated

into "design to" requirements. System development shall be continuously evaluated against these requirements with the same rigor as that applied to technical requirements. Practical tradeoffs shall be made between system capability, cost and schedule.

McCullough describes three methods of applying the design-to-cost concept:

(1) as it relates to the total system (far beyond the "should cost" concept) which requires action taken during the design phase using life-cycle costs as a key design parameter; (2) focus on production hardware ("should cost" is relevant) which seems to be the current actual practice, and (3) the total force structure (again far beyond the "should cost" concept) which suggests that strategies are established to meet future threats using the budget as the constraining factor and a mixture of smaller, high-technology force to meet similar threats and a larger, standard force of lower-cost weapons be designed to meet these future threats.

CHAPTER V SUMMARY AND RECOMMENDATIONS

A. SUMMARY

The purpose of a "should cost" team is to review the contractor's cost projections and to identify where these projections include the cost presumptions of past inefficient and uneconomical performance and management practices and to recommend methods of improving efficiency and, thereby, reducing cost. The findings of the study form the base for contract negotiations and/or evaluation of past performance. The negotiated contract price should only reflect those changes which can be put into effect immediately. The full benefit of the study by the Government can only be derived from future business with the contractor.

The use of the "should cost" concept must be limited to high dollar major systems because of the expense of deploying a team of highly skilled specialists to the contractor's plant for a long period of time. The cost of the study must also consider various impact costs: the contractor's impact costs incurred by the disruption of his normal operations and the cost incurred by the Government for having to find and train personnel to replace the specialists selected for the team when Government personnel are being utilized.

B. RECOMMENDATIONS

1. The objectives and policy of "should cost" be standardized, but not the application.

Industry feels, as pointed out by the Commission on Government Procurement (Ref. 6), that the absence of formal, common, and consistent standards of the Government's "should cost" policy and procedure contributes to

contractors' lack of understanding and apprehensions regarding the concept. Application of the concept must be tailored to the situation, but a uniform objectives and policy statement is possible.

2. "Should cost" should not be used during the early stages of the system life cycle.

"Should cost" is just one method of pricing and has limited application with regard to Government contractors. As with any cost estimating procedure, its accuracy is highly dependent on the degree of certainty of quantity, performance, and schedule. In this respect, "should cost" has little or no applicability during the early stages of the system life cycle and is best suited for the case of follow-on production. Although "should cost" can be applied either before or after contract negotiation, maximum benefit is gained by application prior to contract award.

3. A study (possibly a follow-on thesis) be conducted to determine the feasibility of employing a preliminary "should cost" review to determine if sufficient potential cost savings merit extensive "should cost" expense.

As recommended by the Commission on Government Procurement (Ref. 6), when there is any doubt as to whether a "should cost" study is justified, a great deal of time and effort can be saved by sending a small team, selected on the basis of their industrial engineering and management capabilities, to the plant to decide in a relatively short time and with minimum disruption if the contractor's situation is serious enough to warrant a full "should cost" review.

4. A study be conducted as to what is the most effective team size and composition.

Government "should cost" studies have involved from six to 40 team members and the most effective team size is unknown. It is realized that an exact number would depend on many aspects of the study in question.

but some determination of whether the team should be large or small is needed.

Although industry is in favor of teams made up of independent consultants, an argument is that Government representatives most familiar with a contractor's everyday activities (Plant Cognizance Program) can usually perform the most effective "should cost" review. It seems apparent that a mix of Government personnel and independent consultants is necessary to get the continuity and objectivity needed, but this mix is not known.

5. "Should cost" studies conducted by the contractor be included as a below the line factor in the weighted guidelines.

As explained by ASPR, weighted guidelines is a technique that will insure consideration of the relative value of the pertinent profit factors in the establishment of a profit objective and the conduct of negotiations. "Should cost" could be included as a special profit factor with a weight factor equal to that of contractor performance. Thus, the weighted guidelines would be used to guarantee a contractor a higher profit factor if he took it upon himself to conduct a "should cost" study.

6. Automatic data processing techniques be used to link together "should cost" and value engineering concepts.

As pointed out by Frank (Ref. 8), value engineering (product cost reduction activities) and "should cost" techniques can be administratively linked together with automatic data processing techniques to reduce the likelihood of unwarranted program cost growth. This concept further reinforces the concept that "should cost" is highly product oriented, but is in contradiction with the idea that maximum benefit is gained by application prior to contract award. Automatic data processing is also useful in monitoring contract progress. Automatic data processing allows for simulation

of an on-going program to help the Government and the contractor to better understand the cost ramifications of program decisions before it is necessary to put these decisions into effect.

7. Investigate the feasibility of the design-to-cost concept to fulfill "should cost" objectives.

One of the tasks of the Commission on Government Procurement (Ref. 6) was to focus attention on areas where illusion and gamesmanship had crept into the procurement process. The "should cost" process was identified as showing signs of becoming another game, thus defeating its potential as a useful method of cost estimating. Once a process becomes a game it becomes time to "get on with" the job to be done and this may require new methods. Design-to-cost has a great deal of promise for Government procurement and is being enthusiastically received by industry.

C. CLOSING STATEMENT

The overall goal of the Defense procurement system is to optimize defense for the taxpayer's limited dollars. To insure that cost is a manageable item, it is first necessary to have the right procurement system and to rely heavily on competition. There is no one pricing technique which suits every procurement situation and care must be taken to insure that the method of cost estimating is appropriate for the procurement at hand. Whatever the costing techniques used, it must be exercised to insure that the findings lead to a realistic basis for negotiation; undue optimism can lead to goals that are unrealistic, and, if accepted by the contractor, could lead to a loss position unless every conceivable fortuitous circumstance occurs.

APPENDIX A

QUESTIONS USED DURING INTERVIEWS TO STIMULATE A FREE EXCHANGE OF IDEAS

1. What is your attitude toward "should cost" as a pricing policy?
2. What is your company's attitude toward "should cost" as a pricing policy?
3. When, if at all, do you feel that the "should cost" technique is appropriate?
4. Do you or your company feel any resentment toward Government "should cost" analysis?
5. Do you favor flexibility in the application of "should cost" or would you like to see uniform guidelines to be used by all Government agencies?
6. What do you feel that the Government can do to motive you, your company and all industry to conduct your own "should cost" studies?

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