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In 1959, the Department of Defense (DOD) adopted the Value Engineering (VE) program as one of several programs aimed at overall cost reduction. The purpose of VE is to achieve the essential functions of DOD requirements at the lowest total cost, consistent with the needed performance, reliability, quality, and maintainability. The DOD's VE program for contractors is implemented through the inclusion of value engineering clauses in contracts prescribed by the Armed Services Procurement Regulation (ASPR). Of the VE clauses available in ASPR, only the Value Engineering Incentive (VEI) clause authorizes the sharing of savings under two methods: a VE sharing rate, or the original negotiated contract cost sharing rate. Since the DOD seeks to motivate defense contractors through its profit policy, this research investigates the alternate VE sharing methods to determine which sharing method provides the greater profit potential for the defense contractor. This research incorporates the ASPR VE computation instructions into contract pricing models for the fixed-price-incentive and cost-plus-incentive fee type contracts. Simulated profit levels are generated for each VE sharing method through the application of a hypothetical VE change proposal in the models. Conclusions and recommendations are drawn from the simulations.

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AN INVESTIGATION OF PROFIT POTENTIAL UNDER CONTRACTUAL VALUE ENGINEERING

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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Chapter 1

INTRODUCTION

Overview

The purpose of this research was to investigate the Department of Defense (DOD) contractual value engineering (VE) program as it pertains to the DOD's profit policy. This chapter is devoted to a discussion of the importance of value engineering, brief descriptions of the DOD value engineering program, the DOD policy on profit, a statement of the specific problem, the research scope, a statement of the research objectives, and the research question to be addressed.

Importance of Cost Management in the DOD

The magnitude of the Department of Defense (DOD) acquisition effort today represents a major investment in the United States economy (5:9). This investment, currently in excess of $44 billion annually[1] for the development and production of complex weapon systems, represents

[1] Extracted from the Office of the Assistant Secretary of Defense (Comptroller), subject: Amended Submission 1978 Budget, February 21, 1977.

a major commitment of the nation's resources toward national security and involves substantial long range commitment for future spending (5:9). Because DOD purchases represent a large segment of government expenditure, Congress and the General Accounting Office (GAO) have focused their attention to a great extent on DOD procurement activities and on the managerial expectations of those within DOD entrusted with expending public funds (9:563). Consistent with this external emphasis has grown an increased realization within DOD that

> the military effectiveness or military worth of any given weapon system cannot logically be considered in isolation. It must be considered in relation to its cost and, in a world in which resources are limited, to the alternative uses of those resources. Military requirements are meaningful only in terms of benefits to be gained in relation to their costs. Accordingly, resource costs and worth have to be scrutinized together [6:36-37].

Efficient utilization of resources has long been a management objective of the DOD; however, congressional budgetary restrictions and public pressure for improved financial management have made it necessary to increase that emphasis within the DOD (21:1). In pursuing improved methods to enhance economical efficiency, DOD investigated and implemented a number of programs aimed at overall cost reduction (1:1). One such program, Value Engineering (VE), was implemented within the DOD in 1959 (1:1).

What Is Value Engineering (VE)?

Value engineering is defined in the DOD as

> the systematic effort directed at analyzing the functional requirements of DOD systems, equipment, facilities, procedures, and supplies for the purpose of achieving the essential functions at the lowest total cost, consistent with the needed performance, reliability, quality, and maintainability [21:1].

Such analysis seeks to eliminate unnecessary and wasteful features which contribute nothing to the essential functional capability (21:1). In a memorandum dated 5 July 1967 to the President of the United States, the Secretary of Defense stated:

> The Nation cannot afford the luxury of paying for design or performance features that contribute nothing to military effectiveness. Such unneeded features are often introduced into design specifications either because the designer is over zealous or because there is inadequate practical experience on which to base a sound judgment. To prevent such "goldplating" of specifications, we have in recent years greatly augmented our "value engineering" staffs and conducted a vigorous education and training program to increase their skills. In addition, strong financial incentives have been introduced into our contractual arrangements to encourage defense contractors to exploit every "value engineering" opportunity which presents itself [21:1].

Value engineering within the DOD consists of two distinct elements (20:4). The first element is an in-house effort wherein VE is performed by Defense personnel. Particularly active in this area are the Air Force Logistics Command and the Air Force Systems Command (13:26). The second element, and the counterpart to the in-house effort, is DOD's program for contractors.

The Contractual Value Engineering Program In Brief

The DOD's VE program for contractors is implemented through the inclusion of value engineering clauses in contracts. These clauses, identified in Section VII of the Armed Services Procurement Regulation (ASPR), are designed to stimulate a defense contractor to develop and submit VE proposals to change those contract specifications which the contractor feels imposes costly, non-essential requirements (22:1). Inducement to submit a proposal is provided by sharing the cost savings resulting from government-accepted change proposals (15:p.1:201). ASPR states:

> It is the policy to provide contractors with a substantive financial incentive to undertake VE on the premise that both Government and the contractor will benefit. Accordingly, the contractor should be assured (i) that the Government will provide objective and expeditious processing of proposals submitted and (ii) that if a proposal is accepted he will receive a fair share of the savings [15:p.1:201].

Two basic clauses in ASPR reflect DOD's objective for contractual value engineering; namely, the Value Engineering Program Requirements (VEPR) clause, and the Value Engineering Incentive (VEI) clause (15:p.1:201). Each clause has the same basic purpose and objective--to share in the projected cost savings with the contractor and to reduce the total overall cost for acquiring and supporting the product (15:p.1:201).

Projected cost savings may be shared (1) on the instant contract, (2) on future contracts awarded within a specified period of time, (3) on collateral contracts when savings from the cost reduction exceeds any increase in the acquisition cost, or (4) any combination of these three contract alternatives (21:14-15). Both contract clauses specifically identify the computational procedures to be employed in each of these contract situations.

The value engineering program requirements (VEPR) clause. This clause, though directed toward the same objective as the incentive clause--identification and initiation of cost reduction measures--presents to the contractor a more structured requirement than does the incentive clause. Specifically, it requires "the contractor to establish a VE program . . ." as is used ". . . when a sustained VE effort at a predetermined level is desired [15:p.1:202]." Mr. Richard E. Biedenbender explained that the contractor is stringently committed to perform VE since it is a funded contract line item (2:6). The fact that the contractor must establish a cost reduction target under this clause presents a significantly different contractor perspective than the voluntary performance initiative rewarded under the incentive clause concept (21:13-14). Thus, commitment toward VE under the VEPR clause is truly an integral element of the contract performance subject to monitoring and evaluation common to other contractual terms (15:p.1: 202).

The value engineering incentive (VEI) clause. Proposals under this clause are submitted by the contractor on a strictly voluntary basis. This clause sets forth the methods for the contractor to submit a VE proposal, for the government to process the proposal, and for sharing resultant cost savings (17:p.7:94). VE incentive clauses are generally required in all contracts estimated to exceed $100,000; however, there are exceptions to this ASPR policy: (1) contracts for specific types of services which are not conducive to VE action or those contracts which already have other provisions relating to product improvement; (2) those contracts which have terms that would conflict with the incentive clause may be generated without this clause at the written discretion of the contracting officer; (3) finally, the head of a procuring activity may direct that such a clause be excluded from contracts of $100,000 or more when he judges that the probability of fruitful VE application is extremely limited (15:p.1:202).

Contractor participation under the VE incentive clause represents a unilateral decision of the defense contractor. The DOD has chosen to stimulate participation through a profit-sharing plan which characterizes the traditional, economic view of profit-maximization as the primary motivation of the defense contractor.

DOD Contractual VE Policy

As identified previously, the ASPR VE clauses provide the contractual mechanisms to implement the objectives of the DOD contractual value engineering program. The Under Secretary of Defense, Research and Engineering, is responsible for providing overall policy guidance for the value engineering program and for reviewing program performance. Department of Defense Directive 5010.8, DOD Value Engineering Program, sets forth the objectives, concepts, policies, responsibilities, and reporting requirements for the VE program within the DOD (20:1-5). The direct responsibility for promotion and implementation of the program in the services is vested in the Secretaries of the Army, Navy, and Air Force and includes the responsibility for ensuring that key Defense personnel--program managers and contracting officers--encourage contractors to develop and submit cost saving VE proposals (21:4).

The DOD VE program for contractors was established to stimulate contractors to develop and propose cost saving changes to those contract specifications which impose nonessential requirements. To induce participation, the DOD policy provides for rewarding contractors with additional profit as a motivator to undertake VE (15:p.1:201). This policy of financial reward is consistent with the overall DOD policy on profit which states:

> It is the policy of the Department of Defense to utilize profit to stimulate efficient contract performance. Profit generally is the basic motive of business enterprise. The Government and defense contractors should be concerned with harnessing this motive to work for more effective and economical contract performance [16:p.3.139].

VE Profit Incentive

Value engineering profits under the VEI clause are calculated presently in one of two ways (15:p.1:204). The first method utilizes the VE share ratios identified in Table 1. Share ratios depicted represent the maximum percentage of additional profit available to the contractor for each dollar of net cost savings contributed by value engineering. Each contract type is restricted to the rate identified in Table 1 for each type of VE clause except as noted below.

The second method of calculating VE profits utilizes the negotiated contract cost sharing ratio that is established for each incentive type contract. This method is employed when included specifically in the basic contract by the contracting officer and is applicable only to CPI and FPI type contracts (15:p.1:204). Historically, the contractor's share of this negotiated cost sharing ratio has ranged from 10 to 30 percent (12:134-36).

Computational instructions for each VE sharing method are depicted in Appendix A.

Table 1

Value Engineering Sharing Ratios [15:p.1:204]

TYPE OF CONTRACT	VALUE ENGINEERING INCENTIVE CLAUSE (Government/Contractor)	VALUE ENGINEERING PROGRAM REQUIREMENT CLAUSE (Government/Contractor)
Fixed-Price (Other than Incentive)	50/50	75/25
Fixed-Price-Incentive (FPI) or Cost-Plus-Incentive-Fee (CPIF)	65/35	80/20
Cost-Plus-Award-Fee (CPAF)	75/25	85/15
Cost Reimbursement (Other than CPIF and CPAF)	75/25	85/15

Criticism of the DOD VE Program

The General Accounting Office (GAO) recently reexamined the progress of the DOD VE program for contractors and found that the program achieved only a fraction of its cost savings potential (22:17). The report cites that one billion dollars of potential savings will be lost if management support continues unimproved over the next four years (22:11). The GAO concluded that the lack of acceptance and support of the value engineering program for contractors by DOD managers has been a critical factor impeding the performance of the program (22:12).

The report also cited the opinion of the Air Force representative to the DOD VE committee:

> Contractors feel they get a better return by investing time and resources in self-initiating projects to generate cost savings which do not have to be shared with the Government [22:14].

This opinion suggests that defense contractors may not view the VE sharing ratio as the financial motivator for participation as perceived by the DOD policy on profit. This concern was similarly expressed by Walter Henderson when he stated:

> As we take stock of the program of value engineering, one thought that bears constant reminder is that all the promotion, all the proliferation of paper regulations and directives, all the contracts with VE clauses in them, will stand for nothing unless its effect is to reduce the cost of defense. Our procurement policy is worth no more than its effectiveness in accomplishing that result. Whatever form this policy takes with the passage of time, there is one essential test that must be continuously applied to it where VE

> is concerned: Does it offer the contractor real incentive to make the special effort it takes to reduce cost without sacrifice of performance? We cannot afford for a minute to lose sight of this factor. It is critical to the success of the program [7:122].

Traditional economic literature on profit analysis makes the assumption that the individual business firm seeks to maximize profits (4:246). The DOD profit policy identified heretofore indeed supports this assumption. However, previous research by Frank M. Scherer indicated that defense contractors do not behave as the theory of expected profit maximization would have them behave (11: 276). Scherer indicated that profit maximization is not the major force driving defense contractors to explore opportunities for cost reduction (10:10; 11:263). As pertains to the traditional theory on profit, Scherer concluded that defense contractors will seek to sacrifice profit maximization in order to avoid the risk of financially unfavorable contract outcomes (12:150).

Scherer presented an economic theory which appears to de-emphasize the importance of profit in the contractor's decision spectrum. Moreover, Scherer's theory exposed a contractor behavioral philosophy which seemingly contradicts the DOD's objective of securing voluntary participation in contractual value engineering. Since the DOD seeks contract cost reduction through its policy on VE, Scherer's conclusion relative to contractor risk aversion may possibly account for the lack of VE participation cited in the referenced GAO report.

Other authors have expressed similar opinions concerning the role of profits as a goal of the business firm. Richard Eells and Clarence Walton stated:

> Profit maximization as the goal of the firm has been replaced in some circumstances by the long range goal of general stability and enhanced reputation [4:248].

Peter F. Drucker stated: ". . . the essential fact about profit is that there is no such thing. There are only costs [3:10]."

Frank M. Knight, noted economist, supported both the theory of risk aversion and the goal of general stability when he concluded that the "return on capital invested must equal, in the long run, the competitive rate of interest [8:303]."

It appears that defense contractors may assess the magnitude of financial risk, return on investment and general stability prior to undertaking VE as a profit consideration.

Statement of the Problem

The previously cited GAO report indicated that the DOD program for VE is achieving only a fraction of its cost savings potential. The GAO cited the lack of internal management emphasis within DOD as contributing significantly to the lack of contractor participation. Although the GAO recommended that the DOD publicly demonstrate the importance of VE by encouraging defense contractors to participate for additive profits, the economic literature reviewed does not necessarily support the assumption that defense contractors will respond to VE under the present VE incentive policy.

Notwithstanding these recommendations and conclusions, there is no evidence in VE literature which specifically addresses how present VE sharing ratios were determined, or whether historical or simulated data were employed in establishing these sharing ratios. Consequently, in the absence of empirical evidence, doubt exists as to whether present DOD VE sharing methods do accomplish the intent prescribed in its overall profit and VE incentive policies.

Based on the DOD premise that profit is the primary motivator driving contractor participation in VE, there existed a need to determine and examine the scope and magnitude of profit incentive alternatives under existing VE sharing methods.

Research Objectives

The objectives of this research were:

1. To determine which of the present methods of computing the contractor's VE incentive share under each contract type examined provides the maximum VE profit and total profit potential.

2. To determine if additional alternative sharing ratios not presently considered provide greater levels of VE profit and total profit potential under each contract type examined.

3. To present and analyze a graphic comparison of the outcomes of Objectives 1 and 2.

4. To identify key implications resulting from the computations derived under Objectives 1 and 2.

Research Question

Since the DOD profit policy appears to support the classical economic theory of profit maximization, the question posed for research was which VE sharing method maximized total contract and VE profit potential for a defense contractor?

Scope

This research effort was limited to an analysis of the profit potential under the VEI clause only. The VEPR clause requirements were excluded since the defense contractor is contractually obligated to perform VE at a predetermined level of effort which is negotiated prior to contract execution. Thus the contractor's motivation to achieve VE under the VEPR clause materializes through his compliance with the negotiated terms and conditions of the contract. On the other hand, VEI participation assumes a completely different perspective since participation is strictly voluntary and self-initiating. No contractual obligation to participate in VE exists. Additionally, only the profit potential pertaining to the instant contract was analyzed since the literature was absent of any empirical data that would support a reasonable prediction of the probability for concurrent or future contracts.

This research was further limited to an analysis of the VE profit potential in FPI and CPI contract types since they are the only two compensation arrangements under which the ASPR authorizes both the VE incentive or contract cost sharing ratio methods of VE sharing.

Organization of the Study

The remaining chapters of this study are devoted to documentation of the effort undertaken to answer the research question. Chapter 2 provides the conceptual development of the research team's approach to defining the task at hand. Chapter 3 describes how the research was conducted and data gathered. Chapter 4 provides an analysis of data gathered, while Chapter 5 addresses conclusions and recommendations based on the results of the data analysis.

Chapter 2

RESEARCH DESIGN

As stated in Chapter 1, the purpose of this research was to determine which of the ASPR VE sharing methods generated the maximum profit potential for a defense contractor. To determine this profit potential, a contract pricing model and a contract profit model incorporating present VE sharing methods were developed according to ASPR pricing guidelines.

Development of the Contract Pricing Model

The basis for the contract pricing model was developed from the DD Form 633, "Contract Pricing Proposal." This form provides a standard format for soliciting pricing information from potential contractors when the DOD is contemplating awarding a contract for a specified product or service. The DD Form 633 lists standard cost element classifications to permit the offeror to identify the proposed cost estimate for each element of cost; however, the form may be manually altered by the offeror if an additional or more descriptive cost element is desired. In any event, the cost and pricing data provided by the offeror become the basis for contract negotiations and, ultimately, the negotiated contract price (18:p.16:14).

Since the elements of the contract price can be separated into two generally accepted classifications, cost and profit, it is possible to combine these classifications into the following algebraic relationship:

PRICE EQUALS COST PLUS PROFIT

However, for the purposes of this research, the following relationship was utilized since profit is a function of cost when VE sharing is contemplated:

PROFIT EQUALS PRICE MINUS COST

This relationship served as the basis for analyzing the profit potential from a VE change proposal when the alternate sharing methods are applied against the FPI and CPI compensation arrangements.

To pictorially represent this cost/profit relationship, simple graphs for each compensation arrangement are identified in Figures 1 and 2. In both figures, the horizontal axis represents cost; the vertical axis represents profit (fee)/loss. Price is not shown directly but can be assessed as the algebraic sum of the measurements on the two axes describing a point (14:68). Table 2 identifies the contract element acronyms used throughout the study.

Table 2

Contract Element Acronyms

TC	Target Cost
AC	Actual Cost
TF	Target Fee/Profit
CP	Ceiling Price
MAXFE	Maximum Fee
MINFE	Minimum Fee
J	Contract Cost Sharing Ratio
I	VE Sharing Ratio

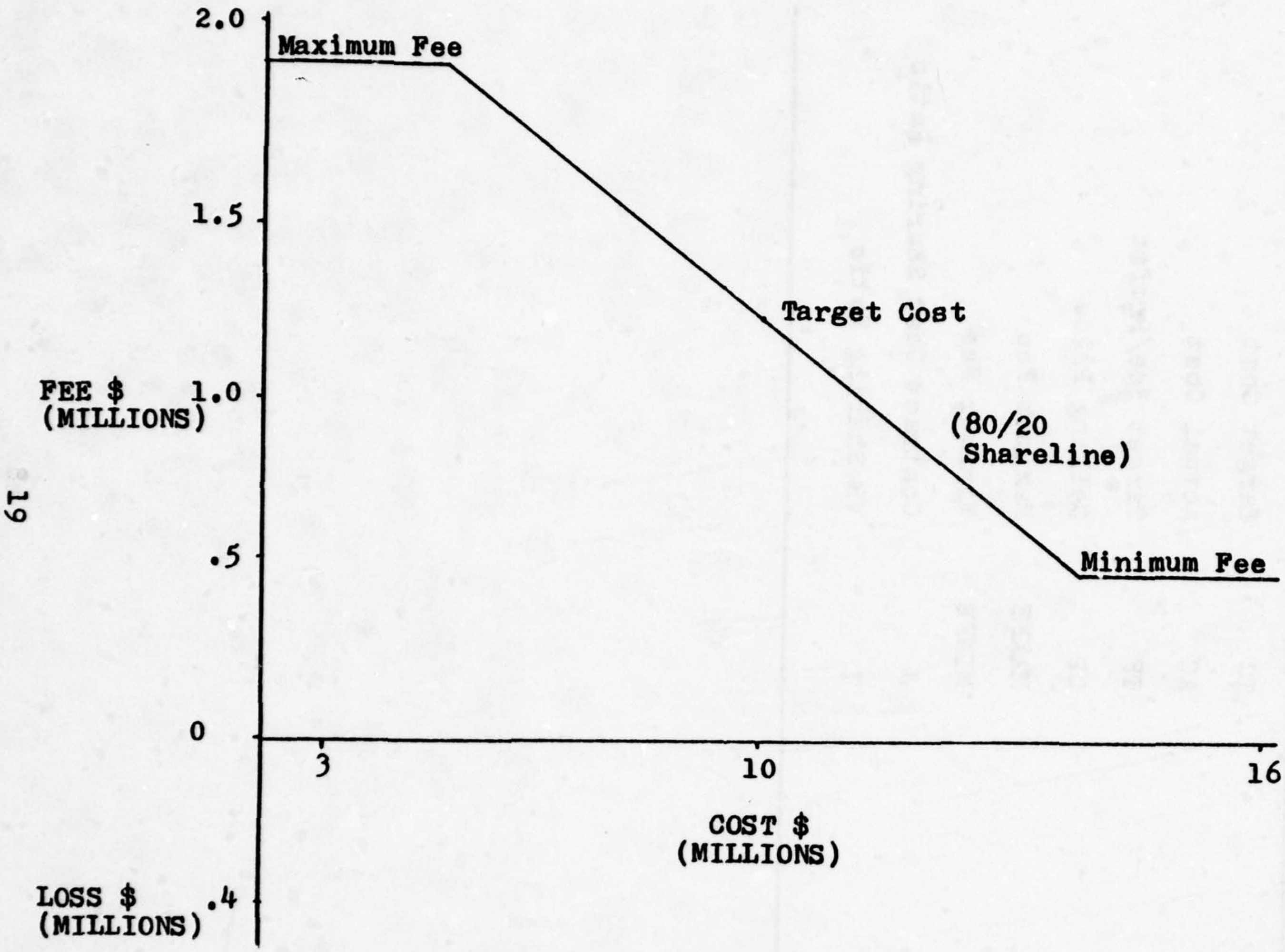

Figure 1. Cost-Plus-Incentive Contract

The cost-plus-incentive (CPI) compensation arrangement. The cost/fee line presents the locus of a number of different possible cost/fee combinations; however, the procurement situation portrayed in Figure 1 is described as follows:

Target Cost	$10,000,000
Target Fee	$ 1,050,000
Sharing Formula	80/20
Maximum Fee	$ 1,700,000
Minimum Fee	$ 400,000

NOTE: Sharing formula refers to government/contractor sharing percentages respectively.

The government and contractor have mutually agreed that $10,000,000 is a reasonable estimate for the cost of this effort. There are still uncertainties in the effort which are recognized by the minimum and maximum fees. These fees constrain the amount of actual fee when the actual cost is less than $7,750,000 or more than $13,750,000. The basic assumption underlying the range of incentive effectiveness (portion of line between $7,750,000 and $13,750,000 on the horizontal axis) is that the final actual cost will fall somewhere on the share line and that the contractor will have performed for a minimal cost. Consequently, the final price of the contract to the government will be the cost of performance plus a fee determined by the sharing ratio at that final cost level (14:77-86).

The fixed-price-incentive (FPI) compensation arrangement. The same basic relationship of cost and profit as depicted by the cost/fee line in the CPIF contract exists for the FPI contract; however, the procurement situation in Figure 2 is described as follows:

Target Cost	$10,000,000
Target Profit	$ 1,050,000
Ceiling Price	$12,000,000
Sharing Formula	80/20

NOTE: Sharing formula refers to government/contractor sharing percentages respectively.

In this procurement situation the government and contractor have mutually agreed that $10,000,000 is the target cost, but both contracting parties recognize that the government's maximum obligation is $12,000,000, the ceiling price. In addition to this limit, there is a cost ceiling point or "point of total assumption" (PTA), beyond which the cost sharing ratio changes from 80/20 to 0/100 and produces the effect of reducing profit by one dollar for each dollar of cost incurred beyond the PTA. The PTA is depicted as the point where the two cost sharing ratio lines intersect. Consequently, final price of the contract to the government will be the cost of performance plus a profit determined by the sharing ratio at that final cost. In any event, the government's obligation will not exceed

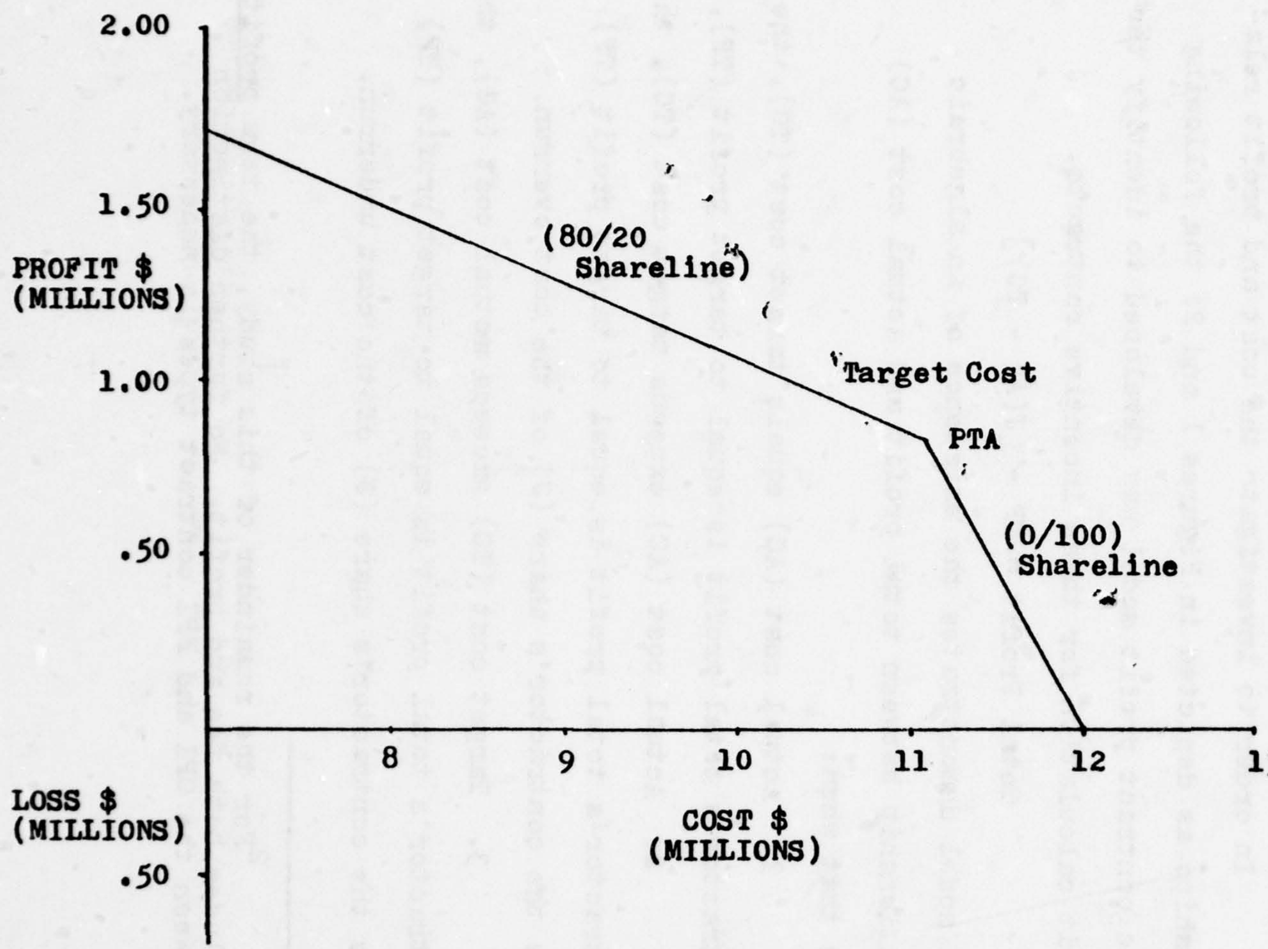

Figure 2. Fixed-Price-Incentive Contract

the ceiling price notwithstanding the contractor's actual cost of performance (14:67-85).

Development of Contract Profit[2] Model

In order to investigate the cost and profit relationships as depicted in Figures 1 and 2, the following basic contract profit model was developed to identify the profit calculation for these incentive contracts.

$$\text{Total Profit} = TF - [J(AC - TC)]$$

This model demonstrates the existence of an algebraic relationship between total profit and actual cost (AC) such that when:

1. Actual cost (AC) equals target cost (TC), the contractor's total profit is equal to target profit (TF),

2. Actual cost (AC) exceeds target cost (TC), the contractor's total profit is equal to target profit (TF) less the contractor's share (J) of the cost overrun,

3. Target cost (TC) exceeds actual cost (AC), the contractor's total profit is equal to target profit (TF) plus the contractor's share (J) of the cost underrun.

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[2]For the remainder of this study, the term profit includes both fee and profit. No further distinction between the CPI and FPI contract types is necessary.

With these preliminary relationships defined, the basic profit model was expanded to incorporate the algebraic computation of VE sharing in accordance with the guidelines in Appendix A. Consequently, the basic contract profit model was redefined as follows:

$$\text{Total Profit} = TF - [J(AC - TC) + I(CIS - GC)]$$

This model identifies the algebraic relationship between total profit and actual costs and the adjustment to total profit when VE savings are shared with the contractor under either of the two VE sharing methods. If for example, the contract contains a VE sharing ratio (I) extracted from Table 1 in Chapter 1, total profit is equal to target profit (TF) plus the contractor's share of the difference between target cost (TC) and actual cost (AC) plus the contractor's share of the VE savings computed per Appendix A. Conversely, if the contract provides for VE sharing pursuant to the contract cost sharing method, I is equal to zero (0) and the total profit is equal to target profit (TF) plus the contractor's share (J) of the difference between target cost (TC) and actual cost (AC).

The following chapter describes how this profit model was used to answer the research question.

Chapter 3

METHODOLOGY

DOD has sought to promote contractor participation in its Value Engineering program by providing additional profit reward for approved VE initiatives. As discussed in Chapter 1, the DOD Value Engineering program has not achieved its full potential in that there has been a general lack of contractor participation. Several factors were noted as possibly contributing to the deficiency in participation, namely, lack of top level DOD management support, and emphasis away from the concept of profit as the primary motivating force within a business firm. Overshadowing these factors, however, in the opinion of the research team, was the specific lack of empirical studies to determine if present VE incentive shares are in fact consistent with overall DOD profit and VE incentive policy objectives.

Chapter 2 describes the models used as a basis for the research effort. The models depict the basic pricing relationships that pertain to the present DOD contractual VE program as defined by the ASPR. These models and the inherent relationships between cost and profit provided the conceptual framework to structure the research objectives and question.

This chapter describes how the expanded profit model was used to objectively assess the VE profit incentive offered by DOD to a participating contractor. The initial task undertaken was to determine if an existing data base could be used to generate the information required for this research effort. The literature review included:

1. Professional journals and periodicals.

2. Published materials on value engineering, contractual arrangements, cost and profit relationships, contractual incentives, and economic incentives.

3. Research reports of institutions of higher learning including United States military professional schools.

4. United States Department of Defense publications.

This literature review did not disclose any empirical data which summarized the comparison of profit potential under the two VE sharing methods. The research team concluded that:

1. Data required for the research effort could be generated by simulating VE sharing computations prescribed in ASPR.

2. The contract cost and profit relationships depicted in the model developed in Chapter 2 could be mathematically portrayed by computer programming.

3. Empirical data were not necessary to examine the computational relationships between the VE sharing methods and the profit potential.

In employing this approach, the research team made the following additional assumptions:

1. The data generated would not support statistical analysis because the data were not randomly generated nor were the data selected from an infinite population.

2. Factors affecting the contractor's decision to submit a value engineering change proposal (VECP) are not known. For example:

a. Defense contractors are unwilling to publicize their policies relative to pursuing increased profits through value engineering participation, and

b. The source of financing contractor VE development costs (CC) may be provided internally or secured from sources external to the organization.

3. Circumstances surrounding the negotiation of and agreement to actual contractual parameters are not known. For example, target cost may be based on an incremental cost concept of pricing in lieu of a full cost pricing concept using the DD Form 633, "Contract Pricing Proposal."

Computer Simulation

Simulation programs in the FORTRAN computer language (Appendices B and C) were developed to generate the data required for analysis. The profit model developed in Chapter 2 was included in the FORTRAN programs, and a hypothetical VE change proposal created by the research team (Appendix D) was used as the basis for data generation.

The CPI contract type was examined first. This particular contract compensation arrangement incorporates a contract incentive share ratio which is intended to reward a contractor for efficient cost management. The effectiveness of this incentive is limited to a specific cost range as depicted in Figure 1, Chapter 2, between the point estimates which represent the negotiated maximum and minimum fees. As explained also in Chapter 2, the effectiveness of this cost incentive is further limited by the amount that actual costs either exceed or underrun target cost.

Initial assessment of the CPI contract type under the contract profit model consisted of processing the value engineering change proposal (VECP) under the hypothetical scenario identified as Appendix D. In addition to the parameters specified in the scenario, three other parameters were varied:

1. Actual cost for the contract was incremented each iteration by $100,000 over the range between negotiated maximum and minimum fees to incorporate both contract underrun and overrun situations in that spectrum.

2. VE share ratios under each actual cost situation examined were varied stepwise in five percent increments to cover the range of theoretically possible contractor shares, 5-95 percent.

3. Contract cost sharing ratios were likewise varied in the same increments, under each VE share ratio examined.

Data generated during each phase of the simulation were written to permanent data files for later analysis.

The FPI contract type was examined next. This contract type is intended also to reward defense contractors for efficient cost management. However, the FPI contract includes an additional cost concept not present in the CPI contract, the point of total cost assumption (PTA), as identified in Figure 2, Chapter 2. This is the cost point beyond which each dollar of additional cost reduces contract profit by one dollar.

Assessments of the FPI contract in Figure 2 under the contract profit model were made in a similar manner to those made concerning the CPI model. The hypothetical scenario depicted in Appendix D was again used to define the basic contract parameters.

Three additional parameters were then varied to generate and compile data for subsequent analysis:

1. Actual cost for the contract was incremented each iteration from an arbitrarily selected minimum value of $7,500,000 up to and including the ceiling price ($12,000,000) in increments of $100,000 to incorporate both contract cost underrun and overrun simulations.

2. VE share ratios and contract cost sharing ratios were then incremented in the same manner as identified in the CPI simulation (5 percent increments through 95 percent).

Data generated by this simulation were also written to a permanent file.

Data Gathered During Simulation Runs

Data were generated during simulation runs of the various contract models and situations, and were written to permanent files on the computer. Data generated and stored were those required for additional study to produce the information required to meet the research objectives and to answer the research question. Data compiled during each simulation run included the following:

1. VE profit under each sharing method for each level of cost simulated.

2. Total profit under each contract type, each method of sharing, and each level of cost simulated.

The following chapter describes how the data generated by the computer simulations were transformed into information necessary to answer the research question.

Chapter 4

DATA ANALYSIS AND FINDINGS

Overview

The entire effort of this research was to answer the research question--which VE sharing method maximized the VE profit potential and the total contract profit potential for a defense contractor? Using the data collected through both the contract pricing and the hypothetical VECP models developed in Chapter 2, the ranges of possible profit outcomes were determined for both VE profit and total contract profit.

The first data analysis consisted of numerically summarizing the profit potential to a defense contractor when simulated costs equaled target costs for each compensation arrangement. The second analysis measured the profit potential in cost underrun situations, and the final analysis measured the profit potential for cost overruns. These last two analyses were divided into separate segments in order to categorize the data according to the specific contract pricing features unique to the CPI and FPI compensation arrangements.

Graphic representations provided the basis for identifying the relationships of these pricing features in order to achieve the objectives of the research and to answer the research question.

Analysis of VE Profit Potential

VE profit potential is the product of computing the contractor's share of the excess as defined in Appendices A and D. The symbolic representations of these mathematical products are as follows:

VE share ratio method:

RI(CIS - GC)

Contract cost sharing method:

RJ(CIS - GC)

NOTE: RI and RJ values represent the entire range of theoretically possible sharing ratios as specified in Chapter 3.

Thus, the maximum VE profit potential available to the defense contractor is derived by applying the larger sharing percent, RI or RJ, to the mathematical differences between CIS and GC. Since the difference between CIS and GC remained fixed at $60,000 throughout the data generation phases of this research, the maximum VE profit potential available to a contractor is related directly to the larger of the two sharing ratios, RI or RJ.

Analysis of Profit Potential - Cost Underruns

The CPI compensation arrangement. As identified in Chapter 3, simulated cost for the CPI scenario included in Appendix D was incremented by $100,000 over the cost range associated with the maximum fee of $1,700,000 and the target fee of $1,050,000. Concurrently, VE share ratios and contract cost sharing ratios under each simulated cost iteration were varied stepwise in five percent increments to cover the range of theoretically possible sharing combinations in this cost range.

Figures 3 through 7 summarize the results of the data generated for contract cost underrun situations ranging from $5,500,000 to and including target cost, $10,000,000. The horizontal axis on each graph represents the theoretical range of the contractor's portion of the VE sharing ratio. The vertical axis represents the theoretical range of contract cost sharing percentages available to the contractor. Points of intersection of the two ratios, falling in areas on the graph designated either contract share (CS) or VE share (VE), depict the sharing method which maximizes total contract profit potential at that point. The lines on each graph represent the locus of points at which total profits for each share method are approximately equal.

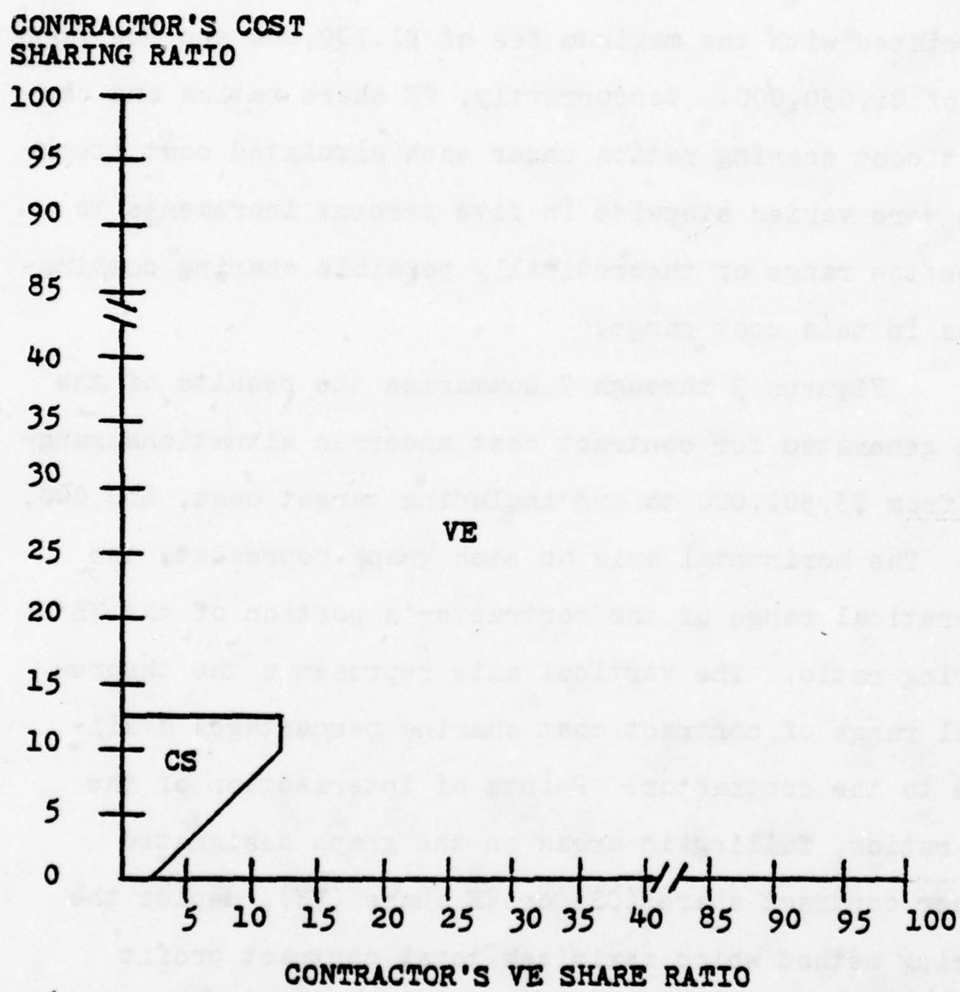

Figure 3. CPI Total Fee Potential, Simulated Cost $5,500,000

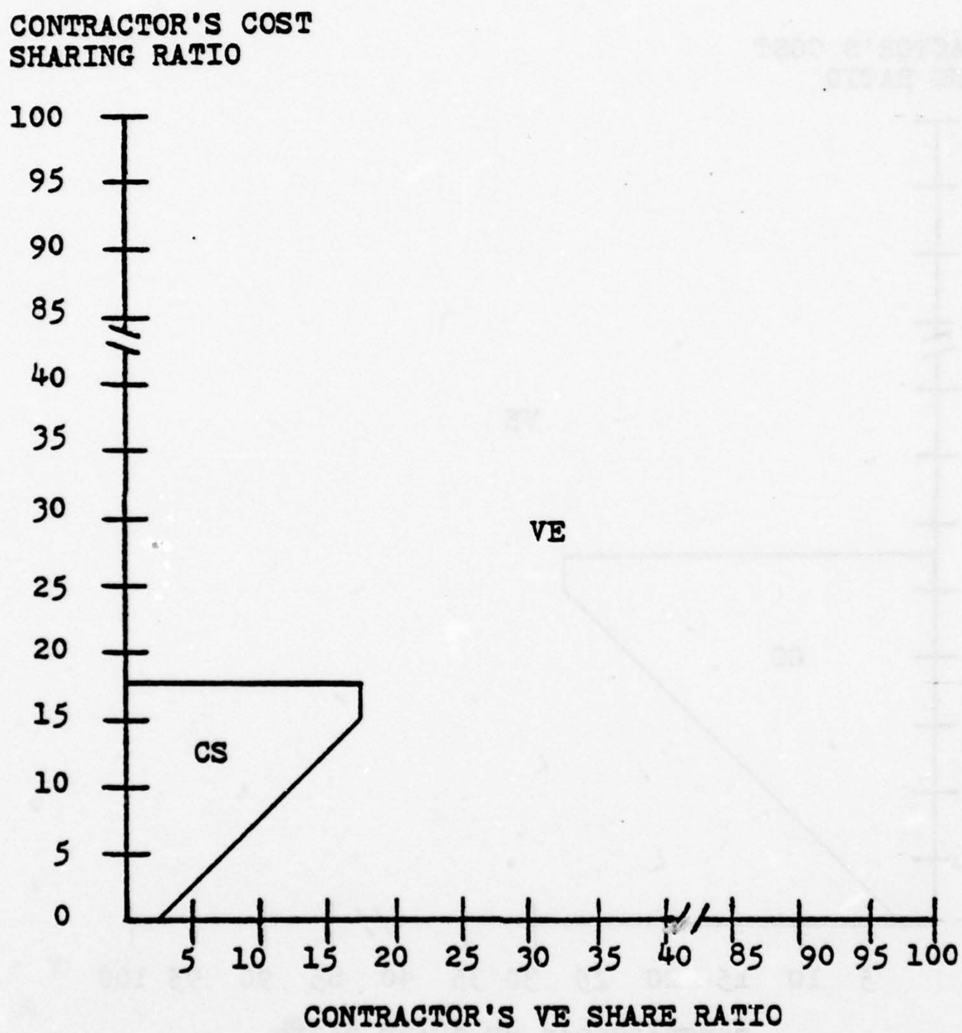

Figure 4. CPI Total Fee Potential, Simulated Cost $6,500,000

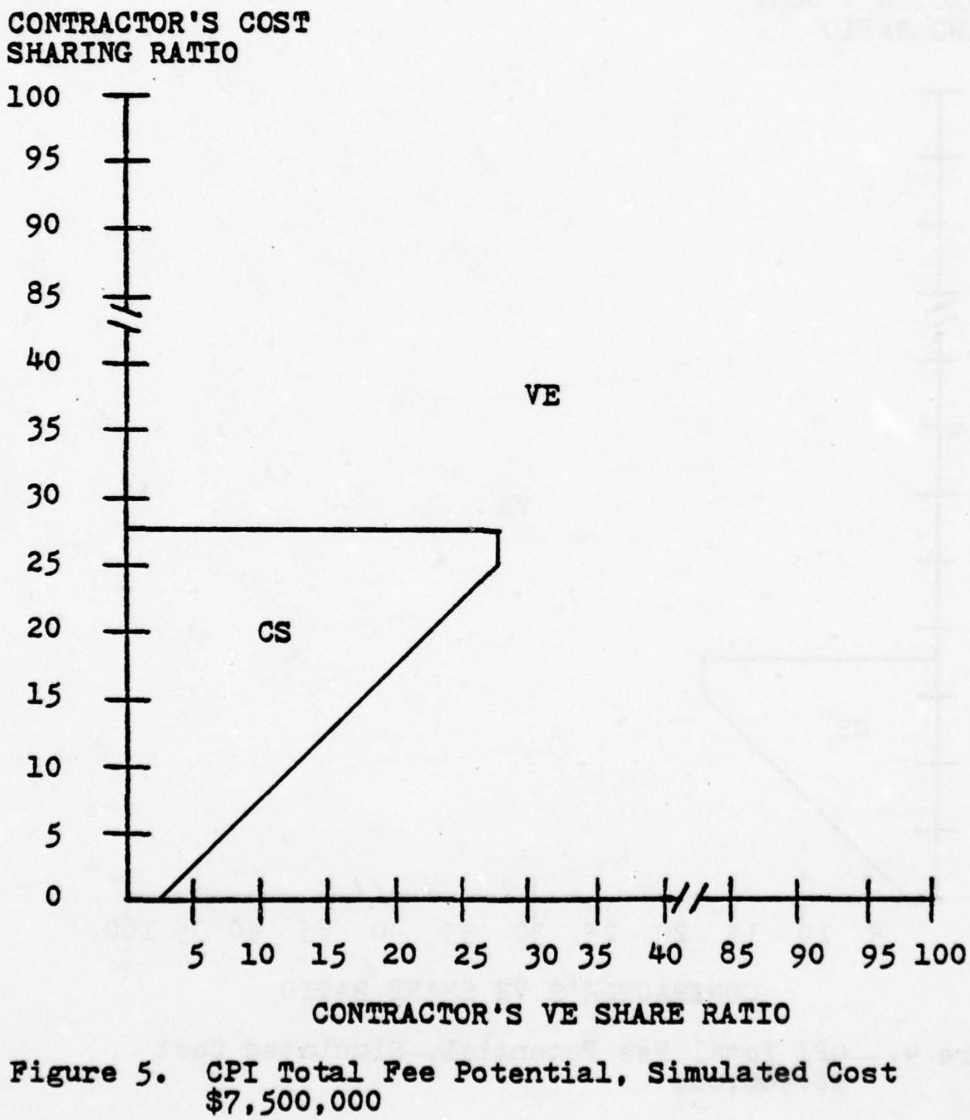

Figure 5. CPI Total Fee Potential, Simulated Cost $7,500,000

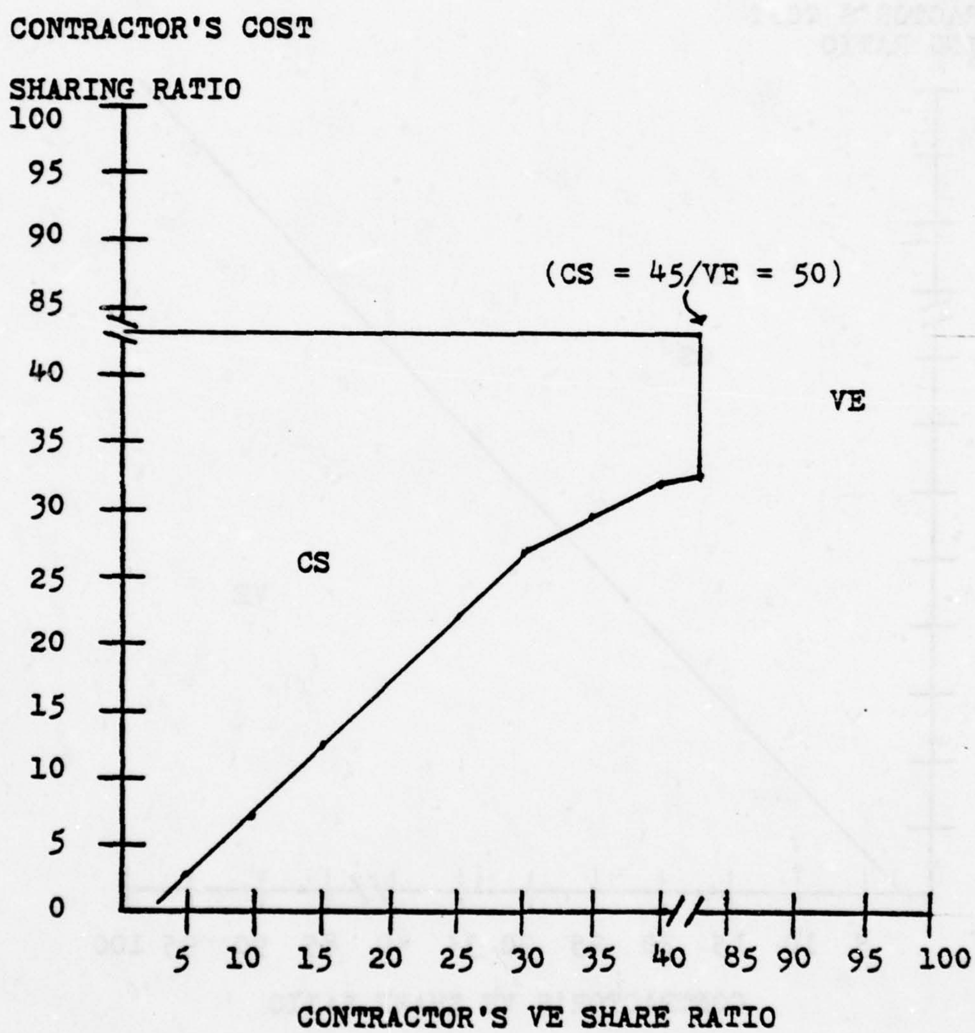

Figure 6. CPI Total Fee Potential, Simulated Cost $8,500,000

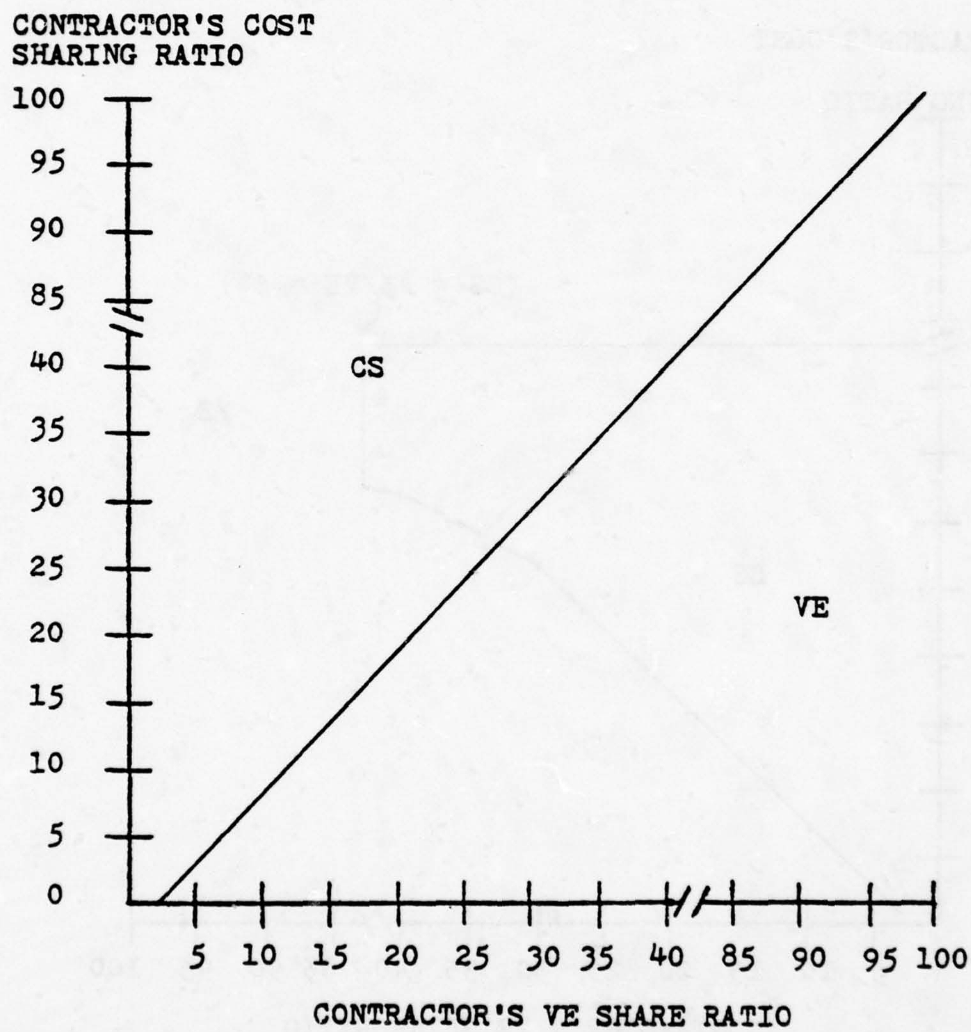

Figure 7. CPI Total Fee Potential, Simulated Cost $10,000,000

Figure 3 illustrates results obtained at a level of simulated cost of $5,500,000. At that level, the contractor will maximize total contract profit potential under the contract share method only at the points of ratio combination intersection which lie in the area designated CS. At all other intersection points, the VE share method provides maximum total contract profit potential. For example, given a contract share of 10 percent in combination with a VE share of 10 percent or less, the contractor maximizes total profit potential if operating under the contract share method. Conversely, given a contract share of 15 percent, the contractor maximizes total profit potential under the VE share method regardless of the magnitude of the VE share rate.

Figures 4 through 7 further identify the sharing combinations which maximize the contractor's profit potential as simulated costs move closer to target cost. As simulated costs increase in magnitude, the area in which the contract share method produces the maximum total profit potential also increases, growing in area upward and to the right until at target cost, the graph is bisected into the two separate and distinct areas depicted in Figure 7. Within this range of anticipated actual costs, a VE share ratio of 35 percent in combination with a contract share rate of less than 30 percent always provides the contractor with maximum total profit potential when sharing VE savings under the VE share method.

The FPI compensation arrangement. As identified in Chapter 3, simulated cost for the FPI scenario included in Appendix D was incremented by $100,000 over the cost range between $7,500,000 and target cost, $10,000,000. Concurrently, VE share ratios and contract cost sharing ratios under each simulated cost iteration were varied stepwise in five percent increments to cover the range of theoretically possible sharing combinations in this cost range.

Figure 8 summarizes the results of the data generated for contract cost underrun situations ranging from $7,500,000 to $10,000,000. The horizontal and vertical axes represent the contractor's share of the VE sharing ratio and contract cost sharing rates respectively. The area labeled CS identifies those contract cost sharing percentages where profit potential is maximized over this $2,500,000 cost range. Sharing value engineering savings at a separately negotiated VE share rate does not provide the contractor the maximum profit potential when the combination of the contract cost sharing rate and VE share rate falls within the area designated "CS" on the graph. For example, the contractor will maximize profit potential for simulated costs ranging from $7,500,000 to $10,000,000

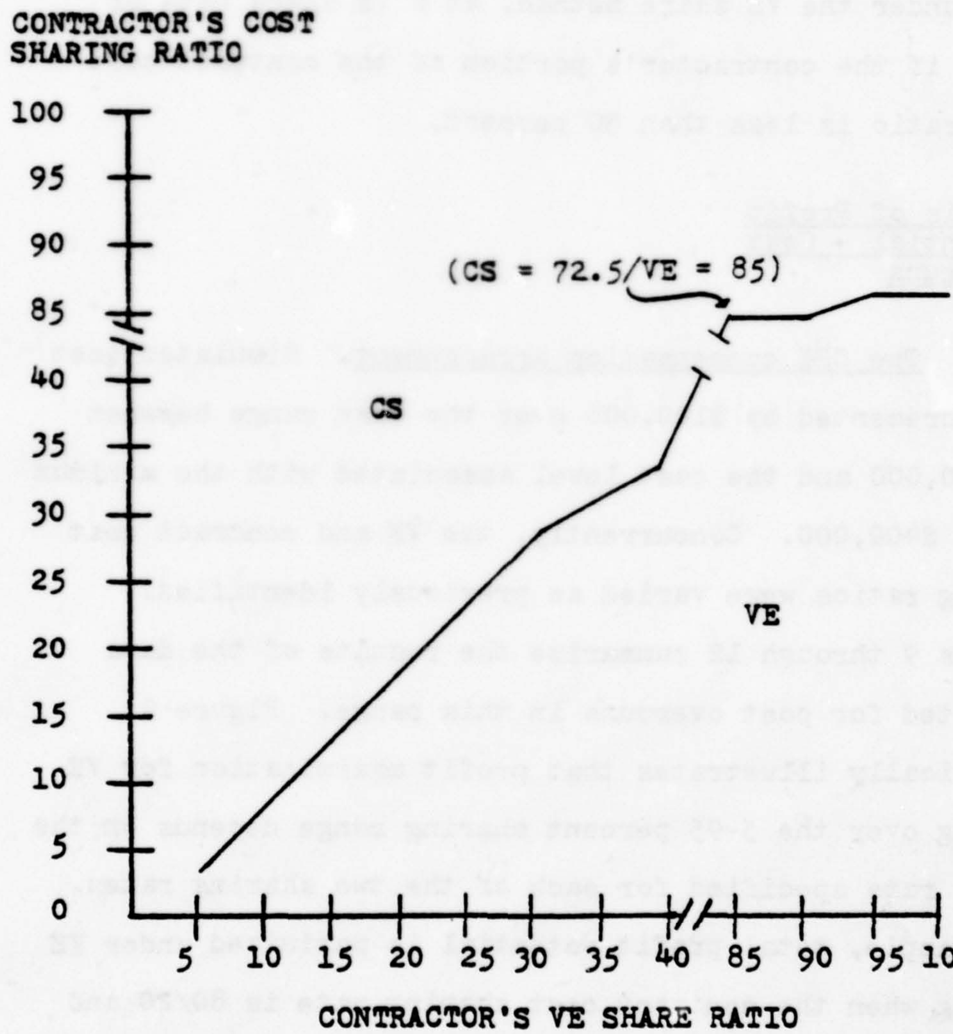

Figure 8. FPI Total Profit Potential, Underrun to Target

when sharing VE savings at the contract cost share bases as opposed to sharing VE savings at a VE share rate of 65/35, if the contractor portion of the contract share rate is greater than 30 percent. Conversely, the contractor will maximize profit potential over this same simulated cost range under the VE share method, at a VE share rate of 65/35, if the contractor's portion of the contract cost share ratio is less than 30 percent.

Analysis of Profit Potential - Cost Overruns

The CPI compensation arrangement. Simulated cost was incremented by $100,000 over the cost range between $10,100,000 and the cost level associated with the minimum fee of $400,000. Concurrently, the VE and contract cost sharing ratios were varied as previously identified. Figures 9 through 12 summarize the results of the data generated for cost overruns in this range. Figure 9 specifically illustrates that profit maximization for VE sharing over the 5-95 percent sharing range depends on the actual rate specified for each of the two sharing rates. For example, total profit potential is maximized under VE sharing when the contract cost sharing rate is 80/20 and the VE share rate is less than 85/15. Conversely, if the VE share rate is 65/35, then profit potential under contract cost sharing is maximized only when the contractors

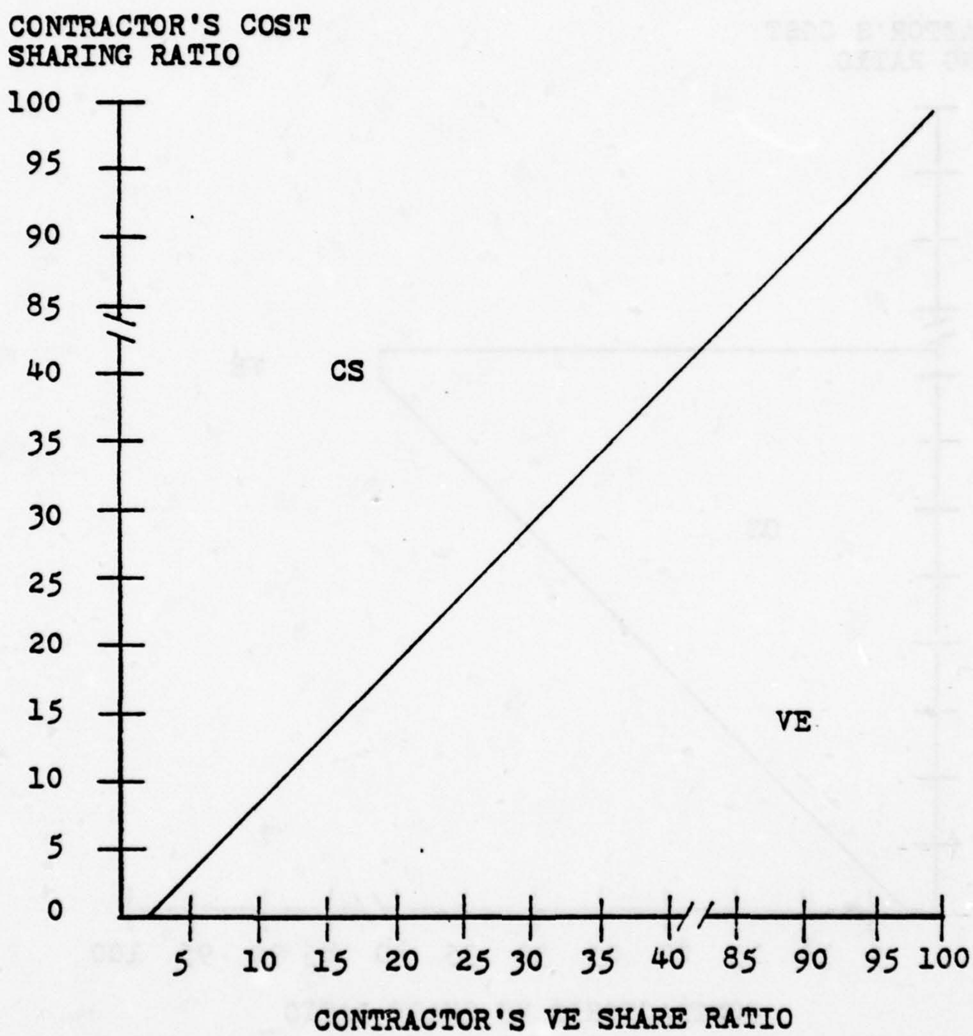

Figure 9. CPI Total Fee Potential, Simulated Cost $10,100,000

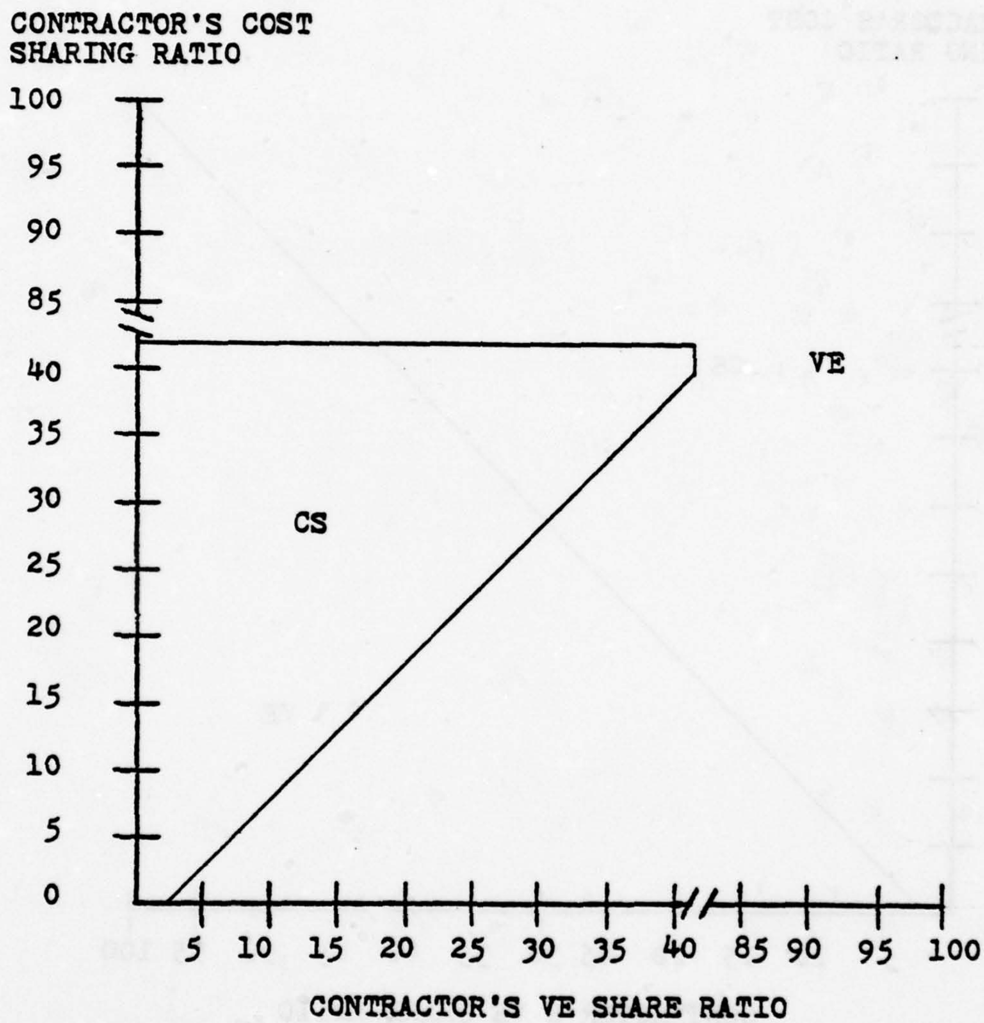

Figure 10. CPI Total Fee Potential, Simulated Cost $11,500,000

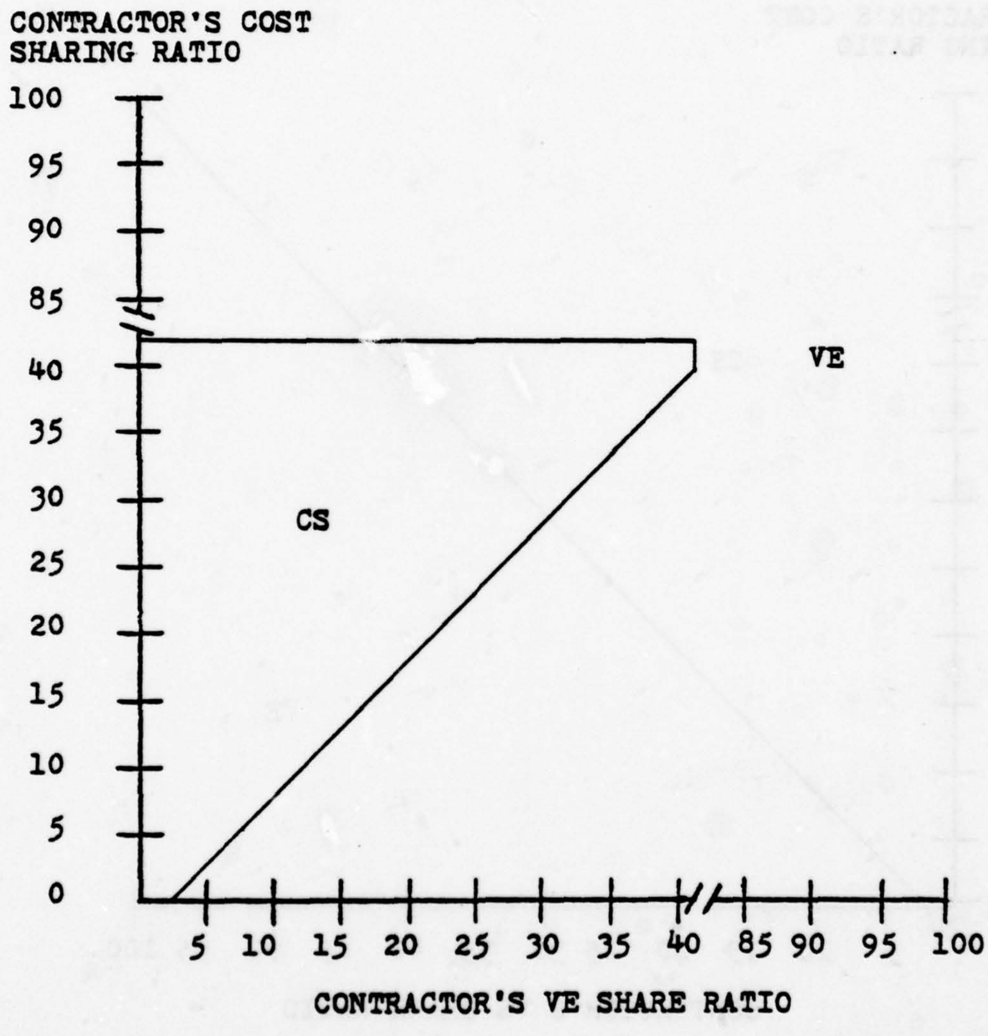

Figure 10. CPI Total Fee Potential, Simulated Cost $11,500,000

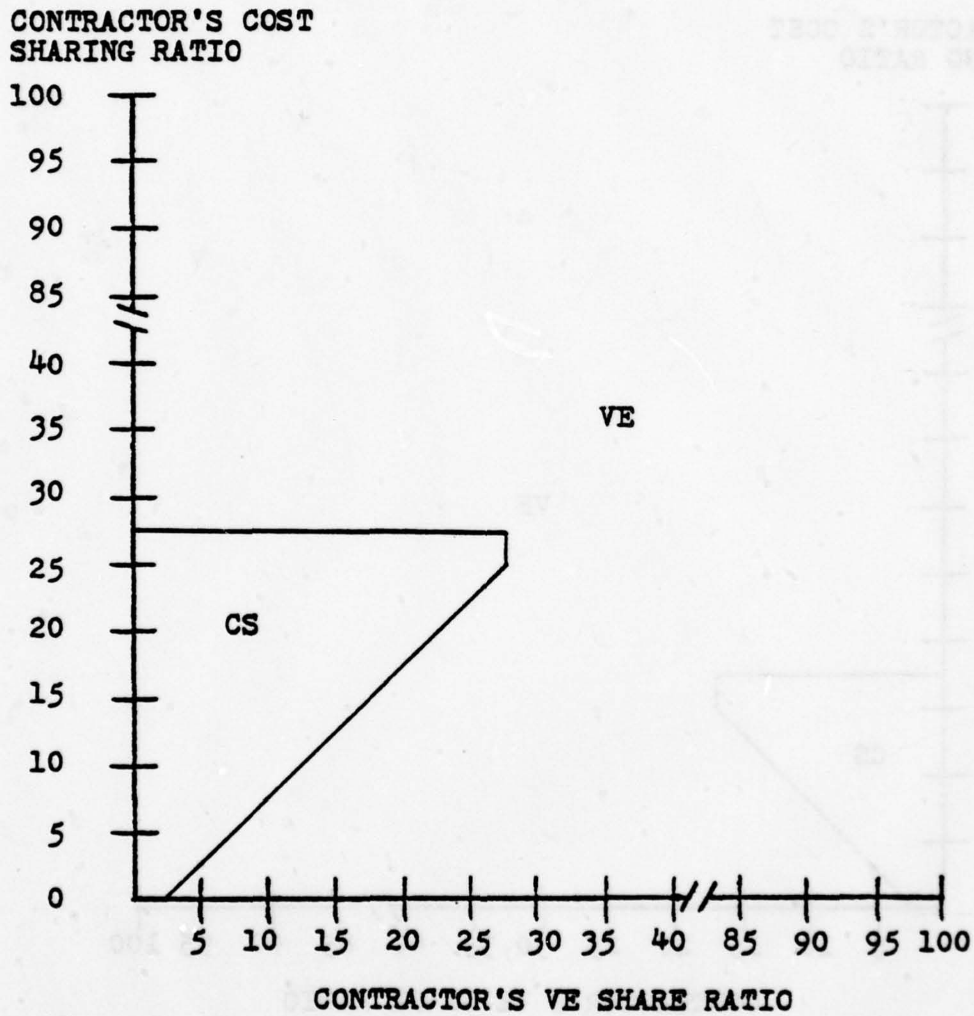

Figure 11. CPI Total Fee Potential, Simulated Cost $12,500,000

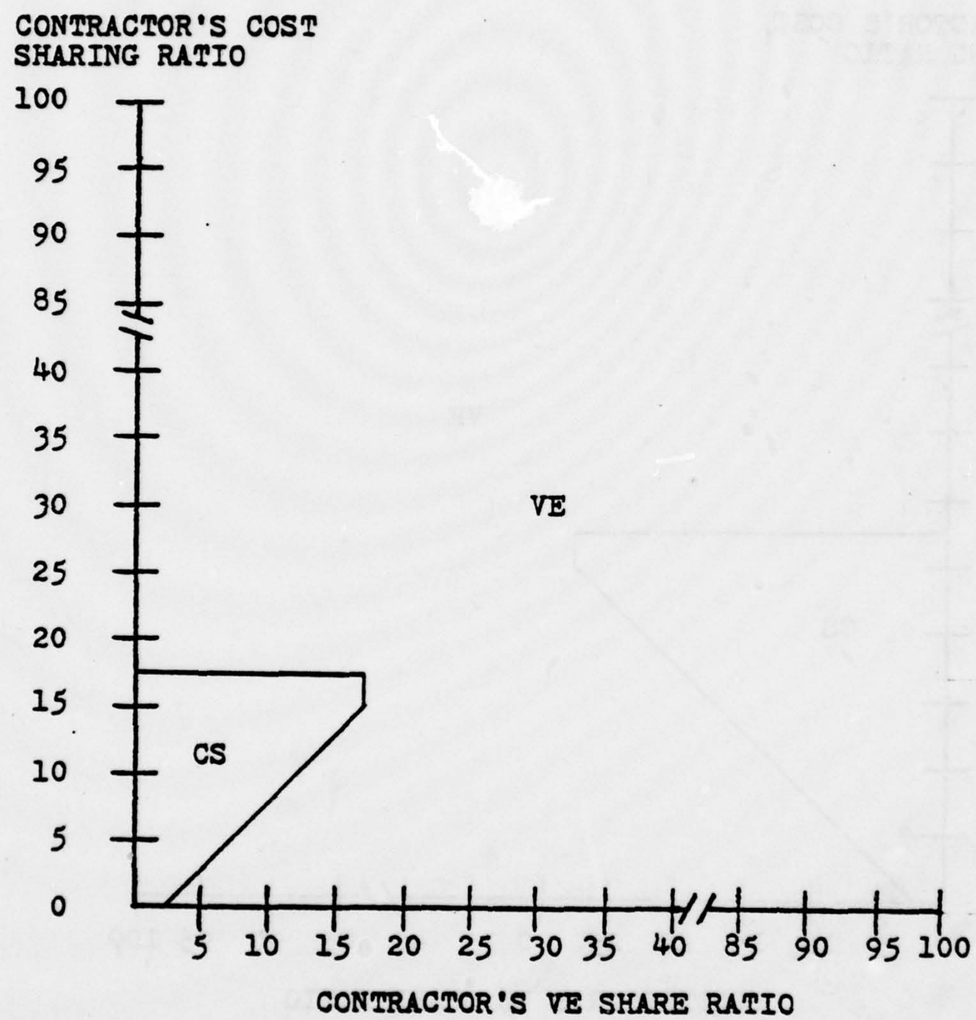

Figure 12. CPI Total Fee Potential, Simulated Cost $13,500,000

share of the cost sharing ratio is greater than 30 percent.

Figures 10 through 12 reveal that, in an overrun situation, as simulated costs move farther from target cost, the range of sharing rate combinations which maximize total profit potential under the VE share rate method of computing VE savings increases. In this range of costs, the area of rate combinations which favor the contract share method becomes wedge shaped, and shifts downward and toward the origin with increases in those costs. For example, at simulated costs of $11,500,000 and $12,500,000 as depicted in Figures 10 and 11 respectively, given a contract cost sharing ratio of 80/20 and a VE share rate of 80/20 or less, the contractor maximizes his total profit potential by sharing VE savings at the contract share rate. As depicted in Figure 12, however, at a simulated cost of $13,500,000 and the same rate combinations, the VE share method maximizes that potential, the effect of the shift of the wedged area downward and toward the origin.

<u>The FPI compensation arrangement</u>. The structural characteristics of the FPI compensation arrangement supported the decision to examine profit potential in two separate cost ranges for a cost overrun situation. Accordingly, the analysis is divided into the following two

categories: (1) Target cost to PTA and (2) PTA to ceiling price.

1. Target cost to PTA--Figure 13 identifies the sharing ratio combinations which maximize total profit potential in the cost range from target cost to the PTA. The relationships depicted in Figure 13 are identical to the realtionships depicted in Figure 8. However, the data also indicate that given a VE sharing rate of not less than 35 percent, total profit potential is maximized under the VE sharing method if the contractor's portion of the contract cost sharing ratio is less than 30 percent.

2. PTA to ceiling price--Figures 14 through 22 summarize the data for each cost iteration of $100,000 above the cost level at the PTA. The area labeled VE in each of the figures illustrates the region where the VE share method of computing total profit potential is more advantageous to a defense contractor. Sharing VE savings at a cost sharing rate which falls within this area will not permit the defense contractor to achieve maximum total profit potential. Conversely, a defense contractor should elect to share VE savings under the cost sharing method if the contractor's portion of the contract cost sharing ratio falls outside the area labeled VE.

Figure 23 reflects the area of maximum total profit potential where simulated costs equal $12,000,000, the

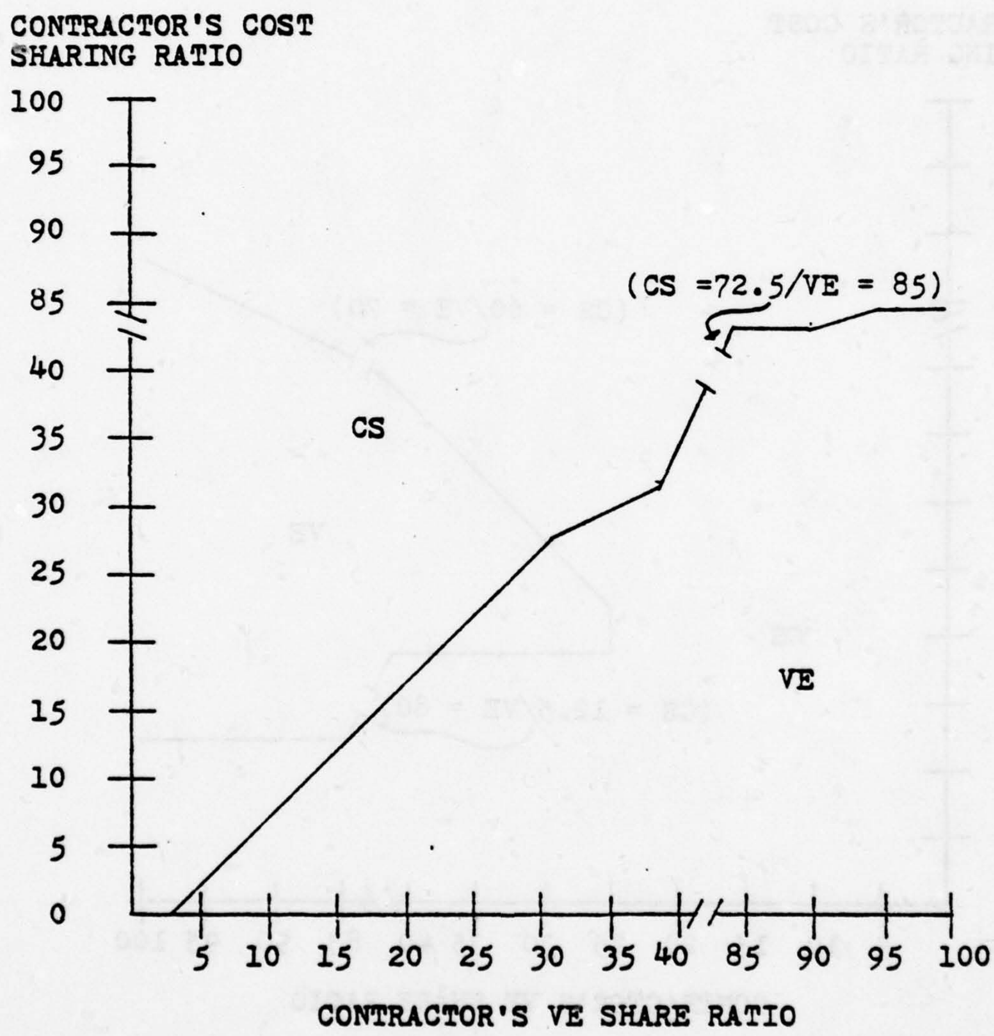

Figure 13. FPI Total Profit Potential, Target to PTA

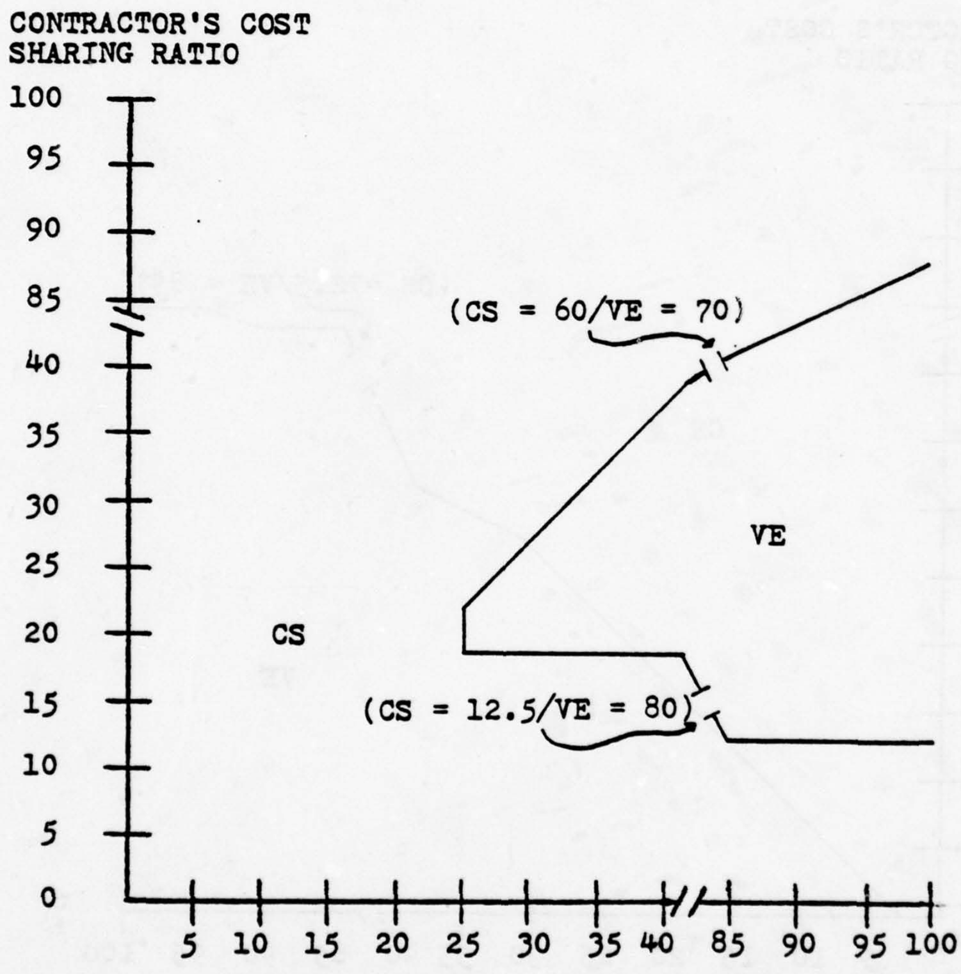

Figure 14. FPI Total Profit Potential, Simulated Cost $11,100,000

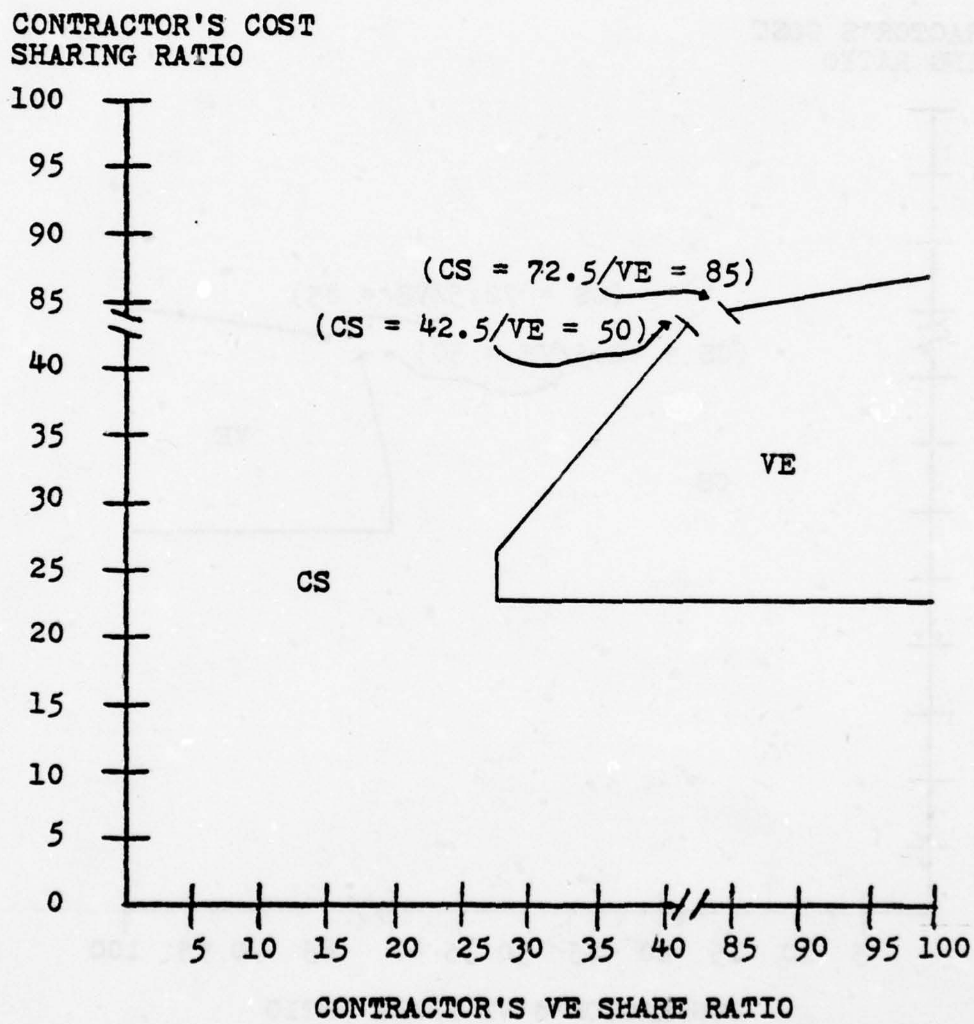

Figure 15. FPI Total Profit Potential, Simulated Cost $11,200,000

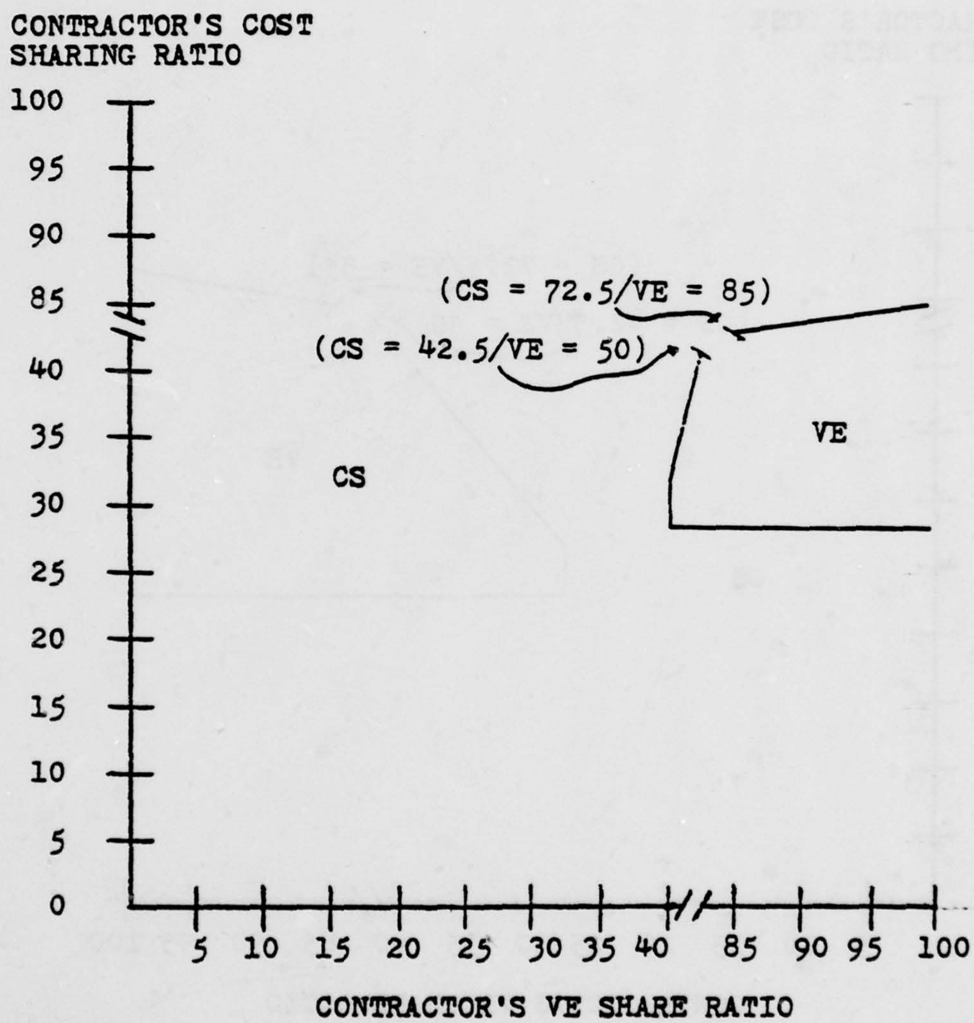

Figure 16. FPI Total Profit Potential, Simulated Cost $11,300,000

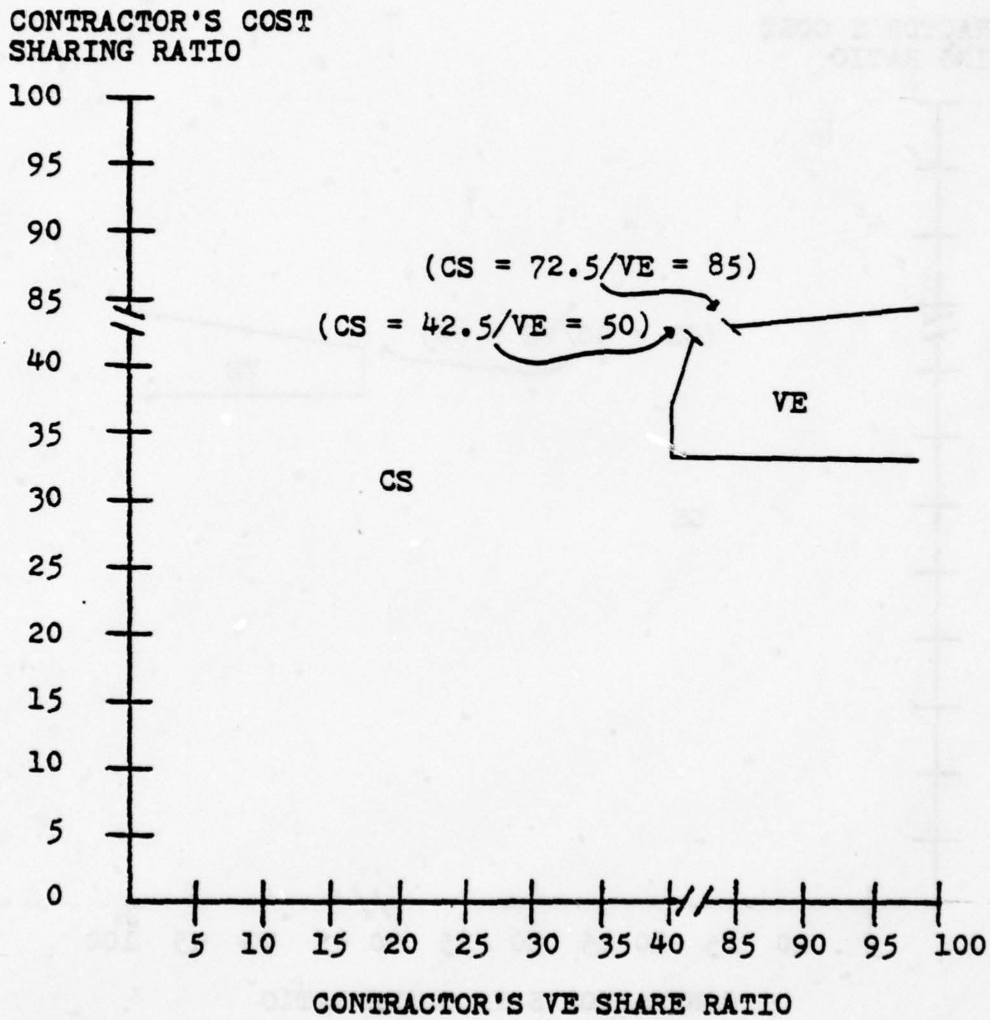

Figure 17. FPI Total Profit Potential, Simulated Cost $11,400,000

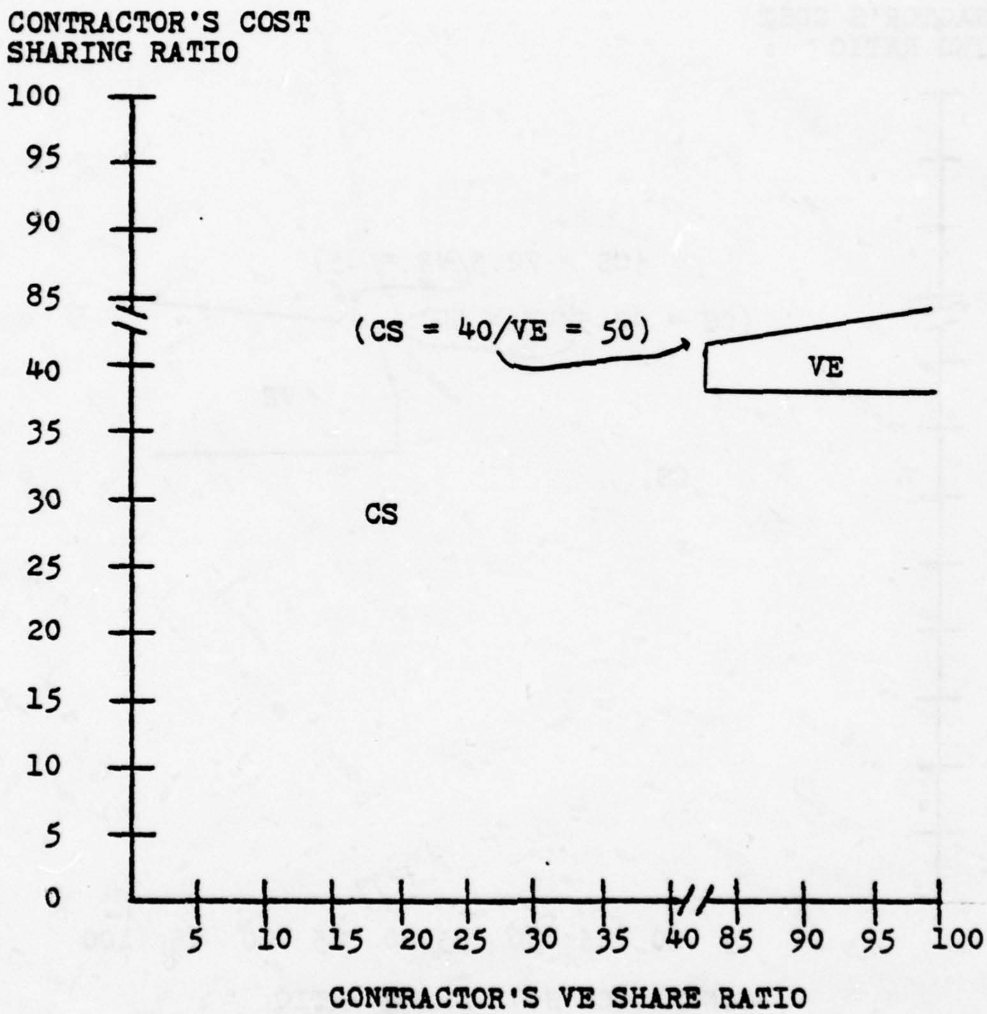

Figure 18. FPI Total Profit Potential, Simulated Cost $11,500,000

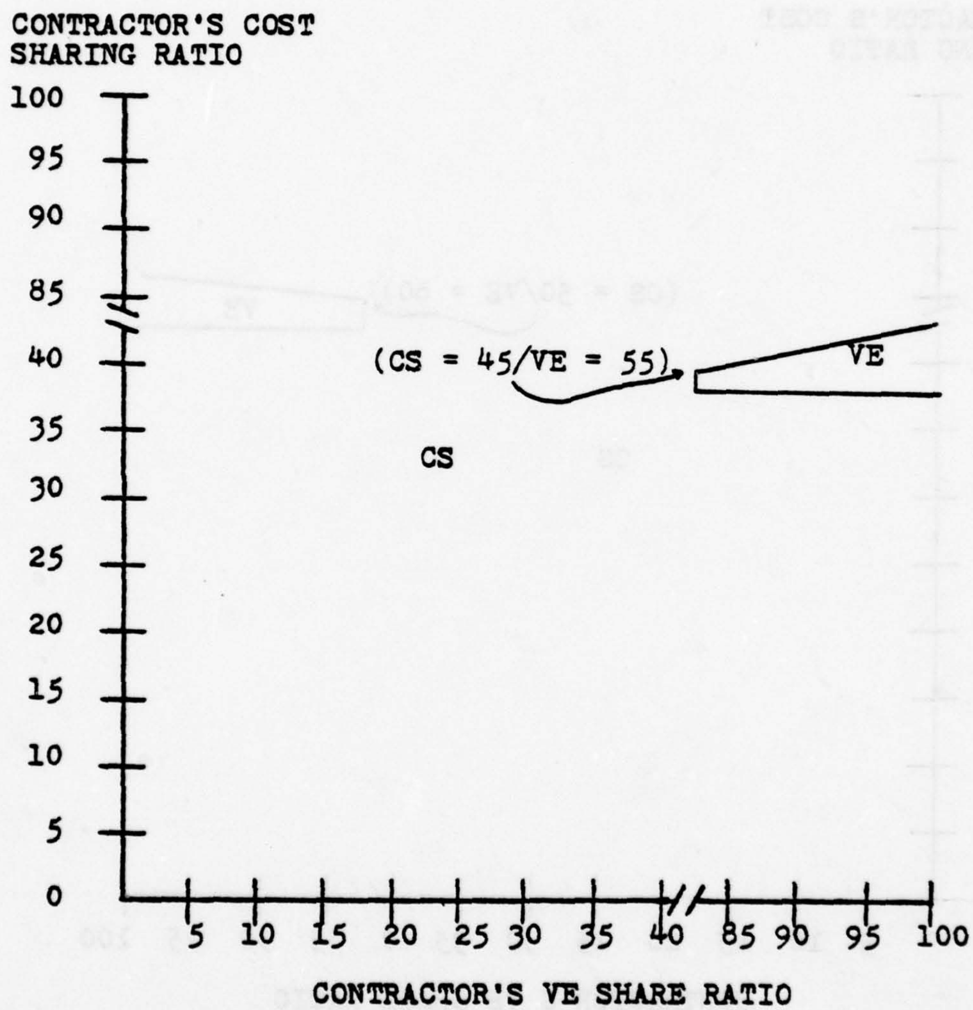

Figure 19. FPI Total Profit Potential, Simulated Cost $11,600,000

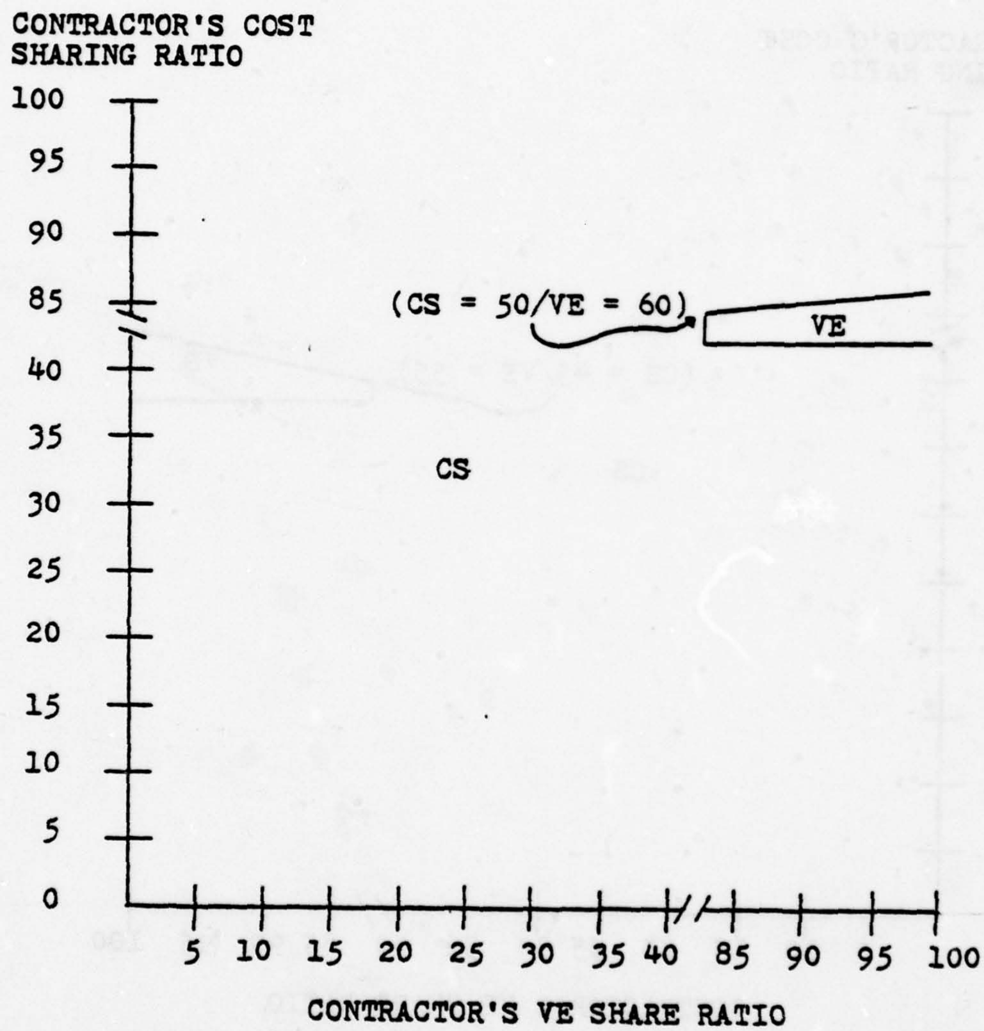

Figure 20. FPI Total Profit Potential, Simulated Cost $11,700,000

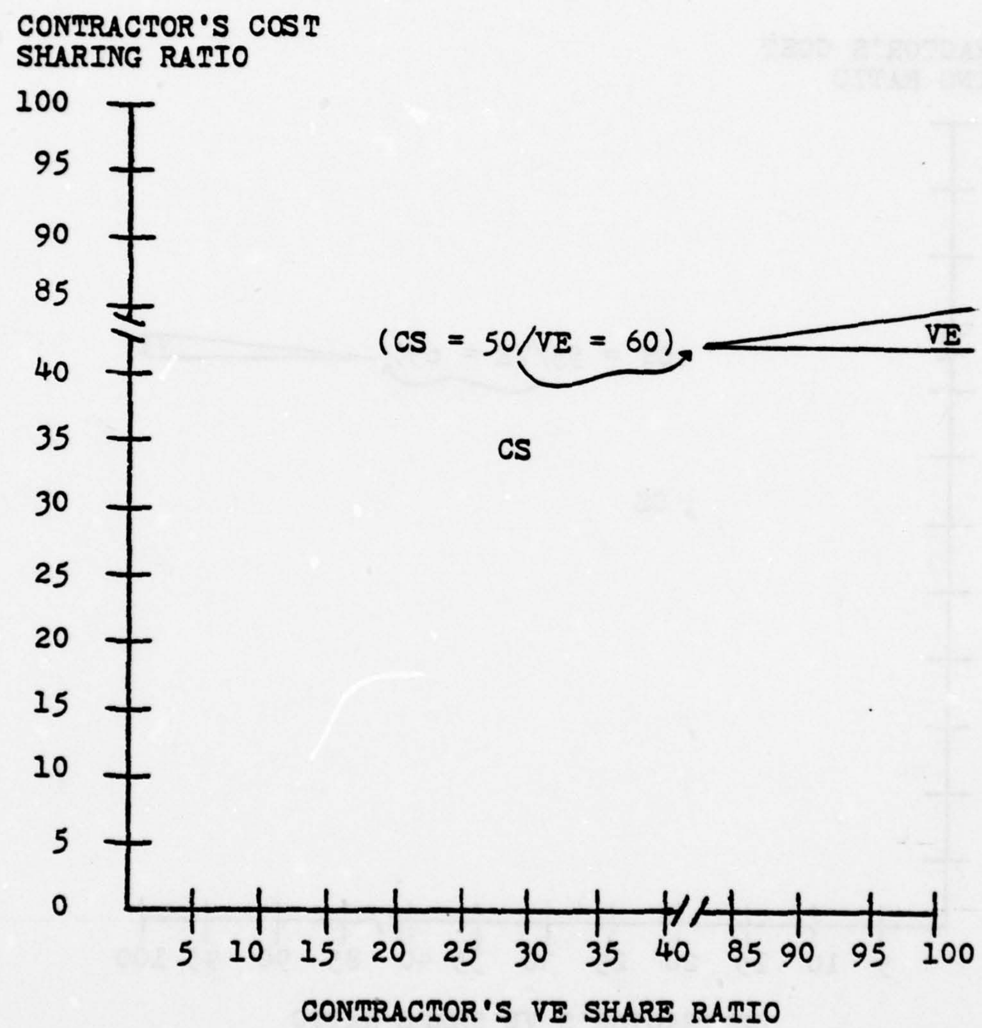

Figure 21. FPI Total Profit Potential, Simulated Cost $11,800,000

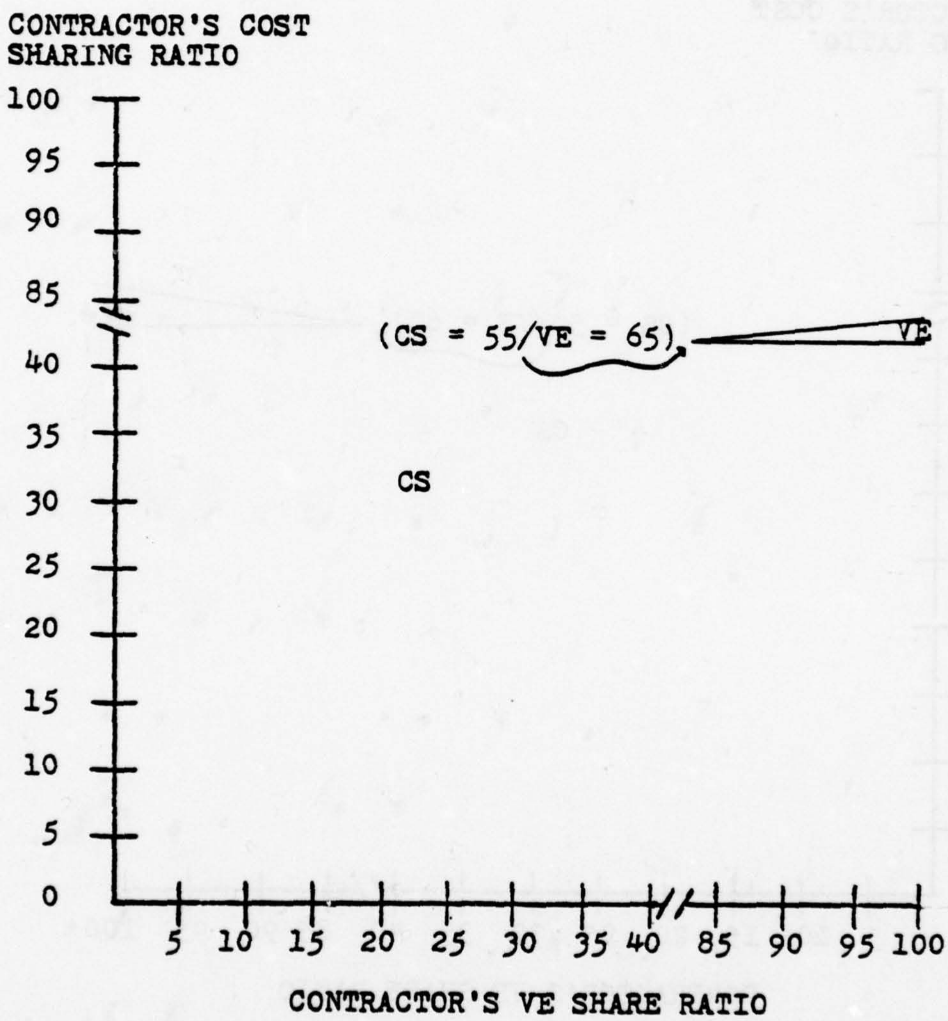

Figure 22. FPI Total Profit Potential, Simulated Cost $11,900,000

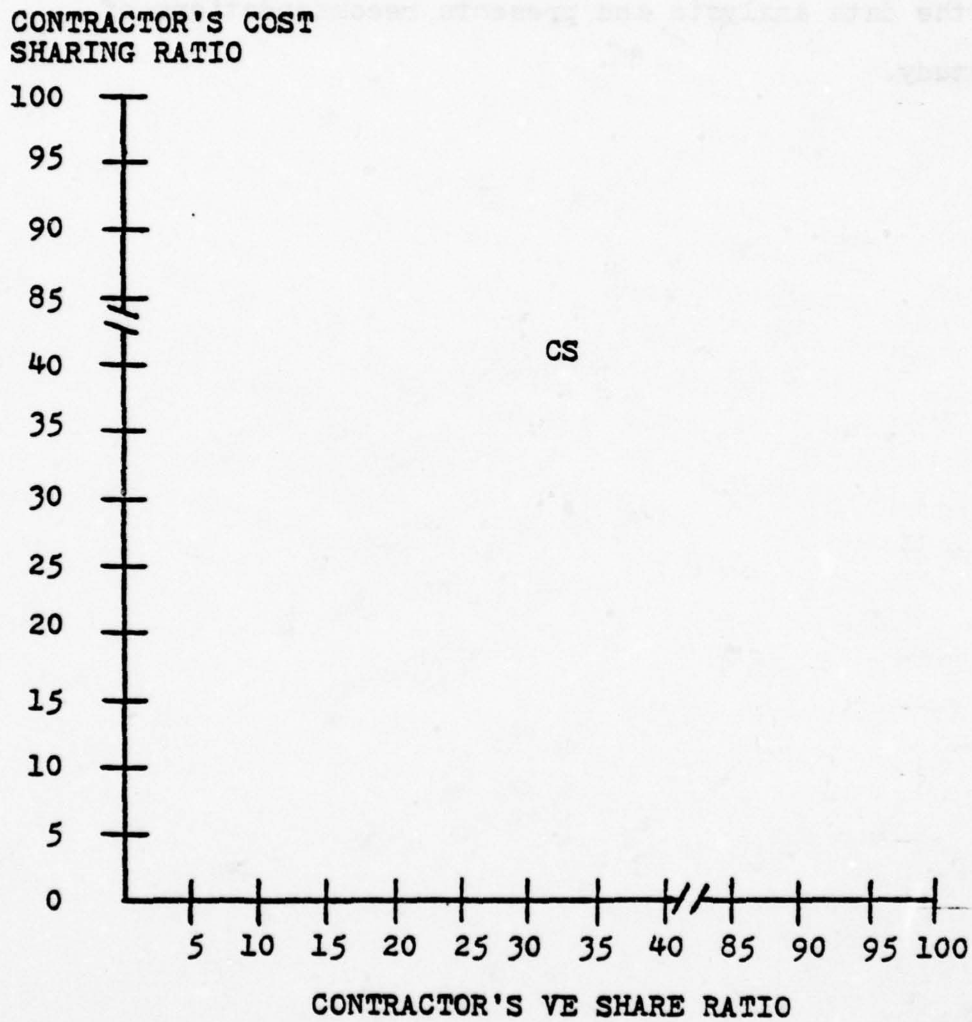

Figure 23. FPI Total Profit Potential, Simulated Cost $12,000,000

the contract ceiling price. At this cost level, total profit potential is maximized or, in reality, loss is minimized when VE sharing is accomplished under the contract cost sharing method.

The final chapter addresses the conclusions drawn from the data analysis and presents recommendations of the study.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This research effort began by investigating the government's contractual VE program. The objective of this study was to determine which of the alternate VE sharing methods provided maximum profit potential to a defense contractor given that the DOD policy assumes defense contractors are motivated to maximize profit. A research methodology was designed to collect data through the use of a computer simulation program. Hypothetical contract pricing models and a hypothetical VE proposal were developed to determine VE and total contract profit potentials when subjected to various iterations during simulation runs. It was recognized that the pricing and VE models may have unintentionally biased the results of the research; however, the ranges of cost and sharing combinations examined appear to have minimized the effects of arbitrarily selecting values for these variables. Data collected were graphically portrayed to identify which VE sharing method produced the maximum profit potential. The data were analyzed to determine the relationships between the VE sharing methods currently authorized by the ASPR and the cost sharing arrangements historically negotiated in DOD incentive contracts. The data analysis provided the basis for the conclusions and recommendations that follow.

Conclusions

Conclusions drawn from the research effort are summarized in three areas:

1. Maximum VE profit potential is a function of a sole determinant, the larger of the alternate sharing ratios available under either the contract cost sharing or VE sharing method of computing VE profits.

2. There is no single, universal method of computing VE sharing which maximizes total contract profit potential over all possible anticipated cost outcomes.

3. The cost sharing method of computing VE savings as authorized by ASPR 1-1704.2 does not always support the DOD policy relating to contractor profits.

<u>VE profit potential</u>. The existence of alternate VE sharing methods only enhances a defense contractor's profit potential for the VECP when the largest sharing rate is applied to the sharing base. Since the sharing base is exactly the same under both sharing methods, the maximum VE profit potential available to the contractor is a function

of the larger of the two sharing rates. Historically, DOD incentive contracts have included negotiated sharing rates ranging from 90/10 to 70/30. In the same light, however, the maximum permissible VE sharing ratio for incentive contracts is 65/35. Given the historical range of cost sharing ratios and the maximum VE sharing ratio, the latter consistently produces the maximum VE profit potential for a defense contractor.

Universal method of VE sharing. In contract cost underrun simulations employing the hypothetical scenario developed by the research team, results appear to confirm the total profit maximization benefit of the ASPR VE share ratio, as opposed to the historical range of DOD contract cost sharing ratios. In anticipated cost underrun situations under both the CPI and FPI compensation arrangements, the VE share method consistently produced higher total profit potential when the contractor portion of the VE share ratio is numerically greater than that of the contract cost sharing ratio. In general, then, in this range of simulated costs, if contract cost sharing ratios are negotiated at rates which have been traditional within DOD, the defense contractor will not maximize his total profit potential by sharing VE profits under the contract cost sharing method.

In contract cost overrun simulations within the same hypothetical scenario, results indicate that the application of the VE share method to maximize total profit potential cannot be universally adopted. In addition, results indicate that in this range of simulated costs, the method which maximizes total profit potential in the CPI contract does not always do so in the FPI contract.

Under the CPI contract in the cost overrun situations simulated, total profit potential is maximized when the present VE share rate, 65/35, is used in conjunction with any cost sharing ratio in the range 90/10 to 70/30. This conclusion mirrors the same conclusion found in the CPI contract during simulated cost underrun situations.

Under the FPI contract in cost overrun situations simulated up to and including the cost level at the PTA, the VE share method consistently maximizes total profit potential when the present VE share ratio, 65/35, is used in combination with the traditional range of cost sharing, 90/10 to 70/30. As simulated cost increases beyond the PTA, total profit potential is maximized almost exclusively under the contract cost share method. In this range of simulated costs, the VE share method appears to be effective only in those instances where the contractor portion of the VE share ratio is greater than its present maximum, 35 percent.

Profit maximization through contract cost sharing. The conclusions set forth above do not support the need for the optional contract cost sharing method of sharing VE savings given the maximum allowable VE share ratios set forth in the ASPR and the historical range of contract cost share ratios. Within those parameters, the contract cost sharing method provides maximum total profit potential only under the FPI contract and at substantial cost overruns. Consequently, at this cost spectrum, the practicality and benefits derived from the cost sharing method as an inducement to increased profit potential are questionable.

Recommendations for DOD

Based on the conclusions drawn from the research, it is recommended that the DOD re-examine its present VE policy in the following areas:

1. VE sharing policy as set forth in ASPR 1-1704.2.
2. Basis for contract cost sharing method.

ASPR 1-1704.2 policy. Given the range of cost sharing ratios historically negotiated in the DOD, total contract profit potential is not maximized when the contract cost sharing method of sharing VE savings is used pursuant to ASPR 1-1704.2. Accordingly, the unqualified use of the authorization set forth in ASPR 1-1704.2 can lead to reduced profit potential to a defense contractor.

Consequently, the DOD should re-examine the propriety of this blanket authorization in view of the reduced profit potential occasioned by the use of the cost sharing method.

Basis for contract cost sharing. Since the findings and conclusions generally do not support the use of the contract cost sharing method as a viable alternative to the VE share ratio method, DOD should determine the basis for a defense contractor's agreement to share VE savings under the method which reduces profit potential. A survey of the defense industry seems most appropriate for this investigation. It appears that a contractor's agreement to share VE savings under the contract cost sharing method may be contrary to the DOD conclusion that defense contractors' actions are driven by the profit motive. The data analyses confirm that profit potential is normally reduced if VE savings are shared under this method. It also appears that some other factor or factors may weigh more heavily than the profit motive in the contractor's decision to participate in VE.

On the other hand, DOD's total expenditures for VE savings may be reduced when the contract cost sharing method is used since less profit dollars flow to the contractor under this method. Consequently, DOD should ascertain the factors driving the contractor to participate in VE as well as its own motives for providing profit as the contractual incentive to VE.

Recommendations for Future Research

Further research is required to substantiate the conclusions set forth in this study. Additional research is needed to identify those factors which influence a defense contractor to concur to share VE savings at contract cost sharing ratios which do not appear to maximize his profit potential. Conclusions drawn individually by Scherer and Knight in their research concerning profit as a motivator could be used as a basis for further study.[3]

In addition, the research team recognizes the fact that the hypothetical scenarios developed for the research effort may have unintentionally biased the results of the simulation. Consideration should be given to developing a more detailed simulation program encompassing randomly generated contract parameters, anticipated cost figures, and sharing ratios based on their historical probability of occurrence. The most promising anticipated benefit from this approach would be the ability to subject the data to statistical analysis.

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[3]See pages 11 and 12.

APPENDIX A

COMPUTATIONAL REQUIREMENTS FOR VE

1. ASPR 7-104.44(a)(2)(e)(1)(ii) and ASPR 7-204.32(b) state:

(A) If there is a reduction in costs, reduce the total target cost of items affected by the VECP by ICS . . . .

(B) If ICS exceeds GC, add 35% . . . of the excess to total target profit relating to such items . . . .

(D) Subtract 65% of ICS from the maximum dollar limit on the total final price of such items.

2. ASPR 1-1704.2 states:

. . . The VE clauses in 7-104.44 and 7-204.32(b) (as applicable to supply contracts), (specifically the sharing provisions of paragraph (e) thereof), may be modified when used in incentive contracts to provide for the sharing of VE instant contract savings in the same ratio as the contract incentive share ratio, with no adjustment to targets or ceilings when a VECP is approved. This modification permits instant VE savings to be rewarded under the overall contract cost incentive.

3. ASPR 7-104.44(a)(6) and 7-204.32(d) state:

. . . If the cost reduction proposal submitted pursuant to this clause involves an anticipated decrease in the cost of performance of this contract and is accepted by the Government, the parties agree that neither the target cost, target profit, nor ceiling price of the instant contract shall be adjusted by reason of the acceptance of such proposal. The new requirement will be incorporated into the contract by a contract modification which will state that it is made pursuant to this Value Engineering clause.

APPENDIX B

CPI FORTRAN PROGRAM

```
CALL ATTACH(14,"INFILE;",3,0,,)
CALL ATTACH(15,"OUTFILE;",3,0,,)
INTEGER AC
REAL PTAI,PTAO
READ(14,105,END=99)CC,GC,CIS,TCI,TFI,MAXFE,MINFE,CP
105 FORMAT(5(F6.0,1X),2(I5,1X),F6.0)
DO 10 AC=7500,12100,100
WRITE(15,1000)AC
1000 FORMAT(3X,I8)
DO 20 I=5,95,5
RI=I/100.
do 30 j=5,95,5
RJ=J/100.
TCO=TCI-CIS
TFIO=TFI+(RI*(CIS-GC))
CPO=CP-((1.-RI)*CIS)
PTAI=((CP-(TFI+TCI))/(1.-RJ))+TCI
PTAO=((CPO-(TFIO+TCO))/(1.-RJ))+TCO
IF(PTAO.GE.CPO)GO TO 50
IF(AC.GT.PTAO)TPFPIVE=TFIO-(RJ*(PTAO-TCO))-(AC-PTAO)
IF(AC.GE.CPO)TPFPIVE=CPO-AC
IF(AC.LT.CPO.AND.AC.LE.PTAO)TPFPIVE=TFIO-(RJ*(AC-TCO))
GO TO 70
50 IF(AC.GE.CPO)TPFPIVE=CPO-AC
IF(AC.LT.CPO)TPFPIVE=TFIO-(RJ*(AC-TCO))
GO TO 70
70 IF(PTAI.GE.CP)GO TO 60
IF(AC.GT.PTAI)TPFPICS=TFI-(RJ*(PTAI-TCI))-(AC-PTAI)
IF(AC.GE.CP)TPFPICS=CP-AC
IF(AC.LT.CP.AND.AC.LE.PTAI)TPFPICS=TFI-(RJ*(AC-TCI))
GO TO 40
60 IF(AC.LT.CP)TPFPICS=TFI-(RJ*(AC-TCI))
IF(AC.GE.CP)TPFPICS=CP-AC
GO TO 40
40 WRITE(15,1200)I,J,TPFPIVE,TPFPICS
1200 FORMAT(12X,2(I3,1X),2(F10.2,1X))
30 CONTINUE
20 CONTINUE
10 CONTINUE
99 CONTINUE
STOP
END

ready

*
```

APPENDIX C

FPI FORTRAN PROGRAM

```
010 CALL ATTACH(13,"FPIFILE;",3,0,,)
020 CALL ATTACH(14,"INFILE;",3,0,,)
030 CALL ATTACH(15,"OUTFILE;",3,0,,)
040 INTEGER AC
050 READ(14,105,END=99)CC,GC,CIS,TCI,TFI,MAXFE,MINFE,CP
060 105 FORMAT(5(F6.0,1X),2(I5,1X),F6.0)
070 DO 10 AC=5500,13500,100
080 WRITE(15,1000)AC
090 1000 FORMAT(3X,I8)
100 DO 20 I=5,95,5
110 RI=I/100.
120 CPIFVE=RI*(CIS-GC)
130 DO 30 J=5,100,5
140 RJ=J/100.
150 TCO=TCI-CIS
160 TFIO=TFI+(RI*(CIS-GC))
170 MAXFEO=MAXFE+(RI*(CIS-GC))
180 MINFEO=MINFE+(RI*(CIS-GC))
190 TPVE=TFIO-(RJ*(AC-TCO))
200 IF(TPVE.GT.MAXFEO)TPVE=MAXFEO
210 IF(TPVE.LT.MINFEO)TPVE=MINFEO
220 CPIFCS=RJ*(CIS-GC)
230 TPCS=TFI-RJ*(AC-TCI)
240 IF(TPCS.GT.MAXFE)TPCS=MAXFE
250 IF(TPCS.LT.MINFE)TPCS=MINFE
260 WRITE(15,1200)I,J,TPVE,TPCS
270 IF(AC.LE.5500)WRITE(13,1100)I,J,CPIFVE,CPIFCS
280 1200 FORMAT(18X,2(I3,1X),3(2X,F10.2))
290 1100 FORMAT(2(1X,I3),2(1X,F10.2))
300 30 CONTINUE
310 20 CONTINUE
320 10 CONTINUE
330 99 CONTINUE
340 STOP
350 END

ready

*
```

APPENDIX D

HYPOTHETICAL SCENARIO FOR CONTRACT MODELS

CPI Model

Target Cost	$10,000,000
Target Fee	1,050,000
Maximum Fee	1,700,000
Minimum Fee	400,000
Sharing Formula	80/20

FPI Model

Target Cost	$10,000,000
Target Profit	1,050,000
Ceiling Price	12,000,000
Sharing Formula	80/20

VECP For Both Models

Contractor Development Costs (CC)	$ 30,000
Instant Contract Savings (CIS)	70,000
VECP (CIS + CC)	100,000
Government Costs (GC)	10,000
Excess (CIS - GC)	60,000

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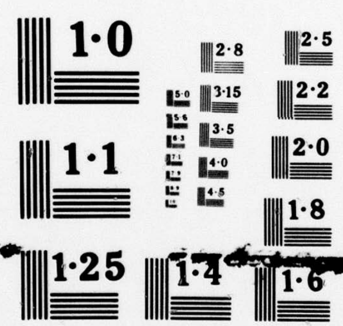

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GLOSSARY

1. Target cost — That point in the range of possible costs which the government and contractor agree is the most probable (14:p.79).
2. Target Fee/Profit — The amount of profit or fee received for achieving target cost (14:79).
3. Cost sharing line — The range of cost sharing from the most pessimistic cost point to the most optimistic cost point (19:2C5).
4. CIS — Instant contract savings which are defined as the unit cost reduction times the number of units affected in the instant contract (17:p.7:98).
5. CC — Estimated allowable contractor development and implementation costs (17:p.7:98).
6. VECP — Value engineering change proposal; computationally reflects the combined costs of CIS and CC (17:p.7:98).
7. GC — Government costs which directly result from development and implementation of the VECP (17:p.7:98).
8. Excess — CIS less GC (17:p.7:98).