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PREFACE

This 1969 Incentive Contracting Guide, which supersedes previous DoD and NASA Incentive Contracting Guides (the NASA Cost-Plus-Award-Fee (CPAF) Guide is the only exception), has been developed to describe improved incentive contract structuring and administration techniques in order to maximize the effectiveness of incentive contracts. While the basic policies and regulations pertaining to incentive contracting have not changed, much of the technology and procedures for structuring and monitoring these contracts will be new. The basic objective of this Guide is to provide the understanding of the basic policies and regulations relating to incentive contracting -- not to change them. This Guide is designed to answer many questions, especially those concerned with the over-all pricing arrangement and the proper selection and application of the various contract types. For this reason, most of the first two chapters of the Armed Services Procurement Regulation (ASPR) "Manual for Contract Pricing" are repeated in this Guide in order to reinforce the interdependency between pricing dogma and the proper selection of contract type.

This 1969 Incentive Contracting Guide will introduce to many the use of computer generated visibility tools which can add significantly to the ability to structure or evaluate a multiple incentive contract as they can be used to establish a much clearer communication channel between technical, procurement and administrative personnel. This computer capability can create better understanding of the trade-off alternatives and value statement inherent in every written contract. The successful utilization of these aids requires an awareness that the right questions need to be asked in order to obtain the right information. While the computer generated visibility tools have great potential if used properly, the primary prerequisite for their use is to "feed-in" the right question. For example, the Guide will discuss in detail the problems encountered with such questions as: "What's the relative weighting differential between performance elements? Will the product be satisfactory if the contractor produces a minimum acceptable level of performance for one element and maximum performance for another element? Should the contractor receive maximum fee if he delivers a product meeting maximum performance at target cost?

On the other hand, the Guide will stress simplicity. In many instances, such as cost-incentive-only, the use of a computer is of no value.

It is essential that it is understood that the Guide is <u>not</u> a regulation or directive. It is rather a training text and a reference text for operating personnel. Its use as a standard or checklist to determine the adequacy or course of direction for any particular contracting action -- while useful -- is limited accordingly. Neither conformance or nonconformance is an indicator of prudence or propriety.

The nation's defense and aerospace procurement objectives are closely knit. While there is a significant mission difference between the over-all defense procurement environment and the space program procurement environment, there are many close similarities, especially in the research and development contracting situations. DoD and NASA deal essentially with the same mix of contractors. This community of interest is also reflected in the similarity of the regulatory framework within which these agencies operate. Because utilization of common guidelines will be mutually beneficial to the Department of Defense, the National Aeronautics and Space Administration and industry, this 1969 Incentive Contracting Guide is issued as a joint DoD/NASA Guide. These guidelines take into account and explain differences in emphasis, approach, or techniques reflecting differences required by mission, organization, or management aspects which may be recognized by DoD and NASA operations.

The original DoD and NASA Incentive Contracting Guides, issued separately in 1962, provided an introduction to incentives. The DoD 1963 Guide introduced the interrelationship of incentives with various categories of research and development. That milestone in incentive contracting provided procedures for the expanded use of performance/cost incentive principles. The DoD and the NASA 1965 Incentive Contracting Guides provided advanced instructions concerning the application of multiple incentive formulas. The NASA Cost Plus Award Fee (CPAF) Contracting Guide, issued in August 1967, provided updated guidance and aided in understanding policies and concepts concerning the use of contracts employing the "Award Fee" type of incentive compensation.

During the period between the date of issuance of the 1962 Guides and the issuance of the 1969 Incentive Contracting Guide, DoD and NASA have had experience in the negotiation of incentive contracts which have obligated funds amounting to nearly $55 billion. These 1969 guidelines incorporate appropriate portions of these earlier Guides and reflect the experience acquired during the negotiation and administration of more than five thousand incentive contracts and supplemental agreements and forty-five thousand changes since the issuance of the original guides. Many members of the Government and industry procurement teams helped pioneer the improvements in incentive structuring and administration methods and procedures. The DoD Procurement Management Improvement Conference in Williamsburg in 1962, the NASA/DoD Incentive Structuring Conference at the Manned Spacecraft Center in 1966, the DoD Procurement Pricing Conference in Hershey in 1967, and the 1966 Defense Science Board Study made substantial contributions toward identifying efforts which would promote the appropriate use of the most effective incentive contract structures. The 1969 revisions also incorporate results of the consideration of comments and suggestions proposed by representatives of various industry associations. The conclusions of various studies, recommendations of Procurement Management

Review Groups, audit findings, and suggestions of industry association procurement committees have been carefully considered and reflected in the revised structuring and administration guidelines.

The examples of various incentive structures presented in the manual have been developed and tested in actual procurement situations. Potential problems which are shown to be associated with certain incentive structures, contract provisions, and contract performance are illustrative of situations which may be encountered during negotiation and contract administration.

Over-all, it is the objective of this Guide to increase motivational effect and minimize complexity. NASA and DoD wish to re-emphasize that preoccupation with use of incentives and the theory of the incentive must not become more important than the goal. Simply stated, the objective of any incentive contract is to motivate the contractor to earn more compensation by achieving better performance and controlling cost. The incentive arrangement must also reflect in a practical way failure to achieve desired performance and cost control by reduced compensation; it must be designed to relate compensation more accurately to value received.

To be meaningful an incentive must be capable of inducing the generation of some specific and potentially favorable effort that would not otherwise have been initiated by those individuals able to constructively contribute at a point in time so that the added effort can influence the realization of the objective. Of most fundamental significance is the fact that even if incentive contracting is only applied under appropriate circumstances and the proper type of incentive contract is used and the specific incentives are properly structured (selection and relative weighting), the effectiveness of an incentive contract nevertheless will be eroded or completely destroyed during contract performance by inappropriate contract clauses and administrative practices.

The incentive contract should communicate the Government's objectives to the contractor and motivate the contractor's management to convey the Government objectives within the contractor's organization. There is a need to continually examine and assess the effectiveness of these communications roles. Structuring an incentive should always be an iterative -- empirical -- approach.

The purpose of incentive contracting is to motivate the contractor to performance which is in the best interest of the customer (Government). This is accomplished by adjusting the contractor's profit in proportion to the value (to the customer) of the actual completed contract performance in comparison to target profit and performance goals expressed in the contract document. Thus, two primary concepts are involved: (i) motivation of the contractor, and (ii) value to the customer. Although both of these concepts are covered in the Guide, the language and organization emphasizes the motivational aspect more than the value aspect. The contractor is primarily

involved with the motivational aspect. But the first requirement for the Government is to quantify the dollar values it attaches to various performance characteristics (e.g. analysis of value statement), and secondary to this is quantifying what is necessary to motivate the contractor, with the third step being a determination of whether the value to the Government exceeds (or is at least equal to) that which will motivate the contractor (e.g., incentive analysis). In this Guide, principally intended for Government use, a better balanced coverage giving greater emphasis to the value aspect of the Government's objective is desired.

In introducing the advantages of computer generated techniques and other sophisticated structuring methods, it is of first importance that everyone involved understand the practical limits of their use. Every single decision made in the selection of contract type, structuring the incentives and administering the contract is a product of the people involved. There are few -- if any -- of the decisions to be made which are not primarily subjective in nature. Whether the contract should be Cost-Plus-Incentive-Fee (CPIF), Cost-Plus-Fixed-Fee (CPFF), Fixed-Price-Incentive (FPI), or Firm-Fixed-Price (FFP) with or without performance incentives is largely dependent upon the subjective evaluation of the parties. Agreement on target cost, target profit, incentive fee ranges, the probable cost outcomes, or the performance level to be defined -- though subject to negotiation -- all require some degree of personal judgment, and the negotiation should result in simultaneous, not sequential agreement on all factors.

If those involved in the contracting process recognize the subjective nature of the decision-making process, they can -- and hopefully will -- utilize the obvious advantages of the computer programs and the structuring techniques explained in the Guide as a valuable means of quantifying their decisions -- which are always inherently expressed in any contract.

The Guide recognizes that profit is the basic motivating force behind incentives, but realizes that contractors in maximizing profit do not necessarily seek "maximum" profit on every contract even if they could. Those "extracontractual motivators" (e.g., follow-on business, growth, image, etc.) should be considered in structuring the contract. However, DoD and NASA accept the concept that these factors are often beyond the control of the Government and willingly subscribe to the philosophy that to the degree that a contractor can be motivated by profit to produce more efficiently, he is achieving the Government's objective.

CHAPTER I

INTRODUCTION TO INCENTIVE CONTRACTING

A. SCOPE OF THE GUIDELINES

An incentive is a stimulus to desired action. This Guide provides simple yet comprehensive explanations of effective use of incentives across a wide variety of contracting situations.

Incentives deal with profit motivators under the contract and extra-contractual motivators not directly related to the contract. The main thrust of the Guide will be addressed to contractual profit arrangements. The subject of motivators other than profit is treated more fully in Chapter X, Advanced Studies of Incentive Theory. Practical problems or issues are presented which involve the application of incentives in the contracting environments of: requests for proposals, proposal analyses, negotiations, and contract administration situations.

In operating situations there may be desirable departures from these guidelines. These suggested instructions for structuring contracts should not discourage trial use of new or different approaches.

B. BASIC PRINCIPLES OF INCENTIVE CONTRACTING

The Department of Defense and National Aeronautics and Space Administration policies recognize that profit, generally, is the basic motive of business enterprise. Profit, per se, is not the only motivation recognized. The industrialist has become accustomed to thinking of profit as a necessary element of the price, in the same manner that material, labor, overhead, general and administrative (G&A), and other expenses are elements of the price. Skill at the negotiation table or the strength of either negotiating party may often determine the profit level in the same manner as negotiating skill or strength determines the amount of dollars assigned to key cost factors. This Guide recognizes that contractors will, generally, optimize -- not maximize -- profit. It will attempt to establish, however, a basis for the concept that when contractors maximize profit, it is in the best interest of the Government if, in fact, the Government's planned objectives are achieved.

The profit motive is the essence of incentive contracting. Incentive contracts utilize the drive for financial gain under risk conditions by rewarding the contractor through increased profit for attaining cost (and sometimes performance and schedule) levels more beneficial for the Government than expected (target) and by penalizing him through reduced

profit for less than (target) expected levels. In stressing the profit-making aspects of a company's existence, however, there is no intention to discount the importance of extracontractual incentives, such as to (i) gain future business, (ii) increase profits on other contracts being performed at the same time (by absorbing a portion of the fixed overhead expense which otherwise would be absorbed by other fixed price or incentive type contracts and thereby increasing the profit margin under those other contracts), (iii) contribute to and improve the nation's international reputation, (iv) gain prestige and goodwill, (v) retain and maintain an engineering and/or production capability, and (vi) excel for the sake of excellence. These factors should be considered prior to making awards, and when possible while structuring the incentive sharing provisions, because, with any particular contractor, these factors may outweigh the short term profit incentives. Particular attention should be paid to the absorption of overhead expense, which might be a primary incentive (see Chapter IV). This can often be quantified to some degree prior to award.

Without an extensive discussion of the various theories underlying the incentive concept, it is sufficient to talk about rewards and penalties which may be applied to cost, performance or schedule. In a cost-only incentive contract, the incentive applied to cost is interrelated to performance and schedule (i. e. the sharing ratio applies to a given performance level upon which the estimated cost (target) is based). It is generally assumed that the relative value of cost, technical performance and schedule remain constant; however, these values have rarely remained balanced in incentive structures. This is because the sharing ratio is not normally related to a given set of performance conditions as it should in a cost-only incentive contract. Naturally, in a multiple incentive contract it seldom does apply to a set of performance conditions.

In a descriptive sense, incentive penalty is simply the counterpart of reward; however, there are many cases where penalty (punishment) may arouse emotions or attitudes toward the contractual reason for the penalty. For this reason, a penalty-only incentive may be objectionable to the contractor although either the reward-only or penalty-only approach may be acceptable as the better motivator. The traditional method of applying reward incentives for cost under target and penalty incentives for cost over target in a cost-incentive-only contract has been the most widely applied incentive arrangement. The practical effect is the same, of course, where the fee ranges and the range of incentive effectiveness are the same. Chapter IV of the Guide, dealing with multiple incentives, will discuss the advantages and disadvantages of applying both rewards and penalties around performance or schedule goals or targets.

The rewards and penalties in a cost incentive contract (or the cost sharing arrangement) is expressed as a percentage ratio. This applies equally to either a cost-plus-incentive-fee (CPIF) or a fixed-price-incentive (FPI) contract. A 60/40 incentive share line in the contract means that the Government pays 60 cents, and the contractor pays 40 cents of every dollar of cost above the target of the contract. It follows that for every dollar of cost under target, the Government saves 60 cents and the contractor earns an additional 40 cents, over and above the target profit or fee. The precise dollar amounts of the compensation adjustment are determined by this formula after the contract is completed. The Armed Services Procurement Regulation (ASPR) and National Aeronautics and Space Administration Procurement Regulation (NASAPR) Section XV, Cost Principles, are used as a guide under fixed-price incentive contracts, but they are mandatory under cost-plus-incentive-fee contracts. The distinction of determining costs under these two approaches should be clearly understood.

Profit or fee[1/] in a multiple incentive contract may be increased or decreased depending on the success of the contractor in meeting goals above or below target.

C. SELECTION OF CONTRACT TYPES

Recognizing that flexibility is needed by the DoD and NASA, their respective regulations provide a wide selection of types of contracts needed in the purchase of a large variety and volume of supplies and services. Generally, there are two basic categories of contract types, fixed-price or cost-reimbursement. Fixed-price contracts are characterized by (i) a price which represents full payment for the work, (ii) which meets minimum standards of performance, and (iii) is delivered by a specified time. Cost-plus-fixed-fee contracts, on the other hand, are characterized by an agreement covering the estimate of the contract cost, with the buyer agreeing to reimburse the seller for all allowable costs necessary to perform the work. Between the extremes -- in terms of the degree of cost responsibility -- of the firm-fixed-price (FFP) and the cost-plus-fixed-fee (CPFF) contracts (and bridging the gap between them) are the other principal variations of the two categories including the incentive contract types. Quite naturally, the respective contract types vary as to the degree of responsibility assumed by the contractor for the costs of performance and the amount of profit incentive offered the contractor to achieve or exceed specified standards or goals. Again, the FFP contract is at one extreme with the contractor assuming full cost responsibility and therefore having a maximum profit incentive -- with the CPFF at the other end of the spectrum with the contractor assuming minimal cost responsibility and offering no motivation to increase profit or control costs.

1/ Throughout the Guide, general references to performance incentives will refer to the combined incentives applying to both technical performance and schedule, and general references to profit will apply to profit or fee, unless specifically noted.

Effective pricing and sound procurement practices require discrimination and judgment in selecting and negotiating the right contract type. While the procurement regulations state that the firm-fixed-price contract is the most preferred type (for harnessing the profit motive) because the contractor accepts full cost responsibility, this is not to say that the FFP contract is always the right contract. As stated in the ASPR Manual for Contract Pricing:

> "Sound procurement requires use of the right contract type. The best, most realistic and reasonable price in the world (for the particular requirement at hand) may turn sour if the contract type is wrong."

Additionally, the best structured incentive arrangements may become completely ineffectual if the type of contract and contract price in combination are so unrealistic as to eliminate any possibility of the contractor's earning increased profits through cost savings or performance improvement.

This is especially true in the area of research and development contracting due to the nature of the work, the usual lack of definitive requirements, and the inability to measure technical objectives. The inability to measure risk frequently necessitates the negotiation of a cost-plus-award-fee (CPAF) or CPFF contract. The development effort following the Contract Definition phase, however, can frequently be accomplished under incentive contracts (FPI or CPIF) or FFP.

Although the subject will be discussed at greater length in later parts of the Guide, some general rules for the selection of contract types should be given here. Very general guidelines are:

Cost-Plus-Fixed-Fee. Appropriate where "level of effort" is required or where high technical and cost uncertainty exists.

Cost-Plus-Award-Fee. Appropriate where conditions for use of a CPFF are present but where improved performance is also desired and where performance cannot be measured objectively.

Cost-Plus-Incentive-Fee (Cost Incentive Only). Appropriate where a given level of performance is desired and confidence in achieving that performance level is reasonably good but where technical and cost uncertainty is excessive for use of a fixed-price incentive.

Cost-Plus-Incentive-Fee (Multiple Incentives). Appropriate where expectation of achieving an acceptable performance is good

but improvement over that level is desired and where technical and cost uncertainties are excessive for use of FPI.

Fixed-Price-Incentive (Cost Incentive Only). Appropriate where confidence in achieving performance is high but cost and technical uncertainty can be reasonably identified.

Fixed-Price-Incentive (Multiple Incentives). Appropriate where improved performance is desired and technical and cost uncertainties reasonably identifiable.

Firm-Fixed-Price. Appropriate where performance has already been demonstrated and technical and cost uncertainty is low.

Firm-Fixed-Price (With Incentives Added). Appropriate where improved performance or schedule is desired and technical and cost uncertainty is low.

D. ELEMENTS OF BASIC INCENTIVE CONTRACT TYPES

As previously mentioned, two basic contract types are available throughout the procurement cycle: the fixed-price type and the cost-reimbursement type contracts. The introduction of incentives provides variations to these two basic types of contracts. The two most commonly used incentive types are cost-plus-incentive-fee and fixed-price-incentive.

The following elements appear in the basic contracts:

CPFF	CPIF	FPI	FFP
Estimated Cost	Target Cost	Target Cost	Price
Fixed Fee	Target Fee	Target Profit	(Cost and profit)
	Maximum Fee	Ceiling Price	
	Minimum Fee	Share Ratio	
	Share Ratio		

Later in the Guide it will be shown that the sharing line is limited by the range of incentive effectiveness (RIE)[1/] or the range of cost sharing from the most pessimistic cost point to the most optimistic cost point, and the amount of profit assigned to the cost incentive (fee pool). There are no hard and fast rules which require a 70/30 share line or a 75/25 share line. In addition to the mechanical control of the RIE and the fee pool on the share ratio, the share line should reflect a profit incentive arrangement which will motivate cost control. It may

1/ The Guide will treat RIE as referring to the range of cost sharing under consideration -- not necessarily as referring to the entire range of costs.

be enough to say that in cost-only incentive contracts that the steepness of the share line is a crucial matter for negotiation. It should be consistent with the degree of technical and cost uncertainty inherent in the work to be done. The considerations which influence the most appropriate selection of a sharing ratio is covered in detail under Chapters III and IV.

The negotiator should be concerned with the instant contract and should not be concerned that over-all average profits on other contracts have been either too high or too low. The negotiator should not be concerned with incentive profit ranges that have been developed for previous contracts with any particular contractor. Further, the negotiator should not utilize inappropriate or unreasonably wide cost ranges of incentive effectiveness or unrealistic minimum/maximum fee positions.

In the past, an inordinate amount of attention has been directed toward the target profit point on the contract. The clear and detailed definition of the technical objectives and the method to be used to measure the achievement of these objectives is nearly always more important than the "precise" target cost and target profit.

E. RELATIONSHIPS OF INCENTIVE CONTRACTING AND PRICING POLICIES

Pricing principles do not change because an incentive contract has been selected. The selection of an incentive contract is not a substitute for sound pricing. Cost uncertainties whether or not due to technical unknowns, however, are to be considered in determining the type of incentive contract and the variety of pricing arrangements that can be structured into the contract.

There are uncertainties in the pricing of any contract type. As these uncertainties increase contract selection moves further away from the firm-fixed-price position. In a FFP contract usually both cost and performance uncertainties are largely removed. However, even where there is not a high confidence level in cost, if the uncertainties are known and recognized, the risk, to a certain extent, can be made more acceptable and a contracting arrangement that imposes significant cost responsibility can be negotiated. We are not only concerned with the definition of the areas and scope of cost and performance uncertainties, we are concerned also with the probabilities that the uncertainties will occur. One of the benefits from incentive contracting for both Government and industry has been the discipline that requires better contract and program definition. Better definition begets better pricing.

The Manual for Contract Pricing (ASPM No. 1) points out that the actual cost incurred in the performance of a contract cannot be expected to turn out exactly as predicted at the outset. The incentive

contract deals with the variations from predicted costs, and the infinite variety of incentive structures which are available may be used to provide motivation to have performance result in what the cost "should be".

The establishment of a target cost (estimated cost) in an incentive contract is a result of several variable factors, including three basic factors: (i) the Government's price objective, (ii) the contractor's price objective, and (iii) negotiation as a tool of contract pricing. The process of bargaining between the buyer and seller will involve the consideration of many contractual factors other than cost and profit and should involve also the consideration of certain extracontractual factors. Target cost should represent, of course, that point in the range of possible costs which the parties to the contract agree is the "most probable".

The target cost objective will include the same mutually determined estimate of costs for a level of effort that would have been determined for any type of contract. One important point to remember in considering the target cost in an incentive contract is that the target cost is only a point in a range of possible actual costs. The range of probable cost outcomes, from most optimistic to most pessimistic, must have been determined prior to the establishment of a target cost objective. (See Chapter III.) During negotiations, the target point may change in fact-finding, and may be changed by the negotiation process. The extent of the variation between the target cost point and the projected cost position may change during the contract life. The incentive concept expects variances in final, realized cost. Another important point to remember is that the target cost which is negotiated and the actual cost are not directly comparable between individual cases; however, the validity of the target cost may be assessed by examining the causes of deviation.

Any attempt to evaluate the correlation of target cost and actual cost must be kept in the proper perspective and may be examined in the light of what the realized prices might have been.

The confidence in the target cost position (i.e., variation from target cost) is not the sole criterion or even the primary criterion for determining the selection of either a CPIF or an FPI contract. There are many more important factors -- such as technical uncertainty. Obviously in the situation where there is great technical uncertainty there is great likelihood of cost uncertainty combining to dictate the selection of a cost reimbursement type of contract. These will be discussed later in Chapter IV dealing with multiple incentive contracts.

Evaluation of confidence in predicted cost considers the risk of various situations within the range of incentive effectiveness or range of probable cost and performance outcomes. There may be situations where there is a high probability of a minor cost underrun and where there is a low probability of an extensive cost overrun. On the other

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hand, there may be certain situations where there is the high probability of a large overrun. These differences should be reflected in the range of incentive effectiveness and in the sharing ratio.

It was stated previously that the point mutually determined to represent target cost should present an equal probability of cost over target or under target, but this did not refer to equal magnitude of the variance from target. In the past, an erroneous assumption has been that there would be an equal probability of variance from target and an equal probability of various cost positions between minimum cost and maximum cost. This is demonstrated by the fact that too often every factor is equal or balanced (e.g., cost range $\pm$ 25%; cost fee $\pm$ 4%; performance fee $\pm$ 2%; schedule fee $\pm$ 1%). This equal balancing normally reflects a failure to evaluate the probable outcomes.

The incentive sharing arrangement, the slope of the share line, should be negotiated based on the target cost and the probability of various cost outcomes. When the probability for technical achievement is high, the fact that there is a high probability for a large cost variance does not dictate the use of a CPIF contract. The probability of a large variance only affects the range of cost incentive effectiveness. Thus, there may be a possibility of a plus 25 or 30 per cent or minus 10 to 15 per cent variance from target cost in either a CPIF or an FPI contract, and on the other extreme there may be a high probability only a plus 15 per cent or minus 10 per cent variance from target cost in either type of incentive contract.

The concept mentioned in the previous paragraph is a slightly revised version of the discussions concerning range of incentive effectiveness in previous incentive guidelines. Technical uncertainties are far more significant than cost uncertainties in the selection of contract type. Where there is a high probability of technical failure (and therefore cost uncertainty) any fixed price type contract, other than a level of effort type, should be avoided.

While it is true that the confidence in both technical and cost outcomes should be very high in firm-fixed-price contracts, generally technical uncertainties should influence the selection between FPI and CPIF contract. A fixed-price-incentive should be used only when there is a reasonably high expectation of technical success, without significant likelihood for the need for extensive technical direction.

Because probability does not remain constant during the life of a development effort, it becomes increasingly important in pricing to consider the probability of the occurrence <u>within</u> the cost range. The identification of cost based probability distributions can be a very complex process involving the requirement for technical capabilities which are

not generally found in contracting offices and project organizations. This subject will be discussed more extensively in Chapter VIII dealing with Contract Administration. Changes in Risk and Changes in Probabilities are discussed in Chapter VI.

The contractual pricing arrangement should never impact adversely on R&D technical performance under any type of contract. When the pricing and negotiation actions are based on accepted estimating and pricing procedures, the determination of a realistic target cost supports technical performance. In a very practical sense, the incentive contract is designed to bridge the gap in appropriate contractual structure after research and through systems development. The negotiation and establishment of pricing ranges and equitable sharing rates should not impact negatively on technical performance. Inappropriate narrative "restraints" such as a technical threshold in the contractual language in lieu of clear definition of technical objectives change the pricing structure and can adversely affect performance in unforeseen situations. The possibilities for this undesirable over-emphasis will generally be found more frequently where there has not been a free and open exchange between the technical and procurement personnel -- either in Government or in industry.

This Guide assumes that negotiation of a fair and reasonable pricing arrangement for an incentive contract will follow the guidance in the ASPR Manual for Contract Pricing. As previously stated, complete understanding of the fundamentals of contract pricing is basic to the understanding of any contract type. Thus, a review of ASPM No. 1 will aid in the understanding of the following Chapters. However, the following excerpts from the Pricing Manual are of such importance that we feel they should be duplicated in this Guide.

F. INTRODUCTION TO PRICING MANUAL

This Guide does not introduce totally new concepts nor significantly eliminate earlier concepts explained in the prior guides. It does emphasize the need for simplicity, visibility and understanding to permit use of incentives and will increase hopefully the knowledge of potential users. Obviously, the better definition of the requirements will permit improvements in achieving contract visibility, understanding, and will promote better definitization of changes, and improve administration.

It is important to recognize that selection of contract type is only part -- although a critical part -- of the total pricing arrangement. In order to establish the vital relationship between selection of contract type and pricing procedures, the first two chapters of the ASPR Manual for Contract Pricing (ASPM No. 1) are presented below. A complete and thorough knowledge of pricing techniques are basic to a successful procurement. It is suggested that a full review of the Pricing Manual should precede a study of this Guide.

PAGES 11 - 50 - Reprint of ASPR Manual For Contract Pricing (ASPM No. 1)

Chapters 1 and 2

Chapter 1

INTRODUCTION TO CONTRACT PRICING

Contract price is a term which encompasses the actions and functions necessary to do four things, sequentially. The first is to analyze a company's sales offer using techniques of price and cost analysis. The second is to establish a goal to be achieved, as nearly as possible, in a later conference with the company's representatives. The third is to negotiate a contractual arrangement (price and contract type) which comes as close to the prenegotiation goal as is practicable considering both the additional information gained during the negotiation and the contractor's willingness to move toward agreement with the Government's position. The fourth is to write a memorandum of the negotiation and do whatever else is necessary to make sure the contract file explains and justifies the agreement reached.

The objective of contract pricing is to assure the Government pays fair and reasonable prices for the timely delivery of the desired quality of required supplies and services. A fair and reasonable price is one which is fair to both parties to the transaction, considering promised quality and delivery and the probability of the seller producing as promised. The concepts and techniques needed to reach this objective are the subjects of this manual.

The contracting officer is responsible for the price, the contractual arrangement. He is responsible for achieving the contract pricing objective. How he discharges these responsibilities will depend on the requirement, the procurement situation, the organization and his own abilities. With some requirements and in some organizations, he will do the job himself, unassisted. In other circumstances, he will have pricing help from specialists. No matter how much help he gets in carrying the load, however, he still is the one answerable, ultimately, for the quality of the contractual arrangement.

This statement of the contracting officer's responsibility is in context of legal responsibility as an agent of the Government. In addition, there are very definite organizational and job responsibilities which exist and the contracting officer is not the only one in the system who is responsible for the price and contract type. Organizationally, and from the point of job responsibility, anyone who specializes in price or cost analysis or negotiation and who, in one of these roles, helps the contracting officer, is responsible for the quality, completeness and timeliness of that help.

The contracting officer cannot pass his responsibility on, even when he relies, as he must, on others for information and technical advice. He should work constantly to evaluate the quality of the assistance and the reliability of those assistors. He may even, from time to time, have to accept this help at face value, having neither the time nor, in some cases, the capability to evaluate the job done for him by the specialists. Should the information be erroneous or incomplete, that failure is charged to the specialist who did the work rather than to the contracting officer who used it. However, if the fault lies in how the information was used, that failure can be assigned to the contracting officer. Therefore, this manual is meant for him at least as much as it is for those who specialize in this part of the total procurement function.

SCOPE. Many of the persons charged with making procurements for the Government at fair and reasonable prices deal in complex weapons, supporting equipment, components and services. Most of the others handle less complex requirements, but their charge is the same, quality and timeliness at fair and reasonable prices, and their tasks are not necessarily easier. Procurement of new, complex and costly weapons and support requires a high degree of competence in contract pricing; the public trust demands that same competence in all procurements. To be competent in contract pricing, one must understand its philosophies and be adept in using its techniques.

This manual consolidates those philosophies and describes the techniques. The philosophies are fundamental and useful in all procurement situations and for subcontract as well as prime contract pricing. The techniques discussed were developed, for the most part, to meet particular problems in buying certain requirements from certain contractors or certain industries. As such, the techniques may lack universality. In addition, they assuredly do not represent the ultimate. They may be the latest, but not the last, words. What we have done, therefore, has been to collect known items and to present them in such a way as to make them understandable and, therefore, useful.

The Armed Services Procurement Regulation (ASPR) states the pricing policy. This manual takes these polices, explains them as necessary and shows some of the ways the policies can be put to work. It will be necessary to refer to, quote or paraphrase these policy matters from time to time. If there should be a conflict between this manual and other parts of ASPR, the regulation will govern.

We have put very few procedural details into this publication. However, certain efforts, such as the development and maintenance of the spare parts pricing packages, require the concerted action of PCOs, regardless of service, the ACO and the contract auditor. In such instances, the manual will discuss the matter and label it as either suggested or mandatory.

After this chapter, which covers the ideas and objectives of contract pricing, comes a chapter describing the types of contracts authorized for use and suggesting situations where each might be used profitably. The next two chapters cover analysis. The one on price analysis describes how to tell if competition is adequate and if prices can be considered catalog or market prices. It discusses price comparison, value analysis and the usefulness of Government price list (catalog) contracts.

The chapter on cost analysis describes what it is and the factors which influence the degree of analysis to be undertaken. The next eight chapters cover specific techniques of analysis and the special features of analysis of different costs. Analysis of profit is included in this coverage because, as a consideration in the negotiation objective, profit is a cost to the Government, even in fixed-price type contracting.

The next two chapters are broader. One deals with the negotiation conference, how to prepare for and conduct it. The other deals with the problems of communictaion and documentation. The remaining chapters deal with specific pricing tasks. In each instance, the ideas and techniques of the preceding chapters are redescribed in terms appropriate to these special procurement situations.

We intend this publication to be useful to people in base, post or station (local purchase) as well as central procurement, to buyers of nuts and bolts as well as submarines and missiles, to Army, Navy, Air Force, DSA and DCAA personnel alike. In trying to be all things to all these people, we cannot always use the right words or choose the right examples. This puts a burden on the reader, to take the sense of what is said and put it into terms and situations which are meaningful to him. The extent to which the ideas we present can be reshaped into familiar objects will determine how useful this publication actually is.

Another acknowledgement is necessary. Many individual subjects discussed in this manual are explored in greater, more scholarly, detail in other works. Certain of these sources will be cited, from time to time, as supplementary reading.

WHY ANALYZE PRICES? In a competitive market, a seller's price may be related more closely to what his competitors are likely to quote than to his own cost of manufacture or acquisition. All else being equal, performance must be effective and economical if the company is to make a profit. A company operating in a competitive industry may find it desirable or necessary to absorb short losses in situations where it lacks a competitive advantage. However, a company cannot long survive unless such losses are balanced by larger profits on products or services where it does have a competitive advantage. Such an advantage is realized when the company is able to make a profit at a price which is as low or lower than the prices which its most efficient competitors are likely to quote for the same or similar products or services.

In the absence of competition, or where the competition is based primarily on technical, non-price factors, a seller's price is likely to cover his probable costs plus as much profit as he believes the market will or should bear. Moreover, where the challenge and stimulus of price competition is missing, neither the company's past costs nor its estimate of future costs may reflect the most economical performance of which it is capable. Thus, in the absence of adequate price competition or other basis for determining the reasonableness of price, cost analysis generally is required. Cost analysis is a substitute means of assuring that a contractor has used those estimating methods and assumptions which would be appropriate in competition and that the contractor has anticipated normal efficiencies and put them in his estimate.

While proposals submitted in the absence of adequate price competition frequently are lowered by analysis and negotiation, this reduction is not your principal objective. This must be stressed. Where warranted, reduction of price is a proper goal, but the attitude that every quotation analyzed should be reduced is not right, for at least two reasons. First, the existence of such an attitude is obvious and a company may anticipate it when preparing future proposals. Second, when an assist analysis is performed by some one other than the contracting officer who will handle the negotiation, a determined intent to pay less than offered may cause the analyst to recommend a price objective based on unwarranted, untenable positions. It is both frustrating and ineffective to negotiate from such a position and this bias can destroy the attitudes of mutual respect (between contractor and Government and among the various Government specialists involved) so necessary to successful negotiations.

If reduction of a company's proposal is not the objective in contract pricing, what is it all about? Expressed one way, the purpose of price analysis is to determine if the price equates with value and the purpose of cost analyis is to provide a basis for understanding how the company proposes to do the work and what estimating assumptions it made in preparing its proposal. Ultimately, these understandings will be the basis on which price negotiations will be conducted. In simpler words, you analyze a proposal to see if the offered price is one you are willing to pay for the equipment or service needed.

REALISTIC PRICES. The concept of realistic price ties in closely with the idea that cost analysis is a technique used in the absence of price competition to achieve that which competition is presumed to supply, a fair and reasonable price. You use cost analysis to uncover the facts which will make it possible to reach agreement on a fair and reasonable price. This price you negotiate also can be described as realistic, one that is influenced strongly by the prospect of what it should cost to perform if the contractor operates with reasonable economy and efficiency.

Realistic also means you should avoid extremes. Because you are dealing with estimates of future events, you cannot expect to hit those costs on the button, with 100% accuracy. Neither can you take the "should cost" concept at face value and expect to price at just that optimum level.

You can be in trouble either way. If you are trying too hard for accuracy, you will find yourself enamored of cost-plus-a-fixed-fee (CPFF) contracts or better yet, long-lived letter contracts followed by CPFF. Either that or you will find a way to negotiate a fixed-price incentive (FPI) contract so that it becomes the practical equivalent of CPFF. If you push too hard on "should cost", you can get hung up on the ideal and be trying for a price that would spell loss unless every single good thing that had to happen did happen.

To be realistic means to be reasonable, to go for a price that neither guarantees a profit nor promises a loss. It also means to recognize the nature of a contract pricing proposal, to understand the full implication of what an estimate is. An estimate is a prediction of what the cost of future actions will or should be. Some actions you know will occur and you can predict these with some measure of confidence. Others you don't feel as strong about, but you know they may occur and, if there seems a reasonable certainty that they will, the estimate will provide for them as well.

These you would call contingencies. You can expect to find one or more in every proposal, even though they can be in many forms. Some examples:

- Labor or material price escalation.
- Material scrap loss.
- Changes in the labor base and their effect on overhead rates.
- Changes in manufacturing processes, their effect on labor and material quantities and the offsetting effect on overhead.
- Warranty requirements for assuring performance aspects.
- Possible changes in tax rates.
- Changes in average unit time to produce articles resulting from increased skill or training.

In performing a cost analysis, therefore, you attempt to isolate these sorts of uncertainties and identify the amounts estimated to cover them. Your end objective is to negotiate a realistic price based on knowledge of all current and correct cost or pricing data available to the contractor and the Government at the time of negotiation. This knowledge of actuals tempers the forecast of what it should cost to do the job contracted for. Also, the contract type you negotiate must be right for the situation if the price is to have a chance of staying good for the life of the contract.

After the price has been negotiated and the contract awarded, there are several factors, during performance, which could cause the contractor's costs to be greater or less than estimated. Among these are innovations made by the contractor subsequent to award, substantial changes in volume, unexpected test or production problems, unanticipated program changes which do not require contractual change coverage and contingent events which did not materalize, or did not materialize to the degree predicted. The likelihood of these sorts of factors occurring during performance, and the possible impact on costs if they do occur, are the uncertainties involved in contract performance. The extent to which such uncertainties are present must be evaluated at the time of negotiation. This evaluation should recognize that contractor assumption of a reasonable degree of cost responsibility is an essential part of realistic contract pricing. See Chapter 2 for more on this point.

TYPES OF PRICING. There are two basic situations, prospective and retroactive. Prospective pricing requires a price decision in advance of performance, a decision based on analysis of comparative prices, cost estimates, past costs or combinations of such bases. Prospective prices are more common and more desirable. The limiting factor in any decision to establish a firm contract price for a future event is the degree of risk involved. Stated another way, in accepting a firm price for work to be done later, the contractor takes the chance of losing at least the expected profit from the sale and in so doing, he accepts responsibility for the cost of doing the work. If the prospectively negotiated price bears a reasonable relationship to the probable cost and the contractor is interested in making a profit on the sale, he has a built-in reason to control costs. If the cost of a purchased component goes up unexpectedly, if rework goes up or if assembly and test suddenly takes twice as long as before, such events pose a direct threat to profit and the contractor still may have time to compensate in other cost areas to maximize profits or minimize the loss. The constant concern, however, is that the compensation must not alter the quality downward.

Retroactive pricing is encountered when negotiations are conducted after some or all of the work has been done, when some or all of the costs have been incurred. These negotiations are based on a review of the contractor's performance and the recorded cost data.

Whether the situation involves prospective or retroactive pricing, your objective is the same, to negotiate a realistic price. Where a prospective quotation is not based on adequate price competition, analysis generally will require the evaluation of any prior cost and production experience and the development of estimates of what realistic costs and profits should be during the period of contract performance. In the retroactive situation, costs already have been incurred and it may be more difficult to inject the idea of what it should have

cost into the negotiation. Here, analysis must provide the basis for effective negotiation by establishing the reasonableness of and necessity for all costs incurred, and the relative effectiveness of the contractor's management and performance.

PRICING DOGMA. We said, at the start of this chapter, that pricing includes analysis, prenegotiation planning, negotiation and documentation. We also said the techniques of price and cost analysis would be used in the first step of the process to evaluate the company's price proposal. The company is the principal source of the information needed to evaluate the proposal. However, where price competition is present or where the price level is set in the market place, competing offers and sales literature are sources of intelligence that can be used in price analysis. Where cost analysis techniques must be used, the starting point is the cost or pricing data furnished by the offeror or contractor.

Cost or pricing data are the factual portions of the proposal, or the facts upon which the proposal is based; they are the parts that can be verified. Usually they are data which can be verified by the contract auditor from accounting records and other supporting documents. It is this accounting review which fits the popular conception of what cost analysis is and, while there is more than this to cost analysis, it is one of three analytical skills involved in contract pricing. The others, besides accounting analysis, are technical analysis and price analysis.

Accounting analysis requires access to a company's books and accounting records. The reason for getting to the books is to verify that the costs used as the base point in forecasting the results of future activity are factual. This accounting analysis also may require similar explorations and verification of the costs of other companies doing the same or similar type work. The purpose of this is to develop comparable data to assist in determining the reasonableness of and necessity for costs of the magnitude included in a given proposal.

Accounting analysis is not the total of all cost analysis effort. The contributions of technical specialists, experts in such things as manufacturing techniques, tool design, plant layout, various engineering fields, quality assurance and preservation packaging, also constitute a form of cost analysis. These specialists often can give a qualitative evaluation of incurred and projected costs in their areas of specialization to help answer the question of *should* it cost this much.

Price analysis is the all other skill, the whatever else it is you do to make a sensible decision about the price proposed by the offeror or contractor. As will be pointed out later, you may be able to make a sound price decision using price analysis by itself, but you cannot make an equally sound decision relying solely on accounting and technical analysis of the proposed cost. In other words, you must perform price analysis on every procurement.

From what has been said, you might conclude that cost analysis is performed by either contract auditors or technical specialists. If you do, you are wrong. Anyone who looks at a contractor's proposal and evaluates its reasonableness by examination of individual elements of cost is performing cost analysis. In the typical situation we have several individuals looking at a contractor's proposal (or a company's offer), each from the vantage point of his own special area—accounting, engineering, production, purchasing, esti-

mating—and each reporting what he sees. Like the blind men and the elephant, no one sees the whole animal but each one has some conclusion, based on his examination of his own set of facts, as to the nature of the beast. Someone has to take these separate observations and put them together, along with any other information having a bearing on the procurement, and make a decision about the price proposed. This someone is the contracting officer, or someone working in his name. The putting together to make the decision is called pricing and the skill is called price analysis.

SOURCE OF COST OR PRICING DATA. The offeror or contractor is the primary source for the cost or pricing data you must have to analyze the reasonableness of a proposed price. ASPR implements Public Law 87-653 and both require prime and subcontractors to submit cost or pricing data, under specified circumstances, and to certify that the data submitted was accurate, complete and current. The purpose of the law is to foster "truth in negotiations" by having the seller make full disclosure of the bases for his proposal. ASPR picks up the requirement and adds the procedures needed to make the law operative. The instrument for making this disclosure of cost or pricing data is the DD Form 633 and its related dash models designed for specialized procurement situations. Only one fully executed and signed DD Form 633 is required with the proposal. This will be discussed, in relation to multiple line item procurements, in Appendix A to this manual.

The DD Form 633 is to be used in every negotiated procurement over $100,000 if competition is not present. You also may require its use in multisource solicitations when you doubt that competition will be effective or when you believe you will need the data to determine if you have adequate price competition. You may use this form on negotiated procurements of lesser amounts. The DD Form 633 requires the offeror or contractor to show and describe both factual and judgmental bases for his proposal. A copy of the DD Form 633, together with explanatory discussions, also is in Appendix A.

You have the right of access to such data as you may need to make the price decision. If you are the procuring contracting officer (PCO), or an administrative contracting officer (ACO) operating as a PCO, you are responsible for exercising this right. Your exercise of this right, as it relates to the kind and amount of data you may request, is limited, as a practical matter, chiefly by the value of the procurement action and the availability of relevant data from other, earlier procurements.

Historical accounting data are factual and a part of cost or pricing data as described by ASPR. These data have relevance in the pricing process, without regard for the use made of them by the offeror in preparing his proposal. Similarly, your need to know earlier costs is not affected by the type of contract under which such historical costs were incurred nor are your rights to access impaired by the type of prior contract. When the provisions of P.L. 87-653 apply, you must require the contractor to submit such costs as may be relevant to your price decision, even when costs resulted from work done for a fixed price sale and even when the contractor did not use those costs in preparing his proposal.

The DD Form 633 requires submision of relevant data. By definition, this includes specific identification and description of data when actual submission

is not practicable. The DD Form 633 provides a standard format for cost elements and for the proposed cost estimates, but the offeror may use different formats, if the contracting officer agrees that a different style of presentation would be more effective and efficient. However, even if the contracting officer approves a different style for the "cost elements" and "proposed contract estimate" segments of the form, the offeror also must complete and sign the rest of the DD Form 633 and submit it, without change to any of the words, front or back. This means the offeror will attach supporting schedules, identify specifically the data used which he does not attach, answer all questions and sign the form.

You constantly will have to decide how much is enough when asking for cost or pricing data. The offeror will help you decide, in at least two ways. The cost or pricing data he uses in preparing his proposal and which he submits with it is the starting point. It may be enough, but there also may be other data which you need and should request, even if the offeror didn't use it in preparing the proposal. What you ask for will depend on your experience and your judgment; there is no way to tell you what it will be in every case.

The other way the offeror will help you is by saying no to your request. He is practically certain to resist when you go for irrelevant information or seek to impose a burdensome requirement. He may even resist a legitimate request, so you'll need to sort the facts out and persist in your search. This ends up the same as the first condition; in either case, you still must rely on your judgment in requesting data and in deciding when you have enough.

The PCO, or the ACO when operating as a PCO, is the one who must decide if the proposal is supported by cost or pricing data complete to the time of submission. He is the one who must review, or cause a contract price analyst to review for him, the company's submission and decide if the work of analysis should start. If the submission is complete, he should give the contract auditor and others the go ahead. If not, he must do what is necessary to get the company to make it complete. He must look to the company for this and not to Government personnel.

In requesting information, have specific reasons for the request and be able to show the company how having the data will help both of you. Companies have reasonably certain knowledge of what information can be of value and you can expect resistance if your request goes beyond that point. You should recognize the likelihood that an offeror will be more thorough, use more kinds of data in preparing a proposal in the million dollar class than he will for one around $100,000. His estimating practices may be more complicated, too, and this has a bearing on the kind and volume of data.

When you have frequent negotiations with the company, you should take the time to tailor-make the format in which the company will submit its supporting information. You should review in detail the types of information available within the company, the statistical as well as accounting reports already prepared for internal use, and establish a working arrangement as to what sort of standard or semi-standard types of information will be furnished with what sorts of proposals. This arrangement should be reviewed continuously and refined as necessary. You probably will work with audit and administrative personnel in putting together an agreement and it should make

sense to include representatives from all buying offices doing significant business with the company.

Don't forget that some data items are significant only at certain cutoff or closing dates. These should be identified in the DCAA report on the company's estimating methods. Consider these before you reach any agreement as to data to be furnished. For example, monthly burden rates normally may not be available before the 20th of the following month. This lag may be caused by the time it takes to process through accounting records and make the required internal checks. Because the contractor is obliged to keep the contracting officer current on cost or pricing data until agreement is reached on price, you may want to specify and agree upon specific cutoff (as of) dates.

Submission of cost or pricing data and certification as to its currency, completeness and accuracy are required when the procurement is noncompetitive and the value of the transaction is $100,000 or more. It is required for modifications to existing contracts as well as for negotiation of new ones and it also includes redetermination of prices and termination settlements. Interim and final adjustments of contract prices by the functioning of an incentive clause are price redeterminations.

ORGANIZATION. Where contract pricing is a separate function, it will be manned to give the contracting officer prompt and complete support, including assistance in price negotiations. The contract pricing function should be the specialty which gathers, assimilates, evaluates and, in establishing objectives, brings to bear all the skills and techniques which influence the eventual pricing arrangement in a given procurement situation. Pricing services include price analysis, cost analysis, use of accounting and technical evaluations and the variety of systems analysis techniques which facilitate negotiation of contracts which promise the lowest overall cost to the Government.

Chapter 2

USAGE OF CONTRACT TYPES

This chapter is an introduction to the subject of contract types. It identifies the principal types authorized for use and discusses the basic characteristics of each. It emphasizes the selection of the appropriate type for a negotiation objective.

In categorizing by type of contract, we attempt to distinguish among the various ways of determining contract price and when the price will be negotiated or otherwise established. There are two general categories of contract types, fixed-price or cost-reimbursement. Fixed-price is a broad designation which means that the buyer and seller will meet, sooner or later and preferably sooner, to agree on a price which will represent full payment for the work done under the contract and the price, unit or total, will be paid upon delivery and acceptance of the contract items. Cost-reimbursement designates an arrangement in which the buyer and seller agree on an estimate of the contract cost and the buyer agrees to reimburse the seller, from time to time, for allowable and allocable costs necessary to get the work done. Reimbursement may be full, within the concepts of allowable and allocable, or partial according to a specific sharing agreement written into the contract. The contract may include, or not, a provision for fee (profit) payment.

ASPR describes other contractual arrangements which cannot be distinguished by pricing terms. These deal with procurement methods (indefinite delivery contracts and basic ordering agreements), administrative conveniences (basic agreements) and special authorizations to proceed (letter contracts). These types will not be described in this chapter nor in this manual.

Sound procurement requires use of the right contract type. The best, most realistic and reasonable price in the world (for the particular requirement at hand) may turn sour if the contract type is wrong. You can negotiate a tight price for a development effort and wrap it up in a firm fixed-price package. This contractual arrangement may be good if the contractor is right the first time at every step in the developmental process. If this does not happen, the contractor must explore alternatives and exploration can cost money. The tight price can become a strait jacket rather than an impelling force for economy and efficiency. Conversely, you can negotiate a price which would be fine in a firm fixed-price arrangement and put it in an incentive contract package. Despite the promise to the company that it can share in any reduction from target, the other promise to share in any increase over target may reduce the pressure to achieve the implied objective of the contract, to reach or beat the target cost.

Therefore, effective pricing and sound procurement require discrimination in selecting and negotiating the right contract type. It requires judgment to pick the contract type best suited to the procurement situation. While the rules of formal advertising also permit fixed-price with escalation (FPE) contracts, the firm fixed-price (FFP) contract is used in almost all procurements made by that method. As a consequence, this chapter will deal with usage of contract types under circumstances which require procurement by negotiation.

BASIC CONTRACTUAL ARRANGEMENTS. Several basic contract types are described in the following paragraphs. Some of the types authorized by ASPR will not be covered, either because they are special contracts with narrow applications or because they are designated more properly as procurement methods than as contract types.

The basic types of contracts authorized in ASPR may be used in combination when this would make a contract that fitted the circumstances of the procurement better. This means that a single contract might have, for example, both firm fixed-price and cost-plus-a-fixed-fee features. The proposed combination would have to meet the basic test; it must promote the best interests of the Government. Beyond that, you would want assurance that the elements of work covered by these different pricing arrangements clearly were distinctive and would be identified to and managed by separate components of the company's organization. It also should follow that such a combination would not cause problems that the company's accounting methods could not cope with; the costs of the different efforts must be segregated.

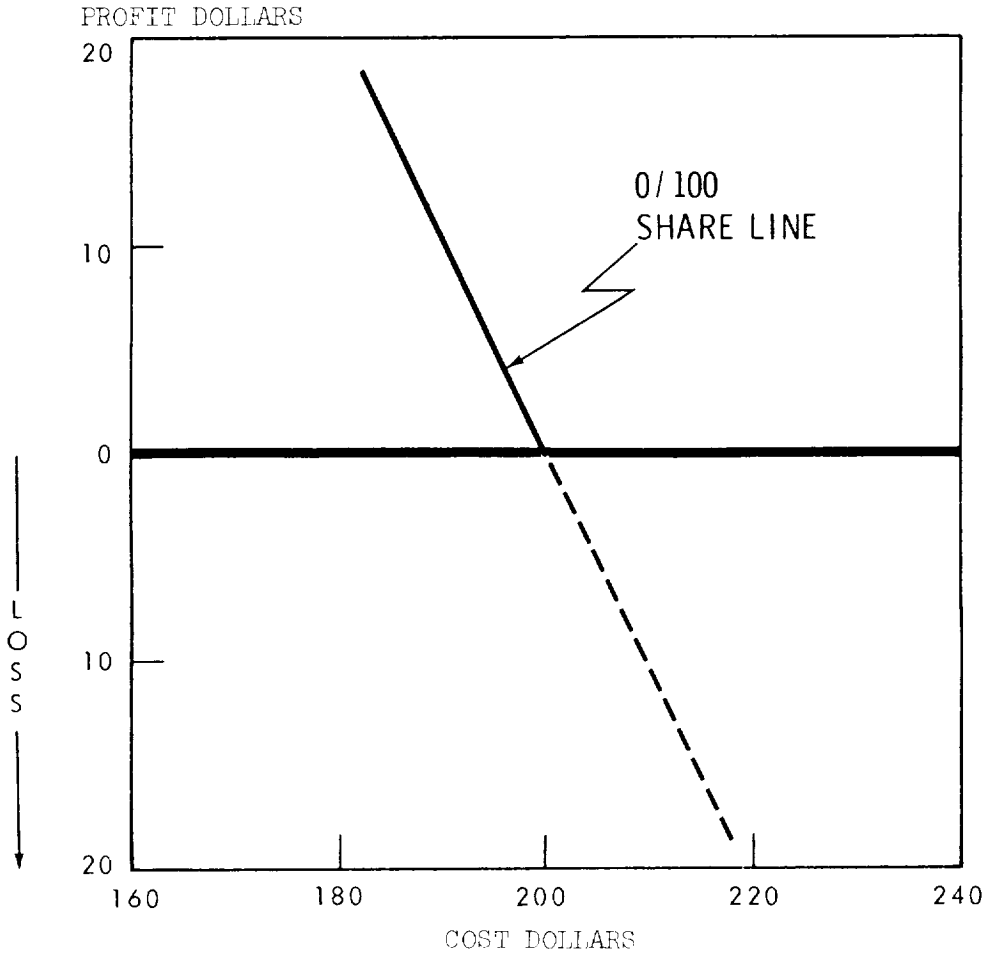
Firm Fixed-Price (FFP). Price is agreed to before a definitive contract is awarded and remains firm for the life of the contract, unless revised pursuant to the changes clause in the contract. Because of this, the contractor accepts full cost responsibility when he agrees to this type of contract. Ultimate profit from the contract is directly related to the cost of doing the work, to how effectively the contractor controls costs and manages the total contract effort. Examples:

Contract price	$200, 000	$200, 000	$200, 000
Final cost	185, 000	170, 000	220, 000
Profit realized	$15, 000	$30, 000	($20, 000)

In the terminology of the incentive contract, the sharing arrangement is 0/100. This means that the Government does not share at all but that the contractor accept 100% of any difference between estimated and actual costs. The contractor assumes complete responsibility, in the form of profits or losses for all contract costs. Chart 2–I, a cost/profit chart, shows this relationship. (For instructions on chart construction and analysis, see GRAPHICS at the end of this chapter.)

CHART 2–I.—FFP contract.

[Dollars—Add 000]



Fixed-Price Incentive, Firm Target (FPIF). The ingredients of the fixed-price incentive contract with target firm from the outset are target cost, target profit, target price, ceiling price and share arrangement. Example:

Target cost	$10,000,000
Target profit	850,000
Target price	10,850,000
Price ceiling	11,500,000
Share	70/30

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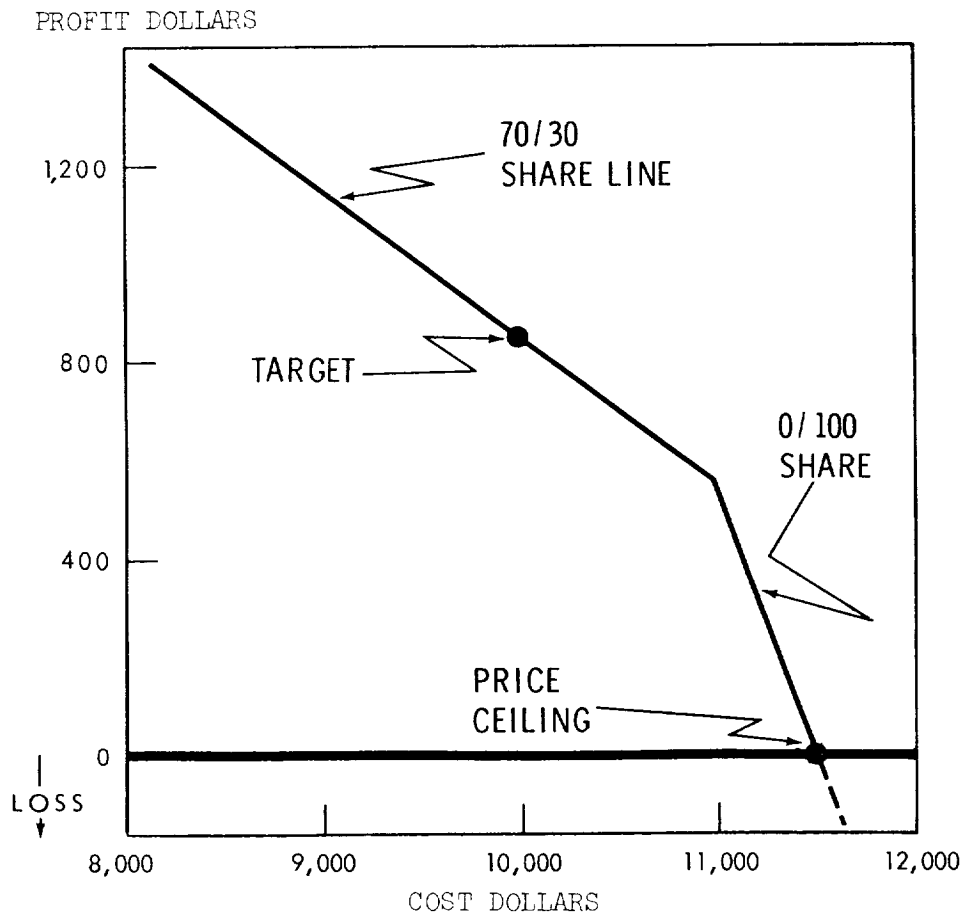
Chart 2–II shows this example. A firm pricing arrangement, such as the one in this example, is negotiated at the outset of the contract to provide the basis for negotiation of the final costs which in turn become the determinant of the final price.

CHART 2–II.—FPIF contract.

[Dollars—Add 000]



When the contract is completed, the contractor submits a statement of costs incurred in performance of the contract. These are audited by contract auditors to determine allocability to the contract and to point out any costs which may not have been necessary to the performance of the contract or are otherwise questionable. These data, the contractor's statement and the auditor's advisory report, are the starting points in analysis of the proposal for final settlement of contract price. Except in rare cases where contract changes have made it impossible, comparison of actual costs with those contemplated at the time the target price was negotiated is a useful tool for analysis. The reason for this look at the original negotiation objective, as modified by subsequent changes, is to identify and then analyze the differences between expected and actual

events. This will help you understand the problems the contractor had to solve and give you an indication of the degree to which the actual costs of contract performance were reasonable and necessary. This analysis should cover engineering, production and management control considerations. Your conclusions should become part of your negotiation objective. After negotiation establishes the final cost figure, profit will be determined by formula application.

The formula in the example above reflects a joint responsibility in the ultimate costs which is translated into a sharing in any dollar difference between target and final costs. In the example, it means that 30 cents of every dollar of difference is the contractor's responsibility, either as an addition to or a deduction from target profit. Although the shares always will total 100%, the proportions should vary according to the uncertainties involved in contract performance, the amount of target profit and the spread between target cost and ceiling prices. Other expressions of Government/contractor shares are 60/40, 75/25 and 50/50.

Common practice has been to make the share line symmetrical, such as 70/30 both sides of target. Because contract terms must be tailored to the procurement situation, there is no need to think in terms of straight share lines. We would expect to see contracts which promised a 50/50 share under target to go with an 80/20, 85/15 or 70/30, for examples, over target. This idea will be explored again later.

Using the arrangement from the example, assume final negotiated cost was $9,600,000:

Target cost	$10, 000, 000	
Final negotiated cost	9, 600, 000	
Difference	$400, 000	(decrease)

Contractor receives 30% or $120,000 of the $400,000 difference as an *increase* in profit:

Target profit	$850, 000
Contractor's share	120, 000
Final profit	$970, 000

The Government receives 70% or $280,000 of the $400,000 difference as a *reduction* in price:

Final negotiated cost	$9, 600, 000	
Final profit	970, 000	
Final price		$10, 570, 000
Target price		10, 850, 000
Price reduction		$280, 000

Again using the arrangement from the example, assume final negotiated cost was $10,500,000:

Target cost	$10, 000, 000	
Final negotiated cost	10, 500, 000	
Difference	$500, 000	(increase)

Contractor receives 30% or $150,000 of the $500,000 difference as a *decrease* in profit:

Target profit	$850, 000
Contractor's share	150, 000
Final profit	$700, 000

The Government receives 70% or $350,000 of the $500,000 difference as an *increase* in price:

Final negotiated cost	$10, 500, 000	
Final profit	700, 000	
Final price		$11, 200, 000
Target price		10, 850, 000
Price increase		$350, 000

Assume, once again using the arrangement from the example, that final negotiated cost was $12,000,000 or $500,000 in excess of the contract ceiling price. Whenever final costs exceed the ceiling, the ceiling amount becomes the final price. In this instance, the ceiling of $11,500,000 is the final price.

In negotiating a fixed-price incentive contract, the interrelated factors of target cost, target profit, ceiling price and sharing formula must be established so that the contractor is provided with a degree of cost responsibility and incentive consistent with the circumstances. For example, the greater the effort required to produce at a cost less than estimated, the greater should be the incentive to the contractor. The possible reward must be greater, to encourage the extra effort needed to produce at a cost less than target. In such circumstances, we would expect an arrangement that combined a tight target cost, a relatively high target profit, a wide share (like 60/40 or 50/50) at least on the underrun side and a tight ceiling (like 115% of target cost).

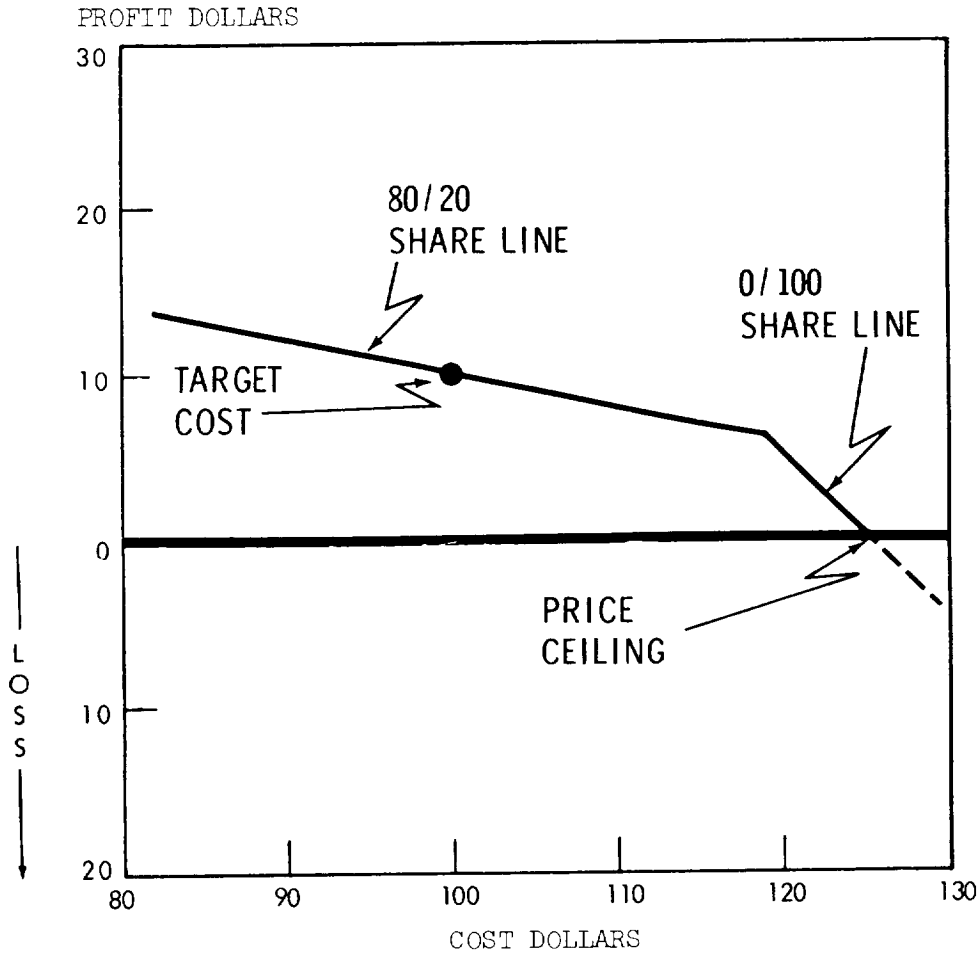
In addition, it is necessary to consider the effect of the mandatory price ceiling. The limit of Government/contractor sharing above target, at the share formula in the contract, is at some figure less than the ceiling price. Assuming a target cost of $100,000, target profit of $10,000, sharing arrangement of 80/20 and a price ceiling of $125,000, the following illustrations of final pricing demonstrate this point:

Final negotiated cost	*Dollars in excess of target*	*Contractor's share*	*Final profit*	*Final price*
$115, 000	$15, 000	$3, 000	$7, 000	$122, 000
118, 000	18, 000	3, 600	6, 400	124, 400
119, 000	19, 000	3, 800	*6, 000	*125, 000

*The final profit would have been $6,200, except that the mandatory ceiling price of $125,000 limits the total payment that can be made to the contractor. Chart 2-III is a graphic presentation of this.

CHART 2-III.—Ceiling effect line, FPI contract.

[Dollars—Add 000]



With this discussion in mind, you can see that the Government/contractor sharing pattern does not have to be a straight line and that the incentive arrangement negotiated could have several shares. One concept is the flat spot, as for example, ±1% from target cost. This would create a situation in which the contractor had no responsibility in the form of either additions to or deletions from target profit, for variations in cost of 1% or less from target cost. In effect, this amounts to a 100/0 or CPFF arrangement in this cost range, as in the following example:

Target cost	$100,000.
Target profit	10,000.
Share	Within ±1%—100/0. More than ±1% —80/20.

CHART 2–IV.—FPI with flat spot.

[Dollars—Add 000]

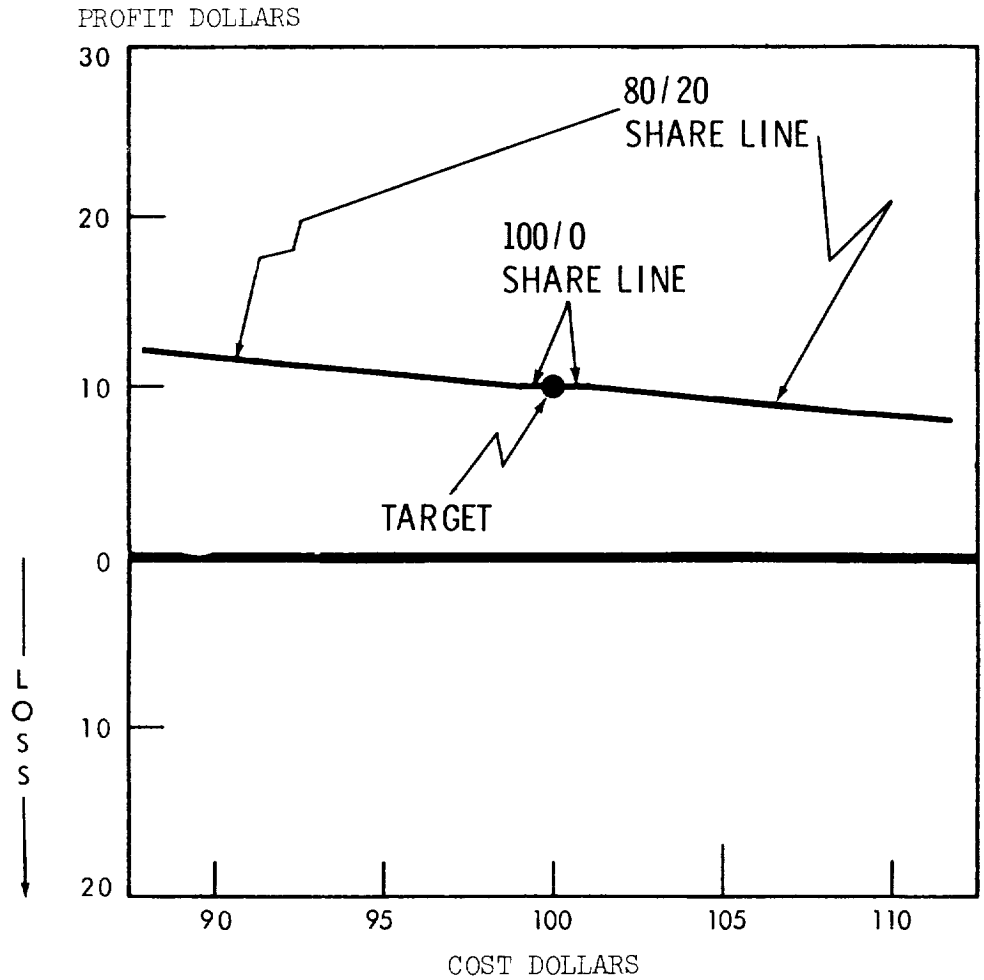


Chart 2–IV presents this example graphically. If final negotiated costs were between $99,000 and $101,000, final profit would be the same as the target profit, $10,000. If final negotiated cost were less than $99,000, final profit would be the target profit of $10,000 plus 20% of the difference between final negotiated cost and $99,000. If the final negotiated cost were greater than $101,000, final profit would be the target profit of $10,000 less 20% of the difference between the final negotiated cost and $101,000. While the flat spot may be useful in isolated situations, we don't recommend general use.

In considering the infinite varieties of arrangements that can be constructed for the incentive contract, keep in mind that too fancy an arrangement detracts from the main purpose of the contract. This purpose is to show the contractor what the tangible results of effective cost control and sound management will be, what's in it for him if he can produce for less than targeted. Therefore,

as a rule, the simpler the incentive arrangement, the more effective it is likely to be.

For maximum effectiveness, the arrangement should be in operation when performance starts so that the first decisions made within the contractor's organization are made with the knowledge that every dollar spent reduces the profit potential by the amount of the share. For example, if the share were 65/35, every dollar spent in performance of the contract would reduce the profit potential by 35 cents. While this may sound like an oversimplification of a complex business relationship, it is a true description of the incentive arrangement. It also is significant. The contractor, not knowing what his final actual cost will be until some point relatively far along in performance of the contract, can be motivated by the incentive to consider the cost implications of most decisions. Thus, for maximum effectiveness, the arrangement should be negotiated early in performance, preferably at the time of contract award.

Fixed-Price Incentive, Successive Targets (FPIS). This contract type is used infrequently. It is designed for some situations involving procurement of the first or second production quantity of a newly developed item. Long lead time requirements may make it necessary, in the acquisition of a new system, to contract for a follow-on quantity before design or production stability has been achieved. Lacking this stability, cost or pricing information available at the time of follow-on award may not be adequate for the negotiation of an FPIF contract. However, cost or pricing information adequate for the establishment of a firm target arrangement is expected at a point relatively early in performance of the follow-on contract. Given such a situation, it may be better to use an FPIS contract than to award a letter contract or negotiate a cost-plus-incentive-fee (CPIF) arrangement. The FPIS establishes an overall ceiling price and gives the contractor some degree of cost responsibility and profit incentive in the interval before a realistic firm arrangement can be negotiated.

When the FPIS contract is used, a firm contract should be negotiated before the first item on the contract is delivered. The new contractual arrangement may be either FFP or FPIF.

The ingredients of the successive targets incentive contract are a ceiling price, initial target cost, initial target profit, initial target price, initial share formula and a ceiling and floor on firm target profit. Example:

Initial target cost	$15,000,000
Initial target profit	1,200,000
Initial target price	16,200,000
Initial share	95/5
Ceiling on firm target profit	1,350,000
Floor on firm target profit	1,050,000
Price ceiling	19,500,000

With the exception of the price ceiling, these elements of the FPIS are used to determine the firm target profit at the time of firm-up. In addition to this arrangement, the successive targets contract also specifies the point in time, normally prior to delivery of the first item, when the parties will meet to negotiate a firm fixed-price or, failing that, a firm target incentive arrangement.

Using the figures in the example, assume at firm-up, negotiation of an estimated cost of $14,500,000. Firm target profit would then be determined as follows:

Initial target cost	$15, 000, 000	
Negotiated cost	14, 500, 000	
Difference	$500, 000	(decrease)
Contractor's share	25, 000	(increase)
Initial target profit	1, 200, 000	
Firm target profit	$1, 225, 000	

Chart 2–V depicts this example.

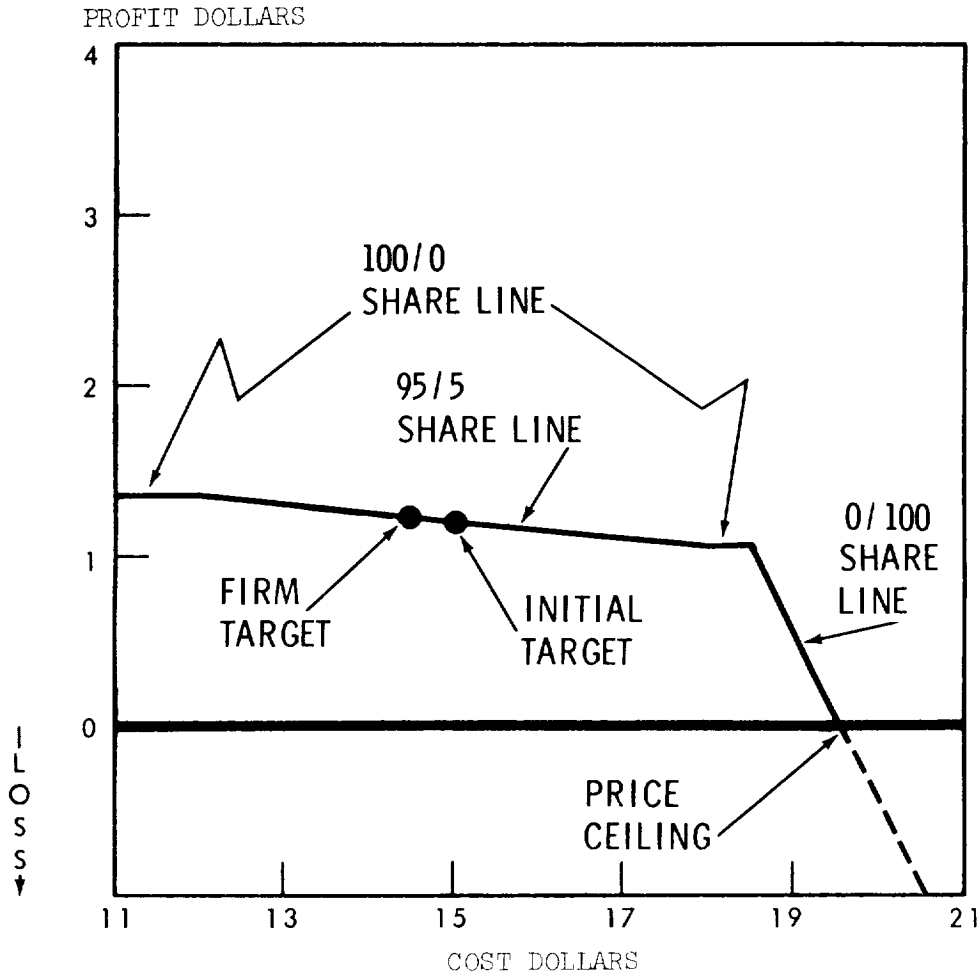
At this point, two alternatives exist. First, using the negotiated cost of $14,500,000 and the firm target profit as guides, a firm fixed-price contract may be negotiated. If a satisfactory firm price cannot be agreed to, or if the parties agree that the uncertainties involved in the remaining part of the contract are too great, a firm target incentive may be negotiated. In this event, the parties must negotiate a new sharing formula. Also, while ceiling price cannot be *increased* at firm-up, a *decrease* may be agreed to where firm target costs are lower than initial target costs. Assuming that a revised ceiling price of $16,700,000 and a 60/40 formula were negotiated, a firm incentive arrangement would be established as follows:

Target cost	$14, 500, 000
Target profit	1, 225, 000
Target price	15, 725, 000
Ceiling price	16, 700, 000
Share formula	60/40

Final settlement at contract completion would be done in the manner described for the FPIF contract.

CHART 2-V.—FPIS contract.

[Dollars—Add 000]



Now, again using the successive targets arrangement in the example, assume that the parties negotiated an estimated cost of $17,000,000 at the time of firm-up. Firm target profit would then be determined as follows:

Initial target cost	$15, 000, 000	
Negotiated cost	17, 000, 000	
Difference	$2, 000, 000	(increase)
Contractor's share	100, 000	(decrease)
Initial target profit	1, 200, 000	
Firm target profit	$1, 100, 000	

If an FFP contract were not in order, and a sharing formula of 75/25 were negotiated, a firm incentive arrangement might be set up as follows:

Target cost	$17,000,000
Target profit	1,100,000
Target price	18,100,000
Ceiling price	19,500,000
Share formula	75/25

At contract completion, final settlement would be made in the same way as under an FPIF contract.

There are several critical factors to consider in negotiating and administering a successive targets arrangement. One, the firm pricing arrangement must be negotiated early in performance, usually before shipments begin. By the time the first delivery is made, the contractor will have committed a substantial portion of the contract cost. If a firm arrangement has not been negotiated, the contractor will not know his share in the responsibility for the cost of performance and what he can make or lose in profit. The effectiveness of any incentive contract depends upon management's response to the challenges of the contract. One effective reaction is an operational budget based on, but lower than, the target. Planning that goes into making the budget needs to be stimulated by knowledge of the firm target costs and the actual sharing formula.

Second, because an FPIS contract is negotiated when cost and pricing information is too sparse to permit negotiation of a firm arrangement, the uncertainties of contract performance are greater than would be the case otherwise in a fixed-price type of contract. So that the pricing arrangement subsequently negotiated will be realistic, the initial share should not provide as great a degree of contractor cost responsibility as would a formula negotiated under an FPIF contract. A 90/10 formula would be considered a reasonable initial share.

Third, the ablity to establish a firm pricing arrangement early does not depend on cost or pricing data from the contract itself. You can draw upon data, as it becomes available, from earlier contracts for the same or similar equipment.

Fixed-Price with Redetermination (FPR). There are two distinct types of FPR contracts, one prospective and the other retroactive. One type provides for the negotiation of fixed prices to be used in a prospective period, and can be described as a series of two or more firm fixed-price contracts negotiated at stated times during performance. Use of this type has been centered in the area of aircraft engine procurement, where the nature of manufacture and resulting methods of accounting for costs have lent themselves to periodic, plant-wide pricing on a prospective basis.

The other type of FPR contract provides for adjusting contract price after performance (completely retroactive.) In two respects, this contract type is like an FPI contract. A ceiling price is negotiated initially and actual, audited contract costs are used as a basis for price revision. However, there is one significant difference. The degree of the contractor's cost responsibility, in terms of a share formula, is written into an incentive contract. This FPR, however, makes the degree of cost responsibility a matter of negotiation at the time of price redetermination, after work has been completed, and depends on a subjective

evaluation of the manner in which the contractor has performed. In other words, a revised price reflecting both cost and profit considerations is negotiated at the time of price redetermination. With an FPI contract, only final costs are negotiated; final profit is determined mathematically in accordance with the contract share formula.

Thus, except for the price ceiling, the contractor does not have a calculable, positive incentive for cost control and this contract type does not foster the cost conscious climate generally present when contractor management clearly sees that higher costs means lower profits. For this reason, ASPR limits use of this type to small dollar, short term contracts for research and development.

Cost-Plus-Incentive-Fee (CPIF). In procurements for advanced, engineering or operational systems development and first production, the uncertainties of performance may preclude use of a fixed-price type of contract, yet they may not be so great as to justify use of a cost-plus-a-fixed-fee contract. In these circumstances, a CPIF contract should be used. This contract injects an incentive sharing formula into what otherwise would be a cost-reimbursement situation with a 100/0 share.

In recognition of the cost-reimbursement situation, there are three characteristics which distinguish CPIF from FPIF and FPIS contracts. One is the absence of a ceiling price. Second, in the CPIF situation, costs are reimbursed in accordance with ASPR Section XV and terms of the contract, while in FPI contracting, final cost is established in accordance with a negotiated agreement. Third, under a CPIF contract, the maximum fee the contractor can receive is subject to ASPR limitations. Maximum fees in excess of the ASPR limits require approval as deviations.

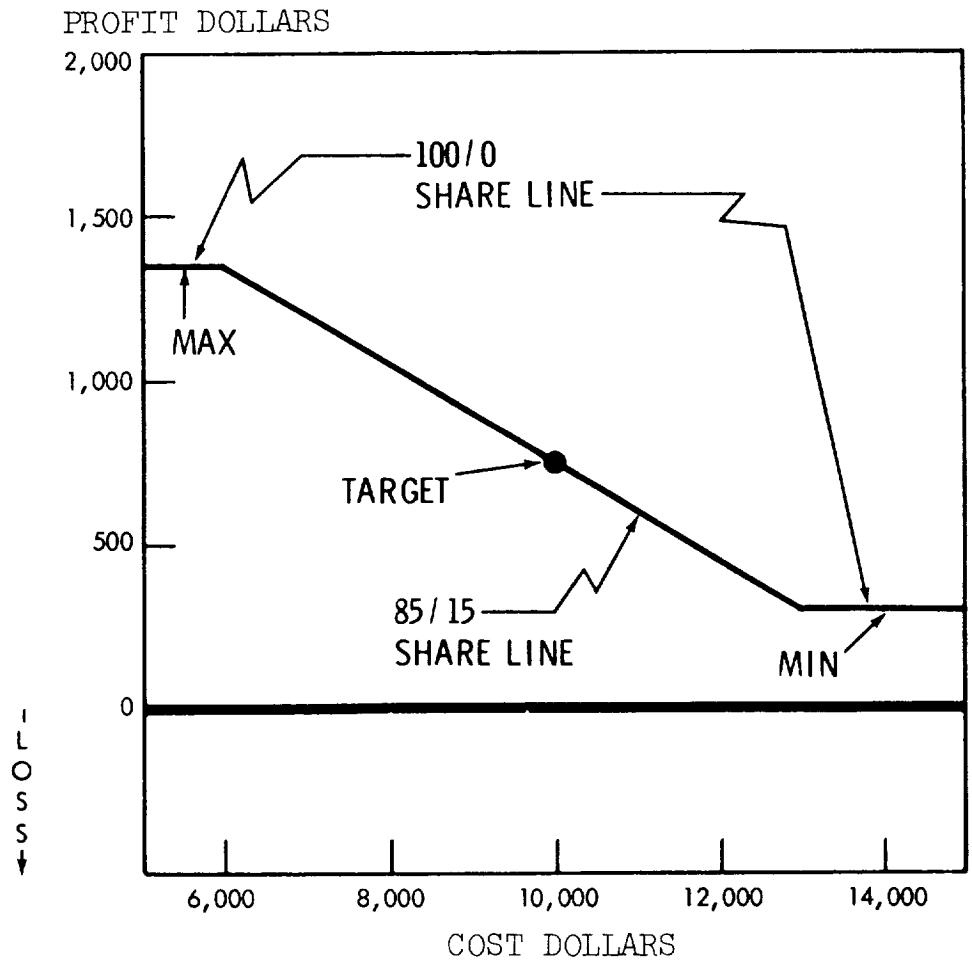
Both maximum and minimum fee levels are negotiated under a CPIF arrangement. Thus, a point is established both under and over target cost where fee becomes fixed at the maximum or minimum levels, contractor sharing ceases and the contract, in effect, converts to a CPFF 100/0 sharing arrangement. Conversely, the ceiling price in an FPI contract also establishes an earlier point over target cost where the Government ceases to share and the contract becomes an FFP with a 0/100 share formula. This difference is significant, for by negotiation of a CPIF contract the parties have indicated that cost uncertainties involved in performance are so great that it is not possible to negotiate a realistic ceiling price within a reasonable range from target cost. Following this point to its logical conclusion, CPIF incentive arrangements should be negotiated in such a way that the incentive remains in effect over greater variations from target cost than would normally be experienced or expected in a procurement situation where use of an FPI contract was determined appropriate. As a general rule, maximum and minimum fee levels and the sharing formula negotiated under a CPIF contract should be such that the incentive will remain in effect over the same relatively wide range of possible cost outcomes that made CPIF contracting necessary in the first place. The following is an example of a CPIF arrangement:

Target cost	$10,000,000
Target fee	750,000
Maximum fee	1,350,000
Minimum fee	300,000
Share formula	85/15

Chart 2–VI shows this example.

CHART 2–VI.—CPIF contract.

[Dollars—Add 000]



Using the example, assume final cost is $9,000,000:

Target cost	$10, 000, 000	
Final cost	9, 000, 000	
Difference	$1, 000, 000	(decrease)

The contractor receives 15% or $150,000 of the $1,000,000 difference between target and final cost as an *increase* in fee:

Target fee	$750, 000
Share	150, 000
Final fee	$900, 000

The Government receives 85% or $850,000 of the $1,000,000 difference between target and final cost as a *reduction* in price:

Final cost	$9,000,000	
Final fee	900,000	
Final cost plus fee		$9,900,000
Target cost plus fee		10,750,000
Reduction in price		$850,000

In this example, the incentive would be effective over a range of $7,000,000, an underrun of 40% and an overrun of 30%. The contractor's share of a $4,000,000 underrun would be 15% or $600,000; his share of a $3,000,000 overrun would be 15% or $450,000. Added to or subtracted from this target fee of $750,000, the share could result in a fee at the maximum level of $1,350,000 or the minimum level of $300,000. Notwithstanding the fact that the actual variation from target costs may be greater than plus $3 million or minus $4 million, the effect of the incentive arrangement under the example would be to fix fee at either the maximum or minimum levels.

CPIF contracts should be negotiated so as to provide the widest fee swing practicable under the circumstances. Because of the interrelationship between negotiated fee levels and sharing arrangement, the wider the swing between maximum and minimum fee levels, the greater can be the contractor's sharing percentage under the formula without limiting the range of cost variation over which the incentive is effective. To demonstrate this point, assume a second example of a CPIF arrangement as follows:

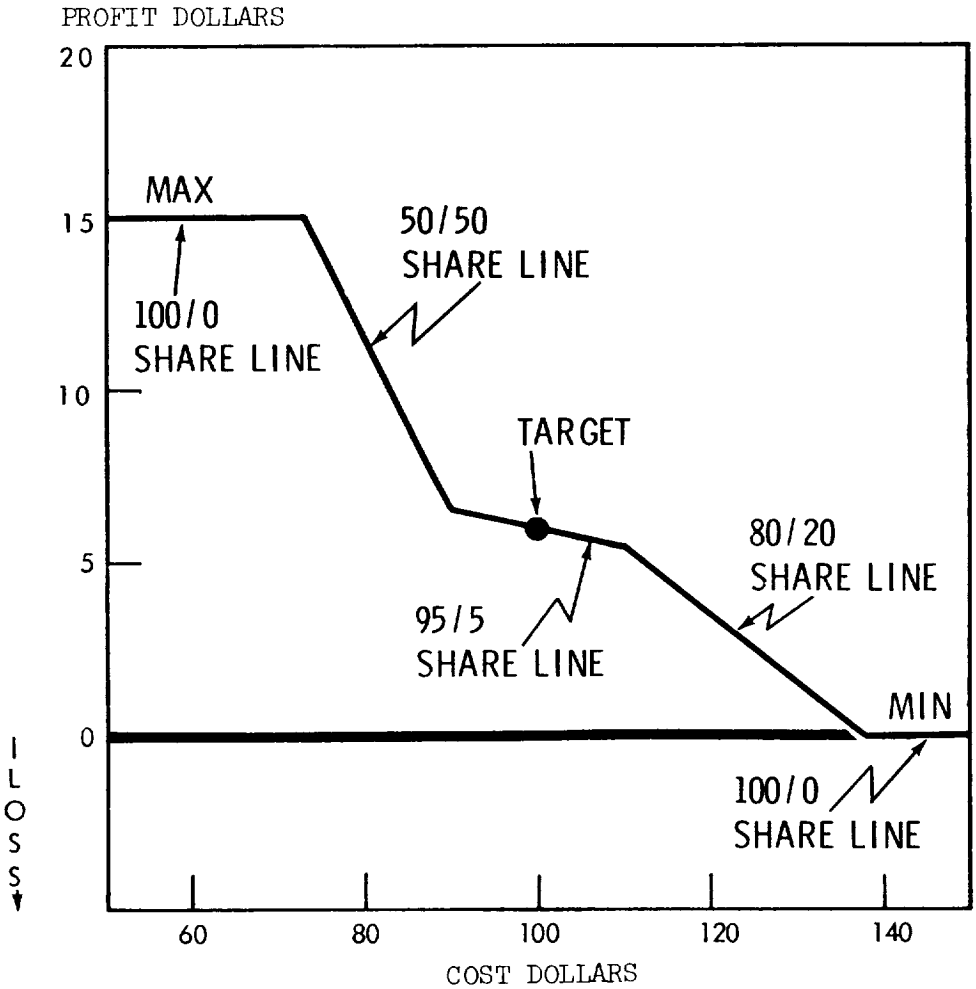
Target cost	$10,000,000
Target fee	700,000
Maximum fee	925,000
Minimum fee	475,000
Sharing formula	85/15

With an 85/15 share formula, the incentive would remain effective over variations from target cost of but ±15% or $1,500,000 (15% of $1,500,000=$225,000 and $225,000 added to or subtracted from the target fee of $700,000 results in fee at either the maximum or the minimum level). Particularly in regard to plus variations from target cost, such an incentive effectivity is unrealistic because of the cost uncertainties implicit in the use of a CPIF contract. Perhaps the first question raised by this example is whether an incentive arrangement providing for a wider fee swing could not have been negotiated.

Each of the foregoing examples has demonstrated an equal share upward and downward from target. There are many other ways the fee pattern may be adapted to specific pricing situations. For example, we may have a 95/5 share ±10% from target, a 50/50 share from minus 10% to the maximum profit and an 80/20 share from plus 10% to the minimum profit. Chart 2–VII depicts this fee pattern. This sort of arrangement might be used in a CPIF situation when the probability of substantial overrun is greater than the probability of substantial underrun and we want to give the contractor good reason to control costs and at least minimize the overrun.

CHART 2–VII.—CPIF with three share lines.

[Dollars—Add 000]



Cost Contract (*CR*). The Government agrees to reimburse the contractor for all allowable and allocable costs incurred in performance of the contract, but no fee is paid. Cost allowability is determined in accordance with ASPR Section XV and any specific provisions of the contract. Because of the no profit feature, this type of contract has limited appeal. Generally, use is restricted to either research contracts with educational institutions or contracts providing facilities to contractors.

"Facilities" means industrial property for production, maintenance, research, development or test. The term includes real property and rights therein, buildings, structures, improvements and plant equipment but it does not include material, special tooling, military property and special test equipment. It is policy that contractors will furnish all facilities needed for performance of Government contracts. However, facilities may be provided by the Government if necessary to get contract performance or if it is more economical to furnish

existing Government-owned facilities. To support this policy of private ownership of facilities, no fee is to be provided or allowed a facilities contractor under a facilities contract. The opportunity to earn profit is provided by whatever other contracts for supplies or services the contractor can get.

When buying research efforts from educational institutions, use of a cost, no fee contract depends on the nonprofit character of the schools and the intrinsic attractiveness of particular projects. If a project is in an area of study which interests an institution's scientists, reimbursement of the research cost can be compensation enough.

Cost-Sharing Contracts (CS). The Government agrees to reimburse the contractor for a predetermined portion of the allowable and allocable costs of contract performance. This type contract is designed for research and development procurements. When contracting with other than educational institutions and foreign governments, you can use the CS contract only when sure that the contractor stands to receive substantial present or future commercial benefits from the project. To use this contract, you must, in compliance with ASPR, show conclusive evidence that there is a high probability of commercial benefit and get the necessary approvals. A company's willingness to share costs should not be a factor in source selection nor should you ask for proposals on a work statement which you know cannot be completed within the funds available. Lastly, you should not even hint that acceptance of a cost-sharing contract will place the company in a preferred position in competition for a possible future contract.

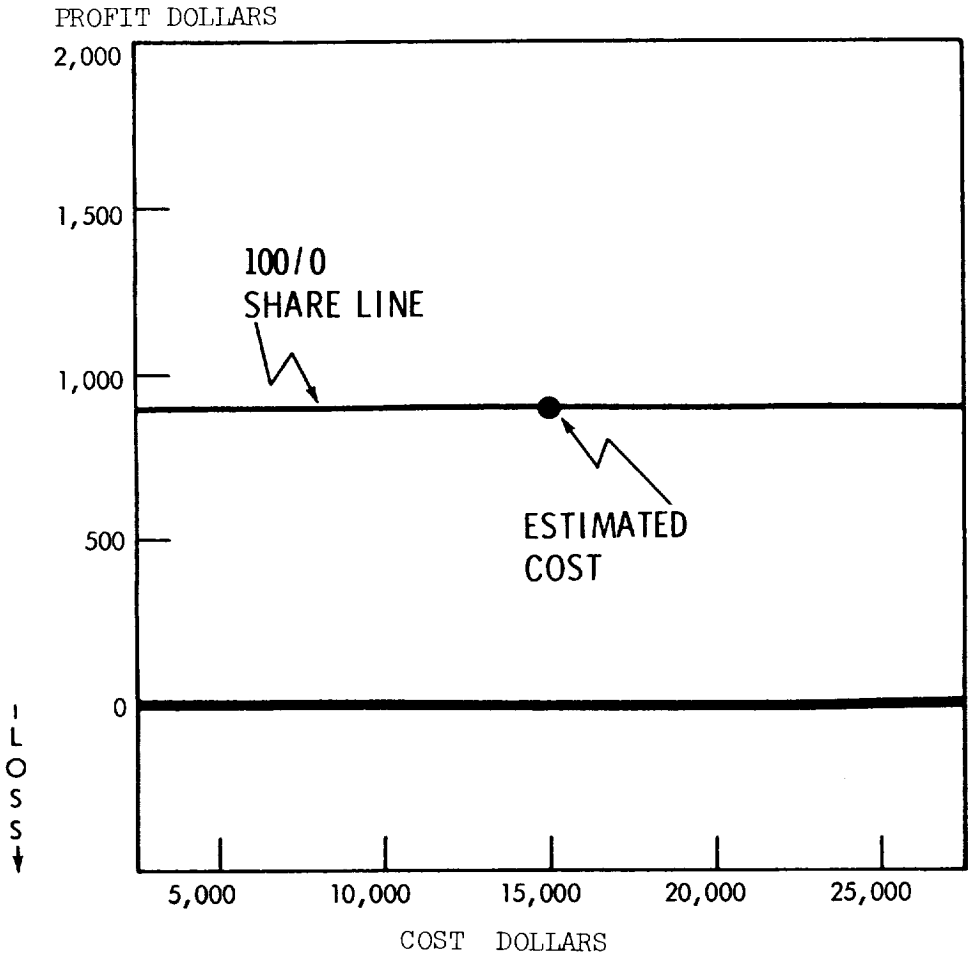
Cost-Plus-a-Fixed-Fee (CPFF). This contract type is designed chiefly for use in research or exploratory development when the level of contractor effort required is unknown. It also is intended for use in advanced development when the nature of the work requires it. Generally, dollars involved are significant, work specifications cannot be defined precisely and the uncertainties of performance are so great that a firm price or an incentive arrangement cannot be set up at any time during the life of the contract. The Government agrees to reimburse the contractor for all allowable and allocable costs incurred in performance of the contract. In addition, the Government agrees to pay the contractor a fixed number of dollars above the cost as fee (profit) for doing the work. Allowability of costs is governed by ASPR Section XV and the specific terms of the contract. The fee dollars change only when the scope of work required by the contract changes. In practice, this contract is at the opposite end of the spectrum from the FFP contract where price is fixed and a dollar of cost incurred by the contractor means a dollar less profit. If, in the terminology of incentive contracting, the firm fixed-price contract is defined as one having a 0/100 share, the CPFF contract type can be described as one with a 100/0 share. The contractor has minimum cost responsibility and, as a result, a minimum incentive to manage the work effectively and economically. The following is an example:

Estimated cost	$15,000,000
Fixed fee	900,000
Estimated cost plus fee	$15,900,000

Chart 2–VIII is a graphic presentation of the example.

CHART 2–VIII.—CPFF contract.

[Dollars—Add 000]



Assume that final costs are $12,000,000:

Final cost	$12,000,000
Fixed fee	900,000
Final cost plus fee	$12,900,000

Despite performance at a cost $3,000,000 less than estimated, the contractor receives the same fee fixed initially by the terms of the contract.

Assume final costs are $20,000,000:

Final cost	$20,000,000
Fixed fee	900,000
Final cost plus fee	$20,900,000

Despite performance at a cost of $5,000,000 greater than estimated, the contractor receives the same fee fixed initially by the terms of the contract.

The pattern illustrated in the two assumed situations is at once the reason for and the weakness of this contractual arrangement. Although conditions which make it necessary to use a CPFF contract do exist, extreme caution is required so that CPFF contracts will be limited to those situations where use of any other contract type would adversely affect the best interests of the parties. Obviously, it is wrong to think that existence of a CPFF contract in a contractor's plant is a signal for him to slow down and forget about costs. However, cost control measures do lose effectiveness when the extra emphasis of an incentive arrangement is missing. The reason is that meaningful incentives can make the cost of alternatives a significant factor in the routine of daily decision making within all levels of a contractor's management.

Time and Material Contract (T–M). This contract is a vehicle for buying time (at a fixed and specified hourly rate which includes direct labor, overheads and profit) and materials at cost.

The contract is designed to be used in those situations where the amount or duration of work cannot be predicted and where, as a result, the costs cannot be estimated realistically. These are the conditions under which we buy repair and overhaul services sometimes, situations where we cannot predict with confidence the condition of items to be repaired.

Although it may be necessary to use the contract from time to time, its use is not preferred. The T–M contract provides no incentive for the economical use of labor because the contractor's overhead absorption and his profits can be increased by the expenditure of additional hours of direct labor. The T–M contract also may be abused if the contractor uses lower graded labor than was anticipated and priced out in the hourly rate. This may benefit the contractor two ways. One is that it gives him a favorable differential in rates. The other depends on the presumption that the less skilled laborers will take more hours to do the job. These potential hazards make it necessary to administer the contract very closely, to see that the contractor exercises proper control and proper restraint.

Any material needed to perform the work required by the contract is to be acquired by the contractor. He will be reimbursed the costs of aquisition, plus certain other costs. Allowable costs of direct materials shall be determined in accordance with ASPR Section XV, Part 2. Reasonable and allocable material handling costs may be included in the charge for material at cost if they clearly are excluded from the hourly rate. Subcontract costs limited to the amounts actually needed to be paid to the subcontractor will be reimbursed, but no costs arising from the letting, administration or supervision of subcontract performance will be included beyond those included in overhead covered by the hourly rate.

The reasoning behind limiting payment to material at cost, without provision for profit or fee, is this. First, profit for the contract is provided in the hourly rate. Second, because it is not possible to estimate in advance the kinds, quantities and value of materials which may be required during performance, there is no way to provide for inclusion of a reasonable profit in the material charge without violating the prohibition against cost-plus-a-percentage-of-cost contracting. Third, when the T–M contract is used to buy maintenance and

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overhaul, we usually want the contractor to repair rather than replace, to the extent this is economical, and absence of a provision for profit makes replacement a less attractive alternative.

Labor-Hour Contract (L–H). This contract is the same as a T–M except that materials are not supplied by the contractor.

KEY FACTORS IN CONTRACT TYPE USAGE. The five key factors determining contract type selection are the incentive approach, the uncertainties of contract performance, the environment, the company's accounting system and the negotiation.

The Incentive Approach. Contracting and pricing policies are based on the assumption that the type of contract used influences the contractor's performance. The incentive approach is to negotiate a price and contract type which will motivate the company to control costs. This is based in turn on recognition that the company's managers are the only ones who can instill and effect real control over cost. The company cannot be policed into cost consciousness; Government review and administration cannot supply the constant vigilance and continued management attention that are prerequisites to effective control of labor, material and overhead costs. When the products or services being procured are such that we are unable to rely on the forces of competition to keep performance costs down, we must exert every effort to negotiate contractual arrangements which substitute effectively for the forces of competition. For this reason, your aim should be to negotiate contracts under which the profit a contractor earns will vary inversely with the costs of performance. This is, of course, an essential attribute of firm fixed-price and incentive arrangements.

The objective of the incentive approach is to establish a contractual climate in which the many decisions and actions required every day on every level of company management are likely to be based on *acceptable* alternatives that will result in the lowest ultimate cost. Policy should and does emphasize the positive aspects of the incentive approach, the opportunity for a contractor to earn increased profits through positive acts of management. However, the negative aspect may be just as strong in influencing a contractor's decisions. If the consequence of failure to control costs is a reduction in profit, this possibility will motivate some managers at least as effectively as will the chance to earn more profit.

While this discussion of the incentive approach has centered on cost control and the desire to buy at fair and reasonable prices, there are other situations where including a special incentive provision is a means of attaining other important objectives. These objectives may be a better performing system, more reliable product, earliest possible delivery or maximum value through the application of value engineering techniques. Such special incentive provisions are discussed in the DOD and NASA Guide-Incentive Contracting (1969).

Uncertainties in Performance. One Government objective is to provide the contractor with whatever degree of cost responsibility and incentive is consistent with the circumstances. This implies an analysis of the procurement situation and an assessment of the uncertainties of contract performance and their possible impact on cost.

The negotiated price must be based on, and justified by, all available and current cost or pricing data submitted by the offeror. It must be based on an educated and intelligent interpretation of present facts and must represent realistic judgment. Nevertheless, it still is a guess, or more formally, a conclusion as to what should happen during a future performance period.

Thus, in varying degrees depending on the procurement situation and the skills of the negotiators, there may be uncertainties with regard to the estimating assumptions made. Some of the factors that may contribute to such uncertainty are: extent of effective price competition obtained; availability of historical cost and performance information on like or similar work; clarity and detail of the work statement or specifications; likelihood of substantial increase or decrease from the plant volume forecast at the time of negotiations; likelihood of program or design changes occurring subsequent to negotiations that will not require contractual changes or repricing; and the likelihood that anticipated test or production problems will fail to materialize, or that unanticipated problems will materialize.

When evaluating the uncertainties present, you may find that they are closely related to the areas frequently spelled out for consideration in negotiating contract type. These are type and complexity of the item, stability of design, the period of contract performance and length of production run.

Because complexity is relative, it must be evaluated in terms of the extent of change from earlier models of the same or similar product. It requires an analysis of differences. Complexity also may be measured by the number and type of operations required in manufacture or, if developmental, the number and kind of scientific disciplines that must be used to develop the desired answer or prototype. Generally speaking, the greater the number of manufacturing and scientific skills required, the more complex the job is and the greater the cost uncertainties involved in performance will be.

Similarly, there is a relationship between the stability of design and the degree of performance uncertainty. Without reasonably stable design, specifications may not be firm enough to indicate clearly the scope of effort desired, and the resulting inability to write a clear, precise statement of work makes it highly unlikely that responses to a multi-source solicitation will have a degree of comparability high enough to permit award solely on the basis of price competition. Without reasonably stable design, comparative price analysis is extremely difficult and the amount, reliability and relevance of available cost data and prior production experience is reduced. Stated positively, reasonably stable design permits the establishment of adequate specifications which in turn, depending to some degree upon the type and complexity of the product, makes adequate price competition possible or lends validity to any prior cost and production information.

Obviously, the longer the prospective period covered by the estimate, the greater are the number of variables injected into the procurement situation. For example, a long span between award and first delivery may mean a high degree of design, tooling and prototype engineering and testing. As another example, projection of a long time span between the first and last direct labor hour to be expended on a per unit basis may indicate a high proportion of production engineering and a corresponding high degree of complexity. Even

when an item has been made in quantity before, a change in production rate or an extension or compression of the prior time span may alter the usefulness of experienced cost data.

Existence of performance uncertainties does not, in itself, preclude negotiation of a contractual arrangement that imposes significant cost responsibility upon a contractor. What is important is the ability to analyze and agree upon what the uncertainties are, the likelihood of their happening during performance and the possible impact on costs if they do occur.

For example, a "contingency" in an estimate does not mean that use of a firm fixed-price type contract is out. Neither does it mean that an incentive arrangement is beyond consideration. Instead, it must be remembered that any estimate is a projection of what costs should (or might) be, and the difference between a realistic estimate and a contingency is one of degree, and not that one is good and the other bad.

Rather than talk blithely about contingencies, we should think instead in terms of unsupported or poor estimates. If an event is possible and experience supports the probability of its occurrence, it may be suitable for inclusion in the estimate. When used, however, it may be proper to question the magnitude of the event if it should occur or there can be a difference of opinion as to its likelihood. If based upon factual interpretation, either point of view could cause the estimate to be revised. Thus, negotiation of a FFP contract at a realistic level may be both possible and appropriate if the uncertainties are identified and evaluation of available support information leads to a consensus as to the possible cost impact and likelihood of ocurrence.

We've talked about the subjective nature of evaluating uncertainties and said that it is all a matter of degree. A flat percentage factor, referred to as a plug, a cushion or as water, does not deserve serious consideration. However, a percentage used to project a price factor may be acceptable if there is a reasonable basis supporting its use. The learning curve exemplifies this. It is based on an assumption of what is likely to occur, but there obviously can be no positive assurance that actual events will follow the projected improvement curve in either slope or magnitude.

Accordingly, in the final analysis, ability to analyze and evaluate performance and cost uncertainties and to negotiate a contractual arrangement that provides for significant contractor cost responsibility depends on the adequacy of available supporting information. In turn, decision as to adequacy depends to a large extent upon the experience, skill and attitude of the negotiator.

As a program progresses from research through successive stages until design maturity is reached, increasing amounts and kinds of supporting data become available. There generally is a direct relationship between the stage in this progression, the degree of uncertainty involved in contract performance, the availability and adequacy of support data and the type of contract most suited to the procurement.

In the earliest stages of research and exploratory development, there is little meaningful data available, except to the extent that ratios and similar statistical tools have been developed from study of earlier research or study programs. Here, use of a CPFF or cost contract may be necessary if the magni-

tude of performance uncertainties or the likelihood of their occurrence cannot be measured. However, once the development stage calling for fabrication and testing of protypes has been reached, definitive data tied to the particular program begin to enter the system. Effective use also can be made of statistical data from other, earlier programs. If the contract definition phase is part of the process, additional data becomes available. It often is reasonable to ask the contractor to assume what frequently can amount to a significant degree of cost responsibility. Use of the CPFF contract still may be warranted in certain advanced development procurements, but by this stage, use of CPIF, FPIS and even FPIF may become realistic alternatives. As the production stage is entered, cost experience on representative lots of completed items or specific parts making up the end item, becomes available and use of a FPI or FFP contract generally is feasible. And finally, when the design has become reasonably stable, negotiation of a FFP contract may be considered the only practical alternative. How soon these events occur will depend to some degree on complexity of the product and dollar value of the procurement.

Of course, there may be many variables in actual procurement situations, and in some programs the latter stages discussed may never be reached due to changes in requirements resulting from technological breakthroughs and advances. The important thing to remember, however, is that with the passage of time and movement from one procurement stage to another, the experience of the contractor and the Government increases and the complexity of the problems, the difficulty in analyzing and evaluating performance uncertainties, decreases.

Contract Environment. In selecting contract type or, if an incentive contract, sharing arrangement, you should have a complete understanding of the physical and contractural environment in which the work will be done. Factors outside of the contract may exert a profound influence on management decisions which in turn will influence the progress of the work. For instance, in one situation, an 85/15 share may give meaningful incentive to control costs but, in other circumstances, even a 50/50 share might fail to attract management attention to the contract.

Another facet of the environment factor is that there is no magic, no special virtue inherent in a given contract type. A FFP which is worth $50,000 and calls for 10 months of effort probably will get no special management attention in a company with monthly billings averaging $2 million. Any benefits accruing to that one contract would reflect instead the basic quality of management and the normal effectiveness of the company's operations. Where the company typically has a great number of relatively small dollar contracts open at any one time, any incentive to control and reduce costs will come from the type of contract which predominates, with dollars as the measure.

To be completely realistic, remember that we are trying to influence management decisions. To do this successfully, we must be able to view situations through their eyes in order to evaluate the relative strengths of different contractual forces which might influence them.

Accounting System. Before reaching agreement on price and contract type, determine that the contractor's accounting system is suitable for the specific type of contract you wish to negotiate and that it will permit timely development of

necessary cost data in the form required by the contract. This may be particularly critical when the clause requires revision of price while performance is in progress, as under the FPIS and prospective FPR contracts. It may help to specify, in contracts requiring such interim revision, that the contractor will release items to production in such a way as to coincide with the quantity or time break specified as the effective point of price revision. Another instance where the contractor's accounting system may be a critical factor in contract type usage is where is it desired to place a cost-reimbursement or incentive type contract and all previous experience with the contractor has been on a firm fixed-price basis. Whenever any doubt exists as to compatibility of the contractor's accounting system with the type of contract to be negotiated, consult with the contract auditor.

Negotiation. There are two principles, each briefly stated. One is that price and contract type should not be agreed to if other terms and conditions of the contract remain open. The other is that selection of contract type, like the work statement and all other terms and conditions, requires a bilateral agreement between Government and contractor. It must represent the best judgment of both contracting parties concerning the contractual arrangement most likely to result in maximum effective performance.

PRICE CEILINGS. Fixed-price incentive and redetermination contracts specify ceiling amounts which are the upper limits to any adjustment in price by reason of the working of the provisions of those pricing clauses. The best way to set a ceiling is to look at one as the sum of the maximum amount of dollars you, as the negotiator, would be willing to pay and the profit you would consider reasonable at that cost level.

To illustrate:

	Company proposal	Government analysis	
		Likely	*Possible*
Total cost	$135, 000	$115, 000	$130, 000
Profit	20, 250	12, 500	7, 500
Price	$155, 250	$127, 500	$137, 500

In this situation, your negotiation objective for a target probably would be the amount it "likely" would cost, plus profit consistent with that result. Your ceiling objective would be the lowest figure above target you can negotiate and no higher than the $137,500.

GRAPHICS. This chapter has been devoted to the question of how to select the type of contract most appropriate to the procurement situation. This selection is an important decision. Pictures have been drawn to depict the actual meanings of given contract types and these pictures are called cost/profit charts. The construction of cost/profit charts, and the analysis of the charts when constructed, will be the subjects discussed during the remainder of this chapter.

We already have said that the choice of contract type depends in significant measure on the ability to predict the cost of contract performance and pointed out that the actual cost incurred in the performance cannot be expected

to turn out exactly as predicted at the outset. This presents the problem of dealing with variations from predicted costs. These variations usually are spoken of as underruns and overruns and we will use those trems, even though they are not precise.

In the case of a 0/100 FFP contract, an overrun or underrun of cost does not change the price to the Government. With the 100/0 CPFF contract, the price changes by the amount of the cost overrun or underrun. If a different sharing arrangement is used, the price changes according to the proportions of the sharing arrangement. To the Government, the risk is how much will the price increase if the predicted cost is exceeded; to the contractor, the risk is how much will the profit decrease in the same circumstances.

At the same time, incentives may be introduced to encourage a final, actual cost lower than the level predicted. In this environment, the question to the Government is how much will price be reduced by an underrun from predicted cost; to the contractor, the question is how much will profit be increased if actual costs are less than predicted. Every negotiation requires an analysis so that an arrangement fitting the situation can be devised and negotiated. An analytical tool is needed to accomplish this objective.

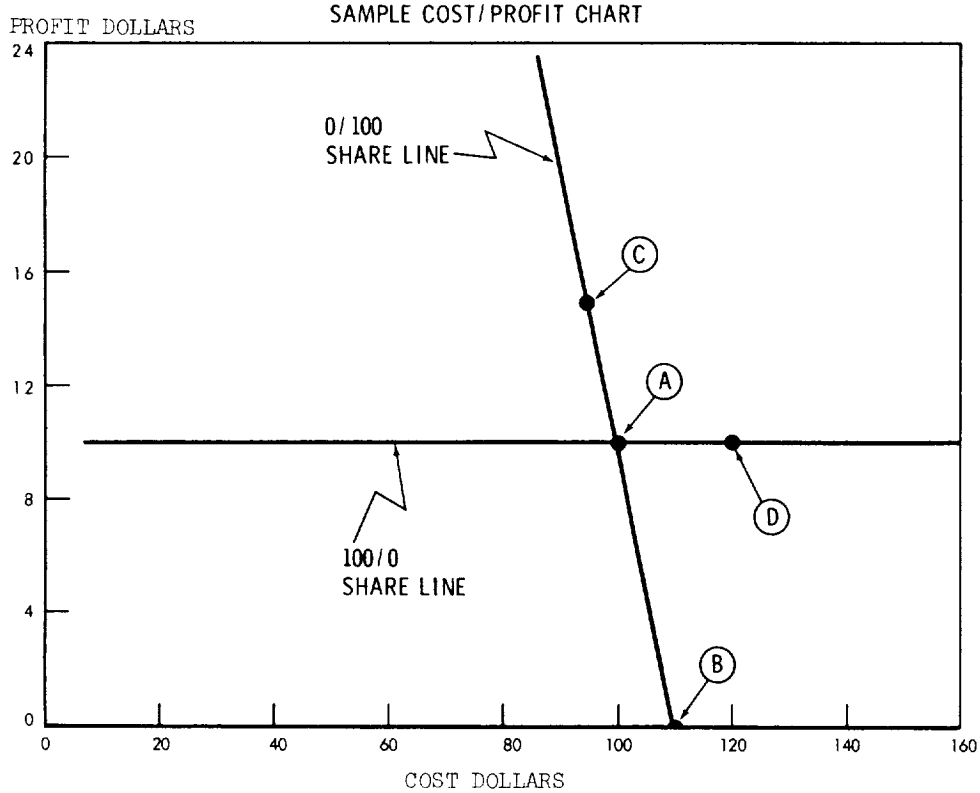
The cost/profit chart is a convenient tool. It is useful in interpreting either initial or subsequent price proposals and in measuring the effect of variations from the cost components of the price. The technique requires a minimum amount of time and permits a more complete and comprehensive proposal analysis.

Cost/profit chart analysis requires arithmetic graph paper, a pair of triangles (or a triangle and a straight edge) and a sharp pencil. The objective is to analyze a proposed price which is the sum of cost and profit dollars. Graph paper lends itself to two dimension analysis; there are two directions or axes to which values can be assigned and which can be designated as representative of factors that are being considered. In this analysis, lay the graph paper so that the longer edge becomes the horizontal axis and the shorter edge becomes the vertical axis.

Draw a straight line in each of two directions parallel to the edge of the graph paper. Leave a border of approximately an inch, as illustrated in chart 2–IX. Label the horizontal axis "COST DOLLARS" and the vertical axis "PROFIT DOLLARS."

Chart 2 - IX

SAMPLE COST/PROFIT CHART



A ratio of 5 to 1 (horizontal to vertical) is convenient for the analysis. That is, if each space on the horizontal axis is equivalent to 5 units or dollars, each space on the vertical axis will be equal to 1 unit or dollar. To label, start at the intersection of the two lines drawn on the graph paper (lower left corner). Label this point O. Using the 5 to 1 ratio to establish and label points on both axes, there is a total range of cost dollars from 0 to 160 and profit dollars from 0 to 24.

The chart now is ready for use. As an example, take a price proposal of $110 which is the sum of $100 cost and $10 profit. This price can be plotted as the point on the chart where imaginary lines drawn vertically from the $100 cost and horizontally from $10 profit intersect (point A, chart 2–IX).

There is one other element in addition to cost and profit dollars which, stated or implied, is common to all contracts. This is the arrangement for sharing any difference between the cost estimated and the cost experienced. For example, if the sharing arrangement gives the buyer a 0 share of any difference between the estimated and actual costs, the contract is called firm fixed-price and the sharing arrangement is described as 0/100, 0 to the Government and 100 to the contractor.

Once the sharing arrangment is known, additional price points can be plotted on the cost/profit chart. By adding a 0/100 share to the example of $100 cost and $10 profit, it becomes apparent that with an actual cost of $110, the seller will have a 0 profit. This is plotted as point B, chart 2–IX. Extending a straight line through and beyond points A and B gives us a picture of a FFP contract. This line is not perpendicular to the horizontal axis. A moment's reflection will confirm that it should not be; any variance from the intial estimate of cost has to be portrayed by a movement from 100 on the horizontal axis. This variance is absorbed by the seller and in effect adds to or subtracts from his initially estimated profit.

To complete this test of the graphical representation, assume any variance in cost. Assuming final costs are $5 less than estimated, move horizontally to the value of $95 (100—5) and then vertically until the diagonal line is intersected. Profit, at this point, is $15 (point C, chart 2–IX). This same answer is derived arithmetically; the underrun of $5 is retained by the seller and becomes an addition to his anticipated profit.

A change in the sharing arrangement to 100/0 will change the contract so that the buyer absorbs completely any variance in the cost. This is the cost-plus-fixed-fee contract. The difference, expressed graphically, is that the line drawn on the chart becomes horizontal through a single profit dollar value. For example, use the initial values of the previous illustration where cost equals $100 and profit, $10 (point A, chart 2–IX). A second point for plotting can be located by assuming a difference between estimated and actual cost. Again, movement is made along the horizontal axis to the final cost value. If there is an overrun of $20 in cost, the final cost totals $120. The profit (fee) remains at $10. Therefore, move laterally on the horizontal axis to the value of $120 and then vertically to the value of $10 designated by point D, chart 2–IX. By extending a line through and beyond points A and D, the CPFF contract is depicted by a straight line horizontal through the profit value of $10.

Various cost sharing arrangements other than 0/100 or 100/0 can be agreed upon by the parties. Because the plotting techniques would be the same for all such sharing arrangements, a 70/30 will be the only one illustrated. In a 70/30 share, the buyer absorbs 70% of any variance between estimated and actual cost; the seller absorbs 30%. If the same initial cost of $100 and profit of $10 is used, point A, chart 2–X, is representative of the price. A second point is located using the procedure described earlier. If there is an underrun in costs such that the actual cost is $80, the difference of $20 is shared 70/30; the seller's share is $6. Because this is an underrun, the $6 becomes a positive increment that is added to the initial $10 profit. To plot the second point for the 70/30 share, move horizontally to a cost value of $80, then vertically to a profit value of $16 (point B, chart 2–X). A straight line through and beyond these points A and B portrays graphically the effect of a variance from target cost for all cost values falling within the scale of values designated on the horizontal axis. This is substantiated by using a third cost value, $120, reading the profit dollars associated with this cost ($4 as determined by moving vertically from $120 to the intersection with the 70/30 share line) and checking this figure arithmetically. An overrun of $20 in cost, using this procedure, will compute to be a cost of $120, a profit of $4 and, when these are totaled, a price of $124.

The price can be determined readily using any of the sharing arrangements by adding the cost and profit dollars indicated vertically and horizontally from any point on the share line. When used this way, the share line becomes the price line.

Other elements also are charted. The CPIF contract has floor (minimum) and ceiling (maximum) levels beyond which fee cannot be adjusted by the functioning of the incentive share. Chart 2–VI pictured a CPIF with an 85/15 share which becomes 100/0 when the floor or ceiling is reached. To chart minimum and maximum, draw lines parallel to the horizontal axis through the dollar values designated as floor and ceiling. The relevant price line follows horizontally along the profit ceiling line until it intersects the incentive share line, then along the share line to the intersection with the profit floor line. The relevant price line continues to follow the profit floor line to ever increasing cost values.

FPI contracts must have price ceilings. A price ceiling limits the total dollar outlay under the contract to some combination of cost and profit dollars determined at the outset. In chart 2–X, target cost is shown as $100 and ceiling price as $125 (point D). The 70/30 share line changes abruptly at point C to a 0/100, FFP line. This new slope is called the ceiling price effect line and the point at which it takes effect is called the breakpoint. This is the point where the combination of costs incurred plus the profit dollars determined by application of the contract share arrangement would result in a total which equals exactly the ceiling price. It is the point beyond which the combination of actual cost plus incentive profit would exceed the price ceiling. Because, by definition, we cannot pay more than the ceiling, something's got to give and that something is the contract incentive share arrangement.

The breakpoint can be computed in the following manner:

$$\text{Breakpoint} = \text{Target cost plus } \frac{(\text{Ceiling price}) - (\text{Target price})}{100\% - (\text{Contractor's percentage share in overrun})}$$

Using the example of $100 cost, $125 ceiling and so forth plotted on chart 2–X, the equation looks like this:

$$\begin{aligned} \text{Breakpoint} &= \$100 \text{ plus } \frac{\$125 - \$110}{100\% - 30\%} \\ &= \$100 \text{ plus } \frac{\$15}{.70} \\ &= \$121.4 \end{aligned}$$

Point C is the breakpoint with the value of $121.4 for cost and $3.6 for profit.

Another feature which may be included is one we call a convenience factor. This would be the preparation of printed charts with predetermined, set scales for horizontal and vertical axes and with printed lines which indicate the percentage of profit. A line showing profit dollars as a percent of cost dollars can

be constructed by starting at the lower left corner and extending through a combination of points such that the profit dollars indicated are a given percent of the corresponding cost dollars. This has been done on chart 2–X. At a cost of $100, a 10% profit is $10. If a line is extended from the lower left corner through the point indicated by $100 cost and $10 profit, all profit values read from this line will equal 10% of the corresponding cost dollars. Construction of other percentage lines in the same fashion permits easy, convenient determination of percentage values of alternative contractual arrangements. This can prove handy during analysis and negotiation, handy but not necessary. Thus, the use of the term "convenience."

The usefulness of cost/profit chart analysis does not stem from nor depend on the exactness of the values read from the chart. Its value comes from the complete and ready interpretation of the impact of cost variations which it permits. In addition, the dependent relationship of all elements of a contractual arrangement is portrayed in a fashion which provides the user a means of interpreting the realism of each of the elements. To be meaningful, the elements of a contract must be attainable. Because of this, a contractual arrangement which meets all the requirements and conditions of ASPR still may be a bad contract. For example, a final profit equal to 15% of target might seem fair and reasonable to both parties. If, however, realization of the 15% required performance at a cost 50% less than estimated and targeted, it could not be considered meaningful or attainable.

COST-PLUS-AWARD-FEE CONTRACTS (CPAF). This is the latest contract type authorized by ASPR. It is a cost-reimbursement type contract that is designed to provide incentive in a procurement situation that otherwise would require straight CPFF coverage. The CPAF contract says that the Government agrees to reimburse all allowable costs allocable to the effort and reasonable in amount. The contractor is to be paid a fixed amount of fee for the work and also may earn an additional amount of award fee. The added amount will be decided by subjective evaluation by the Government and this decision is not subject to the disputes clause of the contract. To insure objectivity in making his decision, the contracting officer should consider getting the evaluations and recommendations of a seperate, independent board.

CHAPTER II

INCENTIVE CONTRACT NEGOTIATION

A. WORK STATEMENT

The subject of negotiating a fair and reasonable price in accordance with the performance requirements of the work statement is covered in the ASPR Manual for Contract Pricing. The Incentive Contracting Guide will only emphasize the importance of the work statement as a base line for the contract structure. The effective operation of multiple incentives and cost incentives which include minimum acceptable performance levels depends more heavily on the definition and understanding of the work statement than on any other factor.

B. INCENTIVES IN PREAWARD ACTIONS

Since an incentive contract is defined as something that influences to action, the contracting officer must be concerned that the course of action will be in consonance with the over-all goals. He must also be concerned that the contracting actions to be taken will not eventually impede the attainment of the technical objectives.

While consideration of incentives has involved fixed-price-incentive, cost-plus-incentive-fee, and, recently, cost-plus-award-fee type contracts, there are infinite varieties of contract structures to be proposed and evaluated in the preaward phases of procurement. The matching of the contract structure as well as the contract type with the character of the work should be an evolving task. The evaluation of several factors following the development of the work statement and RFP may disclose that initial procurement plans for incentive contracting are not appropriate.

The effectiveness of incentives depends first on the definition of the product and its uncertainties. Thus, a major key to incentives lies in the preaward actions.

C. ADVANCE PLANNING

One of the major benefits obtained from incentive contracting has been the improved definition which has resulted from the incentive disciplines. Greater initial effort in the forward planning stage is more than compensated in the long run. The forward planning work should represent the agreed choice of the project, technical, contracting, and supporting personnel involved. Problems which have been experienced throughout the acquisition and administration processes have often been traceable to the language, approach, terminology, and content of work

statements, solicitations, and evaluation plans. Valuable time and extra effort on the part of both the Government and the contractors can be saved in the proposal, source selection, and negotiation processes if the initial baseline and objectives are communicated in the solicitation.

The planning may be modified after its initial use in Request for Proposals or during fact finding and negotiation. The planning effort will identify and quantify to a certain extent the uncertainties. Certain alternatives which appear promising at the start will be discarded in the process and new alternatives will be generated.

It takes a little longer to develop a simple procurement plan, but ambiguity, complexity, and disputes can be avoided in later phases if a small amount of extra effort is used early to determine and justify the best choice among alternative approaches. Preliminary choices of courses of action or contract type may be drastically changed during the preaward phases because no one contract type or course of action is always suitable to serve all tasks in a program. The continuing evaluation at various points in time will assure that all prerequisites have been considered when the choice of contract type is finally made.

Preaward evaluation and planning is required the same as price analysis in connection with every procurement action involving the selection of a contract type. A thorough evaluation may in the first place avoid the misapplication of incentives. The extent of the preplanning and evaluation will, of course, depend on the dollar value, complexity, and length of the prospective period of the effort to be procured. The dollar value of the proposed procurement action will be the primary criterion for determining how much detail is required in the preplanning actions; however, the relationship of a smaller procurement action with the major systems and program contracts or with the predominant pattern of contracts with a particular contractor also should be considered.

D. REQUEST FOR PROPOSALS

The Request for Proposals which contemplate the negotiation of an incentive contract should not be issued until preliminary exploration and studies have indicated a high degree of probability that the development or production effort is feasible and minimum requirements for performance and schedule objectives have been determined. The precision with which the performance goals can be determined and eventually measured will largely determine the type of contract contemplated.

The solicitation should describe the type of contract contemplated and should encourage -- where appropriate -- an alternate contract type to the one suggested. The proposed contracting process, especially for research and development, should remain as flexible as required for good procurement, but the process certainly should not result in an RFP

requesting proposals on different types of possible contracts ranging from CPFF through incentives to fixed price. This latter example points up the need for careful advance planning and informed decision making prior to the issuance of the RFP.

The RFP should not be an instrument which unilaterally establishes the contract type. Both the ASPR and the NASAPR provide that the type of contract to be used will be chosen finally as a result of negotiation between the Government and the contractor. 1/ The selection of an appropriate contract type and the negotiation of prices and all associated incentive factors are closely related.

In development contracts, the solicitation should describe the Government's minimum requirements, the performance goals, and the type of contract which is contemplated. Solicitations of quotations should specify a preferred contract type, together with an indication of the criteria and measurable performance goals to be incentivized and their relative importance. The contractors should be encouraged to submit alternative incentive plans together with supporting rationale for the alternative plans or contract type. The RFP should clearly indicate that the final selection of contract type will be based on negotiation and the logic of the individual situation.

E. ESTIMATES AND OBJECTIVES

Effective use of statistical data and test results from other, earlier programs can be used in developing independent estimates and performance goals for the proposed incentive contracting action. While the nature of the pricing arrangements on the other work may be important in the consideration of the contract type to be selected, the proposed procurement may represent "downstream" or follow-on work and may consequently represent reduced risk. The incentive discipline which requires precision in development of measurable performance goals will produce increased reliability in the independent estimate, and will finally result in an improved pricing action.

An early preaward phase of the procurement process is the best time to estimate the predictable cost difference between various performance levels. This is also the best time to be able to use all of the available project office technical skills in developing a value statement covering the value of the performance which may be incentivized above the performance goals.

The baseline for the evaluation of proposals and for negotiation may be the independent price estimate prepared in the preaward period. The depth of the estimating, of course, will depend on the value and complexity of the proposed incentive contract. A large multiple incentive

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1/ ASPR 3-403(a), January 1, 1969
NASAPR 3.403.

contracting action will probably be estimated in accordance with the work breakdown structure and will include detailed estimates of several work packages.

The extent of the analysis performed in developing an independent estimate will depend on the availability of technical and estimating capability and the availability of data and a cost basis for estimating. Work performed at this time will reduce the time in fact finding and negotiation, and this effort may be the difference between the critical time requirement for a letter contract and the time available to negotiate a definitive contract.

In the systems development contracts, this preaward period will also involve the cost/effectiveness studies which determine and justify the best choice among alternatives to each of the performance incentive parameters. This will be the time when first decisions are made concerning the choices of selecting interim goals or assigning predominant incentive rewards to final mission performance. These studies will provide technical and cost considerations in each possible approach. This analysis should produce a rationale for the selection of the range of incentive effectiveness.

Other important areas for analysis at this stage will include the degree of configuration management to be employed and consideration of the extent of technical direction which may be required. These subjects will also have an impact on the final selection of contract type. Finally, this is also the time for the contracting officer to coordinate the objectives with the lawyer to assure the compatibility of the incentive plan with the contractor's legal obligation under the contract work statement and required specifications.

F. PROPOSAL ANALYSIS

The first and easiest step in proposal analysis involves comparison with an independent estimate or comparative analysis with other proposals. If responsiveness to the request for proposals is indicated, price and cost analysis of the target costs will be accomplished in accordance with approved techniques and procedures. Incentive proposal analysis, however, involves consideration of other interrelated factors such as the range of incentive effectiveness, sharing formulas, and the risk imposed by performance incentives. The FPI proposal analysis will be especially concerned with the price ceiling and the point at which the cost range is converted into a 0/100 share line (PTA).

The analysis of multiple incentive proposals will be much more complex because the value of performance and the predictable cost difference between various performance levels will be introduced.

Cost-profit analysis is the most convenient tool for initial comparisons of proposals. The Program Office for Evaluation and Structuring of Multiple Incentive Contracts (POESMIC) (see Chapter IV) can provide this capability also.

Cost analysis of the proposal can be performed concurrently with the technical analysis for purposes of initial evaluations; however, the results of the technical appraisals must be used to match the stability of the design and the degree of performance uncertainty with the range of cost incentive effectiveness.

There is no universal rating plan for comparative analysis when incentives are involved, and the ranking in the comparative analysis can be only a preliminary indicator for source selection.

Extracontractual influences should be considered during the proposal analysis and prior to the negotiation. An analysis of extracontractual influences may be particularly important as a basis for determining the selection of performance and schedule incentives, if they appear to be appropriate. The analysis at this time may help support the issue concerning whether the performance or cost control will occur because of the incentive, or whether it would have occurred anyway, under any type of contract. An example of an extracontractual influence might relate to schedule if the proposed contractor values prestige and has a reputation for "on time" schedule, an additional incentive for schedule would be wasted. Extracontractual influences also affect decisions concerning magnitudes of the incentive rewards or incentive penalties imposed by the share lines or by performance incentive formulas. There would be a meaningless distinction between a $25,000 performance incentive reward and a $50,000 performance incentive reward in a situation where the contractor's performance standards are already in the top level of a competitive industry and where the single contract might represent a small proportion of the contractor's annual sales.

The extracontractual influences which assist in recruitment and retention of key personnel, the attraction of new business, or the assistance to enter or become stronger in a new field are additional considerations. The "personality" of an organization and the desires for social approval are also theoretical influences. The analyst must finally consider the capacity of the contractor and the rate of "production" or utilization of resources compared with capacity. In short, the proposal analysis which considers extracontractual influences will ask if the performance or cost control will occur because of the incentive or will occur anyway. There may be certain instances when this part of the analysis will show that there are strong influences to motivate the contractor toward a cost over target.

Many of the points to be considered in the proposal analysis will already have been evaluated a number of times (during the development of an RFP, independent estimate, and possibly cost effectiveness studies), and will be evaluated again in fact finding and negotiation. The extent of this re-evaluation depends, of course, on the size of the procurement, but it is conceivable that certain issues will be realigned a number of times during the procurement process. This is a "fail-safe" process and may assist the negotiator to avoid an inappropriate incentive.

The ASPR and NASAPR contain instructions concerning the evaluation of proposals from the standpoint of a basis for selection of sources. The purpose for this separate coverage is to review the interrelationships of several factors which may affect the selection of the incentive structure which is best suited to meet the objectives of the Government.

Experience has demonstrated that most multiple incentive contract proposals will have unique characteristics which bear on the evaluation process. These characteristics and the following subjects should be reviewed, considering the effect on the incentives:

(i) Special funding requirements, if not compatible with the probability of the Government funding plan, may significantly change the incentive structure in midstream.

(ii) Performance achievements must be measurable or the incentive will be ineffective or in dispute.

(iii) Multiple weighting plans (for weights to be assigned to each criterion which reflect proportionate importance) should be developed to evaluate the ranges of cost and performance as well as the target cost and performance goals.

(iv) Technical evaluations must be coordinated with pricing evaluations to determine most likely combinations of cost at various performance levels. This coordination of the analysis across the entire performance and cost ranges of incentive effectiveness will also provide an insight into the contractor's understanding of the requirements.

(v) The types of subcontracts contemplated may have a significant effect on the sharing rates considered for the prime contract.

(vi) Since cost targets or performance goals may be negotiated later at almost any point in the proposed ranges, the proposal evaluation should consider the various probabilities for increments of performance across the entire range.

(vii) In comparative analysis, careful attention should be paid to the estimated cost differences between minimum acceptable and higher performance levels. This is especially important if any proposals have taken exception to suggested performance parameters.

G. SELECTION OF CONTRACT TYPES IN R&D

While DoD and NASA policies and regulations provide contract selection guidance for major weapons systems and space systems, greater flexibility is permitted in selection of R&D contracts which are not subject to contract definition or phased project planning. Integral supporting components or equipment may be in various stages of research and development and not in accordance with the definition of the major system.

Technical direction may be influenced by the systems contractors. The contemplated degree of technical direction and its source also should have a bearing on the contract type. The ability to establish meaningful and measurable incentives in the preaward phase may not be compatible with systems interfaces or Government technical direction which is proposed by a lower tier project office.

The contemplated choice of contract type should be re-evaluated at every step in the preaward phase because the rationale may change significantly during the proposal evaluation or at any point between the RFP and the negotiation. The contractor's willingness to accept a high risk FPI contract should not be a primary criterion. Extracontractual influences may initially support the contractor's choice, but changing conditions may impact adversely on performance during the life of the contract. Values of performance between the minimum acceptable level and a nominal performance goal should be carefully evaluated at different cost points to assure that the Government's trade-off decisions in stating a preference for a contract type are in accordance with the preferred performance objective.

In research, exploratory development, and advanced development effort, the type of contract to be used may include award fee incentives; however, research, preliminary exploration, or study contracts should be CPFF instead of CPAF where the level-of-effort required is unknown or where the performance measurement does not lend itself to the subjective evaluations required by award fee contract. In Advanced Development effort, CPIF incentives may be appropriate when realistic cost ranges can be estimated; however, actions beyond the control of the contractor may cause high sharing rates to be inappropriate. In the first two categories in the spectrum, there are quite often no definitive or measurable goals which are not subject to significant change. The decision to even consider an incentive contract may force a better

definition and cost estimate which often leads to the proper conclusion that incentives are, in fact, inappropriate.

It was mentioned earlier that the contracting officer, in accordance with his concern about uncertainties and in accordance with departmental or agency instructions, should seek legal assistance to determine if the work statement in the RFP and the proposal clearly describes what the contractor and the Government are legally obligated to do. This obligation varies significantly in accordance with the type of incentive contract to be selected. The fixed-price type incentive in research and development shifts the technical risk of non-performance from the Government to the contractor, and this is clearly apart from the cost sharing arrangement. Under the straight cost-reimbursement CPIF contract, the contractor has minimal technical risk of non-performance. In most CPIF contracts, the contractor's obligation as set forth in the statement of work is to exercise "best efforts".

H. PRENEGOTIATION POSITION

The prenegotiation position should include as much of the contractual arrangement as possible and should not be limited to price. The establishment of the prenegotiation position and alternatives for various situations will be another step in defining the incentive contract. This step involves fact finding with the Government team prior to fact finding with the contractor; however, the official prenegotiation position may be established after fact finding with the contractor.

It is especially true in incentive contracting that the prenegotiation position should be a range of costs, a range of values, and a range of performance possibilities and probabilities. The objective should specify a point in the relatively firm ranges, recognizing that the point may change, even significantly, during negotiation. The trade-off alternatives will have considered the effectiveness values of a variety of negotiated situations and a variety of possible outcomes at the time of contract completion.

It must be remembered that fact finding is not a precise period of time or a discrete conference session prior to negotiation, but, in fact, is a continuing process from proposal analysis through completion of negotiations. When knowledge concerning facts is changed, the prenegotiation position changes, or the tentative negotiation offer changes.

Since so many of the variables in an incentive contract are interdependent, even in a cost-only incentive, the prenegotiation positions should include a proper preference order for the several alternatives. The preference order will represent the relative value of various incentive structures in consonance with the Government's primary objective. This is sometimes referred to as a "value statement" and is a prerequisite to the establishment of a profit/fee objective.

I. PREAWARD PROFIT OBJECTIVES

Decisions regarding what the costs should be at various performance levels and decisions regarding the confidence in the Government's prenegotiation position and the contractor's proposal will have preceded consideration of a profit objective. The development of profit objectives will deal with target, minimum, and maximum fee in CPIF and target profit and price ceilings in FPI contracts. The value statement which puts a price tag on various performance levels interrelated with various cost outcomes will provide a range of profit above and below the target profit points.

It is the policy of the Government that contractors shall have the opportunity to earn fair and reasonable profits or fees with due recognition of particular circumstances which influence profit in individual procurement actions. Both DoD and NASA want to fully exploit existing profit and incentive contracting policies which provide for equitable profit opportunities, giving due recognition to significant factors which influence earned profit in R&D procurement situations. Thus, the references to earned profit at various cost and performance positions are in relation to cost targets and performance goals. The incentive language has for many years included the terms "rewards or penalties".

The statutory limitations of 10 U. S. C. 2306(d) which apply to fixed fees under cost-plus-fixed-fee contracts do not apply to incentive contracts. Very wide fee pools for exceptional rewards in situations where truly exceptional performance is desired and attainable should be encouraged and permits fees above the normal 15 per cent fee level (10 per cent for supply contracts).

J. SPECIAL CLAUSES

Procurement management will continue to evaluate the need for the development of new or revised incentive contract clauses. The majority of incentive clauses have been adapted from the standard clauses prescribed for fixed-price and cost-reimbursement type contracts. Certain clauses and provisions have become standards as mandatory incentive clauses and are incorporated by reference or attachment in each contract or basic agreement; other incentive provisions are similarly incorporated only when applicable and agreed to by the parties for each individual contract.

Incentive contracting often requires use of special clauses to preserve equity in a particular situation and to provide a clear understanding of the rights and obligations of the parties in circumstances peculiar to this type of contracting. The approach, emphasis, interpretation, and degree of coverage of any special clause should be

carefully considered because of the possible effect of the clause in the administration phases of the contract. For example, appropriate special clauses may be necessary to avoid penalizing the contractor for incurring unavoidable costs beyond the contractor's power to control.

The following discussion will mention some areas where special clauses may or may not be appropriate, and the Guide will caution that the usage of certain inappropriate terms and words in the schedule of the contract may impact adversely on the operation of the standard clauses. There have been a few instances where definitions of certain incentive terms have not been familiar to both parties during administration. Terms or words which are not used Government-wide or industry-wide but which have common local usage where the contract is written may not be fully understood and may be applied differently during administration in another area. Even familiar words may have different meanings. Thus, the narrative of an incentive schedule and all special clauses should be reviewed and approved by Legal Counsel in accordance with Departmental or Agency procedures. "Usage cannot change a rule of law, but usage may so affect the meaning of a contract that a rule of law which would be applicable in the absence of the usage becomes inapplicable.[1/]

Special clauses may be appropriate and applicable for individual contracts. It is important to use terms in the contract schedule and in any special clauses that are consistent with the standard clauses and provisions. Some of these are:

(i) Failure of equipment which is not the responsibility of the contractor but which affects the ability of the contractor to demonstrate performance under incentive provisions. (Performance incentives should represent earned incentives.)

(ii) Systems responsibility and overriding incentives applied to mission objectives in the event of failure of GFE equipment.

(iii) Effect on incentives in the event that incremental funding allotments are less than agreed necessary for a certain level of efficiency.

(iv) Effect on incentives when there are waivers of tests or interim events which relate to incentive milestones.

(v) Overriding incentive applications which become operable upon the happening of certain unusual or unforeseen events such as catastrophic failures.

1/ Restatement of Contracts, § 339.

(vi) Partial terminations which do not effect total mission objectives but negate the possibility of demonstrating interim incentives and result in a reduced value statement for total mission success.

(vii) Subjective evaluations and disposition of incentives when data are insufficient to permit quantitative measurements of performance. (Contracting officer's determinations may or may not be subject to "Disputes" clause in certain circumstances, especially if failure to obtain or retrieve data is the responsibility of the contractor.)

(viii) Escalation provisions (increase or decrease) for specific significant elements of cost in long term contracts, and the method of excluding these increased costs for purposes of determining earned incentives.

(ix) Methods for effecting changes (e.g. any method which excludes adjustment of target).

(x) Method and timing of payment for earned performance incentives.

(xi) Predetermined and prenegotiated, alternate performance incentive arrangements which become operable upon the happening of certain specific events which may make the primary incentive inoperable, inappropriate, or inequitable.

Most special clauses or special arrangements in the schedule will be necessary because of technical uncertainties in reaching various performance levels rather than being based on any cost uncertainties. Full agreement on all contract terms and special clauses should be reached prior to or occur at the same time as agreement on price.

The negotiators should guard against the indiscriminate use of special clauses. In this connection it must be remembered that certain provisions often result in higher prices being proposed and negotiated to cover the additional risk from the special conditions. Special clauses, of course, need the careful review of legal counsel members of the supporting team because the clauses must contain no conflicting statements or requirements. It is most important to assure that special clauses are in accord with applicable DoD and NASA policies, or overriding policies that support national objectives, and the use of special clauses must be in accord with ASPR 1-108, 1-109, and NASAPR 1.108 and 1.109.

K. TRADE-OFFS IN NEGOTIATION

The ability to effectively use trade-offs depends on the adequacy and the understanding of the supporting information. At the conclusion of negotiation, the price negotiation memorandum should clearly tell the story about all trade-offs which are consummated.

The price negotiation memorandum should tell what was traded off and how it was traded off.

Most trade-offs during negotiation have involved profit and target cost positions; however, the major consideration should be trade-offs between cost and schedule. Naturally, minimum acceptable performance requirements, minimum acceptable schedules, and performance goals are not candidates for trading. Acceptable trading practices will involve concessions in various interdependencies to arrive at the most reasonable over-all price level in the area of highest probability. The focus should be on the over-all contract objective -- not just the price.

There is very little reason to use unrealistic maximum fee levels as trade-offs in CPIF negotiations when there is a very low probability that the extreme cost positions will be reached. If a negotiation is particularly difficult in a situation concerning a minimum fee level, it is not practical to raise a maximum fee level to resolve the issue. For example, in a $10 million CPIF procurement with a cost RIE between $8.5 million and $12.5 million, with a target fee objective of $800,000 and a maximum fee objective of $1.175 million, there might be a negotiation issue concerning the minimum fee rate. If the contractor was insisting on a minimum fee of $400,000 (4%) and the contracting officer was insisting on a minimum fee of $100,000 (1%), the issue could not be resolved by raising the maximum fee because of the low probability of ever achieving the maximum fee. In the first place, the issue has probably been raised because there is a strong probability that the actual cost will be above target cost. There still should be the strongest probability that the target cost position of $10 million will be attained. If there has been a tentative agreement on the profit value of performance at $10 million and this tentative value is $800,000 (8%), the issue may be resolved by examining the sharing rate for costs over the target cost. To reach the Government position of $100,000 (1%) at $12.5 million, the sharing rate is 72/28, while the contractor's sharing objective is 84/16 to the minimum fee level of $400,000. Apart from reaching a compromise between the $400,000 and $100,000 objectives, the contractor's sharing rate of 84/16 could be continued beyond the $10 million cost point to a position of $11.5 million, at which point the sharing rate could be increased to accommodate the minimum agreed upon. Another solution might be to extend the RIE beyond the $12.5 million point to a point that is still within

a probable range, if the minimum fee issue has developed the strong probability that $12.5 million is likely to be reached. At this point, the negotiators might question the basis for the initial determination that the RIE should be $8.5 million to $12.5 million. If the RIE is found to be appropriate, the issue then turns on the value of performance at $12.5 million. There is a difference in opinion between a price of $12.9 million ($12.5 plus $.4 million) and $12.6 million ($12.5 plus $.1 million).

Beyond the cost point of $12.5 million, the Government will be assuming responsibility for all costs (100% sharing); the contract will then be a CPFF contract with a fixed fee level of $400,000. This may be appropriate depending on the uncertainties of performance and the continuing risk for performance to be assumed by the contractor because plant and personnel resources will still be committed to the project if it is funded.

In this example, it is seen that the specific incentive arrangement agreed to must reflect the effect of risk and the total price value at all points on the RIE. A fee rate of 4% may or may not be excessive at the highest point on the RIE. There are no predetermined acceptable fee levels for minimum fee in the same manner that there are no predetermined fee rates for a target fee position. Naturally, the fee swing should be wide enough to permit the incentive to remain effective over the realistic, probable range, not the widest possible range. There is no single correct answer to the issue in this example. Depending on the circumstances, either a 4% or a 1% minimum fee rate may be appropriate and reasonable.

The trade-off in response to tight and loose cost targets and in response to the size of the range between minimum acceptable performance and the performance goals should generally be reflected solely by the target profit objective -- a negotiated target cost that is significantly higher than the objective should be accompanied by a low target profit objective and a tight target cost, as supported by cost data, should be accompanied by higher target profit objective.

The biggest trade-off that could be made would be the trade-off of contract type. There may be rare situations where an FPI contract could be traded off for a CPIF contract with continuing sharing of costs down to some limited negative fee position. The circumstances which might permit this trade-off will be extremely rare because of the basic differences in the FPI and CPIF contracts. Apart from the differences in determining costs under the fixed price and cost reimbursement type contracts, there are significant differences in legal obligations and responsibility for meeting performance and schedule requirements. Some audited costs are negotiated on a fixed price contract, and are audited and applied to the incentive formula as allowable costs on a CPIF contract. There may be an average 1.5% disparity in recovery of costs for unallowables.

Make-or-buy plans and proposed subcontracting plans, including types of subcontracts, should be evaluated before trade-off actions are made during negotiations. Certain subcontracts may effectively relieve the contractor of substantial cost risk, or the contractor's profit may be significantly increased because of cost or performance achievements by subcontractors who will not share in the incentives or who will not be motivated by flow-down provisions of the incentives. A target fee rate should not be increased simply to induce a prime contractor to accept a schedule "penalty" feature if the key component or subsystem is to be subcontracted on a fixed price or FPI basis with tight delivery requirements.

L. DOCUMENTATION

Documentation supporting the procurement action will probably be used extensively before the incentive contract is effective and it will probably be used until long after the contract is physically completed. It will also serve as the contractual base line during contract administration. While popular interest in contract documentation is directed primarily to the business aspects of the procurement, the documentation should be compatible also with the legal and technical interests of the Government.

Every significant personal judgment used to quantify an element in the incentive structure should be documented carefully. The reasons for selection of sharing rate objectives and the reasons for negotiation of sharing rates should be explained. This explanation, of course, will describe the confidence in target cost -- the relationship of the data supporting a cost position with the uncertainties of performance.

Rapid and easy reconstruction of the basis for the incentive structure will be required first during the review and approval of the contract action. The FFP and the CPFF contract approvals require documentation to support the estimated cost and the profit or fee, looking at the reasonableness of price. The incentive approval process will include a review of the basis for determining the target positions and the range of incentive effectiveness, plus the value statement for various positions across the RIE.

The documentation will be required in the second place as background information, a base line, to assure informed decisions at each step during administration. This is especially important in the negotiation of changes.

The third major use of the documentation will be to provide information for other reviews and investigations (i. e. Renegotiation Reviews). The maintenance of negotiation documentation and the progress data for comparison with the negotiation documentation is particularly important in the case of incentive contracts where questions must be answered concerning the effect of incentives on realized profits. Performance reports to the Renegotiation Board include information concerning the extent to which the contractor met targets under incentive contracts and the reasons

therefor, and the reports include information concerning reasonableness of cost and profits and the basis for the initial negotiation of target cost and sharing formula. In summary, the Renegotiation report compares progress with the initial documentation to evaluate the extent that realized profits represent earned profits -- earned through extra efforts as motivated by the incentive structure.

Documenting the negotiation of incentive contracts is more difficult than for other types of contracts. The quality is not higher, but the depth of coverage may be greater. This is especially true in the coverage of the range of incentive effectiveness and the value statement for cost and performance achievement across the RIE. The negotiator is not only obligated to document the rationale for selecting a profit or fee value at target cost, but also must describe the rationale for profit or fee at the RIE points of cost which are under and over target cost. The documentation should describe the extracontractual influences which are considered, and the potential effect if the influences had a significant impact on the relationship of cost, performance, or schedule incentives. Documentation concerning the confidence in target cost should discuss the probabilities of achieving various cost and performance levels. The discussion of probabilities does not need to be a statistical analysis showing distributions of risk. It need only represent the realistic conclusions, simply stated, about technical and pricing judgments concerning most likely achievements.

Discussion of risk should require a reasonable definition of risk. The negotiation memorandum should describe the areas of uncertainty and the degree of uncertainty. Low, realized earnings at completion of a contract do not necessarily mean that it was a high risk contract -- the low earnings could be the result of poor financial management, or poor subcontract management in a low risk contract.

CHAPTER III

COST INCENTIVES

A. INTRODUCTION

Of the three types of incentive parameters discussed in this Guide -- cost, schedule and performance -- the straight cost incentive has received the widest application. It is also the simplest conceptually: an arrangement is made whereby the contractor's profit, or fee, increases or decreases as his actual incurred costs fall below or above the contract target cost. Between this simple concept and the writing of an effective contract, however, are a number of questions that must be settled to the satisfaction of both parties. It is not enough merely to include "some" cost incentive arrangement. The arrangement must be written so that it offers the contractor a real incentive to meet or better cost objectives; it must offer him rewards commensurate with the risks he assumes; and it must not create a situation in which cost is overemphasized or underemphasized relative to other procurement objectives. Satisfaction of these criteria requires that each cost incentive fee arrangement reflect the characteristics and problems of a particular procurement and an individual contractor. This Chapter discusses these problems under both fixed-price-incentive and cost-plus-incentive-fee type contracts. Discussion will be limited, however, to the cost-incentive-only situation; Chapter IV of the Guide deals with the problem of structuring multiple incentive arrangements.

B. FIXED PRICE INCENTIVE - COST ONLY

The Fixed Price Incentive (FPI)[1/] contract is preferred over the CPIF contract by both the Government and the contractor when all prerequisites for the selection of the contract type are met. FPI contracts will not be used when cost or pricing information and performance specifications adequate for the negotiation of firm targets and firm ceiling prices are not available at the time of initial contract negotiation.

The degree of technical uncertainties should be the primary criterion for the choice between selection of a CPIF or an FPI contract. An FPI contract should be selected when there is a reasonable expectation of technical success within stated, measurable limits.

In considering the extent of risk under an FPI contract, it should be remembered that an FPI contract assumes all of the risk equal to that of an FFP contract at a fixed point of cost incurrence prior to the time

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1/ Throughout the Guide the fixed-price incentive contract with target firm from the outset will often be referred to as an FPI contract. The FPI with successive targets will be identified as an FPIS contract.

that the price ceiling is reached. At the point of total cost assumption, the contractor assumes full cost responsibility for continuing performance until completion. On the other hand, the FFP offers the potential for the maximum profit incentive.

Whereas the CPIF contracts provides for the application of audited, allowable costs to the incentive formula, the FPI contracts provide for costs to be negotiated and applied to the incentive formula to determine the amount of earned profit.

The breakdown of R&D effort into various categories for management purposes in DoD and the categorization of R&D effort in Phased Project Planning in NASA have been accompanied by guidelines for the selection of contract type for each category or phase. It should be noted, however, that it is possible for separate parts of a system or subsystem to fit into a different category or phase than the one which describes the over-all program. Thus, the contract type must fit the specific work to be performed, and should not be selected on the basis of the classification of the over-all program. An FPI contract should never be selected in lieu of a CPIF contract simply because policy guidelines have stated it is the preferred type.

The FPI contract should include relatively firm design, specification and performance requirements which will permit the contractor to operate without detailed control or technical direction. Performance goals and schedule objectives should not be impacted adversely by events or direction outside of the control of the contractor. This type of contract equates with a Firm-Fixed-Price type of contract, and to the degree possible should be administered accordingly.

The ASPR Manual for Contract Pricing (see page 23) identifies the ingredients of the fixed-price-incentive contract as:

(i) Target Cost (against which to measure final costs)

(ii) Target Profit (a reasonable profit for target cost at target performance)

(iii) Target Price (target cost plus target profit)

(iv) Ceiling Price (the total dollar amount for which the Government will be liable), and

(v) Sharing formula (the arrangement for establishing final price).

Those who are involved in structuring FPI contracts also consider the "cost ceiling" or "Point of Total Assumption" as a critical element because it is the point where the FPI contract converts to a firm-fixed price contract (0/100 sharing ratio). Beyond this cost point each cost dollar reduces the contractor's profit by a dollar or increases his loss by that amount.

Figure 1 shows a simple FPI structure with the following features:

Target Cost :	$10.0 million
Target Profit:	$1,050,000 (10.5%)
Ceiling Price:	$12.0 million (120% of Target Cost)
Share Ratio :	65/35

Many of the features of the cost-only FPI contract are similar to the features of the CPIF contract. These include the range of incentive effectiveness, target cost, target profit, and sharing formulas that were also contained in the CPIF contract structure. However, the FPI contract introduces the ceiling price and the location of a cost ceiling or point where total assumption of cost responsibility is reached. This point has generally been called the "point of total assumption" (PTA) and represents, in this example, the point where the share ratio changes from 65/35 to 0/100. Thus, all costs incurred beyond the PTA are in a firm-fixed-price area and have the effect of reducing profit by one dollar for each dollar of cost incurrence.

In this example, the intersecting point of the 65/35 share line and the 0/100 share line is immediately above the cost position of $11.46 million. Thus, at a cost which is approximately $540,000 below the ceiling price, there is a profit of approximately $540,000 (accurately $538,500). Locate this intersecting point on the graph (Figure 1) (PTA) (Point of Total Assumption). The following formula may be used to calculate the point of total cost assumption:

PTA Cost = Ceiling Price minus Target Price, divided by the Government Share, plus Target Cost

$$\text{PTA} = \frac{\$12,000,000 - \$11,050,000}{.65} + \$10,000,000$$

$$\text{PTA} = \$950,000 \div .65 + \$10,000,000$$

$$\text{PTA} = \$11,461,500$$

FIXED PRICE INCENTIVE
(FPI EXAMPLE/COST-ONLY)

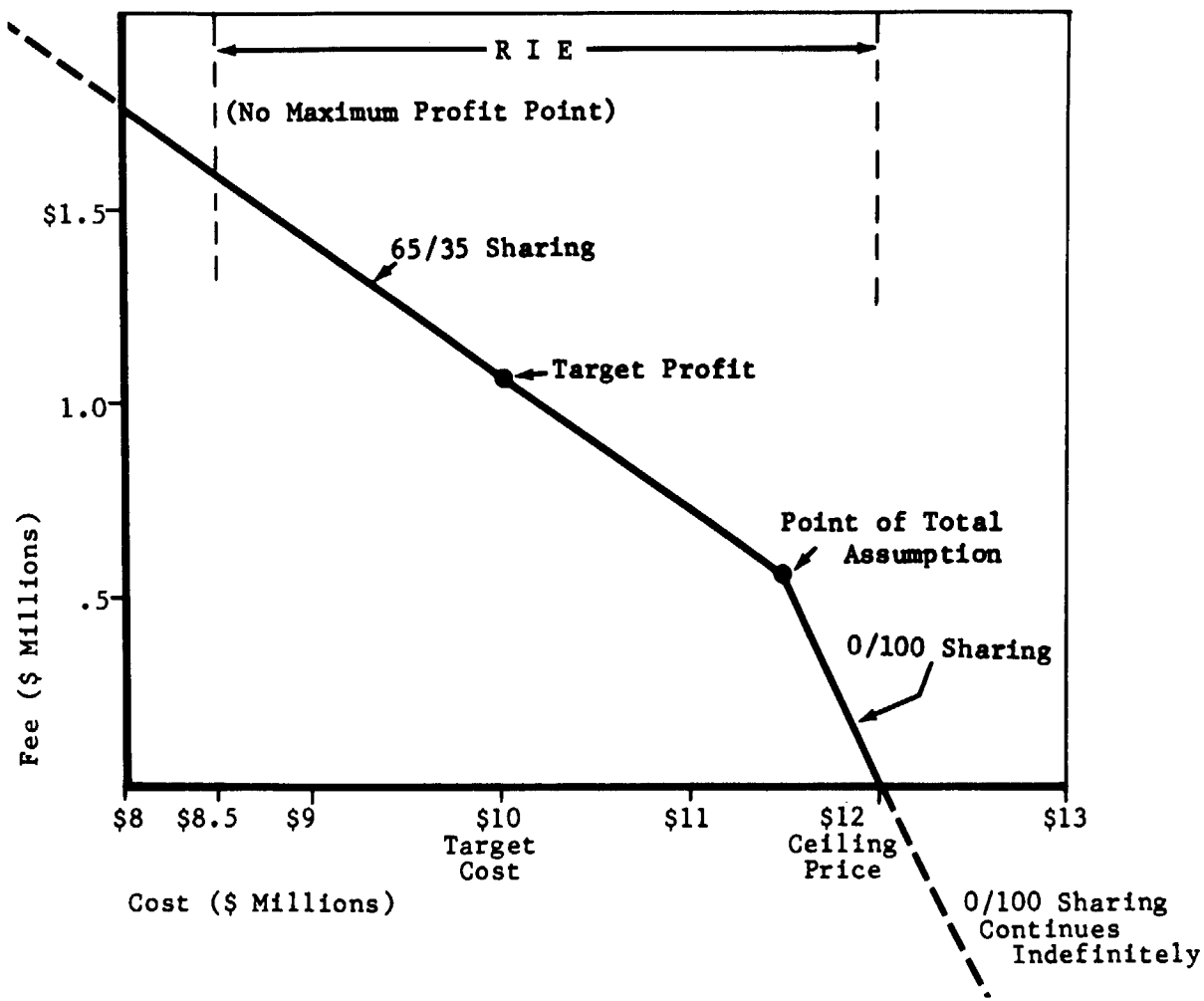

FIGURE 1

The point of total assumption appears to be at a graph point of approximately $11.45 million. This approximation is close enough for use in developing an approximate PTA position or for use in developing several alternate objective points. The simple mechanical method to find the PTA point by counting back a certain dollar amount from the ceiling price and counting up an equal dollar amount on the profit scale is an acceptable short cut in graphics. This is just one example of using graphics to provide pictorial information that is useful in describing various incentive provisions. Graphics can be easily applied to show the effect of various interdependency arrangements or to develop and portray curvilinear structures. As one becomes more familiar with graphics, he achieves a greater understanding of the potential of incentives. It is much easier for some individuals to move a plastic triangle or straight-edge around the assumed cost points, recognizing the vertical axis as fee or profit and the horizontal axis as the cost line, than it is for them to compute several mathematical problems during the development of alternative incentive arrangements.

1. Structuring Technique #1.

In the past there have been two negotiation techniques widely used in structuring FPI contracts. These are:

Establishing a reasonable profit dollar amount for both target cost and the point of total assumption (or the upper limit of the range of incentive effectiveness). This technique automatically establishes both the sharing arrangement and the ceiling price. For example: Assume that the negotiation results in agreement that the following are reasonable --

Target Cost : $10.0 million
Target Profit: $1,050,000

Assume also that the evaluation indicates a reasonable upper cost level of $11.5 million and the negotiator believes the contractor is entitled to $500,000 profit at this point. A ceiling price is automatically set at $12.0 million ($11.5 maximum cost plus $500,000 profit). Further, the sharing ratio is set at 63/37.

The following formula is used to calculate the contractor's share:

$$\text{Contractor's Share} = \frac{\text{Profit Pool}}{\text{Range of Incentive Effectiveness (Cost Sharing Range)}}$$

364-685 O - 69 - 6

Cost at - PTA	$11.5 million	
Cost at - Target	$10.0 million	
Cost Range	$ 1.5 million	
Profit–Target		$1,050,000
Profit at PTA		$ 500,000
Profit Pool		$ 550,000

$$\text{Contractor's Share} = \frac{\$550,000}{\$1,500,000} =$$

$$1,500,000\overline{)550,000}\ \ .37 \text{ , or}$$

Sharing Ratio -- 63/37

The only question remaining is whether the 63/37 sharing arrangement should also apply to cost under target. Generally it could apply equally well to either over or below target cost. If a different sharing ratio was desired for cost below target the same procedure as above target would be used.

While this approach may have drawbacks it does have the distinction of providing a rationale for all of the significant ingredients of the arrangement and does not over-rely on arbitrary percentage factors in selecting sharing ratios (e.g. 80/20, 70/30, etc.) or ceiling price (115% or 120% of target cost).

2. Structuring Technique #2

The other technique often used is to negotiate target cost, target profit, ceiling price and share ratio individually but base final negotiation upon simultaneous agreement of all elements of the price.

When all of the elements are properly evaluated and combined this is an excellent procedure. However, too heavy a reliance on the negotiation for target price may dictate the results of the other ingredients if there is an over-reliance upon percentage factors rather than price and value considerations. For example, in the past there appeared to be a clustering of target profit, ceiling price and share ratio percentages without regard to the product being procured or the stage of its development. This clustering of percentage factors could imply that proper value considerations had not been expressed in the contract -- i.e. evaluation of what profit the contractor should receive at target performance and at a given level of cost performance. This could arise from a

tendency to consider the ceiling price as the upper limit of the range of incentive effectiveness and not consider the effect of the FFP-like 0/100 share ratio after the cost ceiling (PTA) has been reached.

Figure 2 can illustrate this point by showing the difference between the upper cost limits imposed by various sharing arrangements at each of the points A, B, C, and D. While the Government pays 120 in each case, the difference to the contractor is shown below:

Target Cost = 100 Target Profit = 10

PTA Point	Share Ratio	PTA or Cost Ceiling	Profit At Cost Ceiling	Ceiling Price
A	90/10	111.1	8.9	120.0
B	80/20	112.5	7.5	120.0
C	70/30	114.3	5.7	120.0
D	60/40	116.7	3.3	120.0
	50/50	120.0	0.0	120.0

While the practical effect, as stated, is that the Government pays 120 at any one of the points of total assumption, the negotiator should still evaluate the cost/profit relationship as influenced by the different sharing ratios and different ceiling prices. For example, by using the same target cost of 100 and same profit of 10 and changing ceiling price to 125, the following cost/profit relationship exists:

Target Cost = 100 Target Profit = 10

PTA Point	Share Ratio	PTA or Cost Ceiling	Profit at Cost Ceiling	Ceiling Price
A	90/10	116.7	8.3	125.0
B	80/20	118.8	6.2	125.0
C	70/30	121.4	3.6	125.0
D	60/40	125.0	0.0	125.0
	50/50	125.0	-2.5	125.0

A comparison of the two charts demonstrates the very minor effect on profit in the shallower share ratios regardless of changes in ceiling price (until the ceiling cost point is reached). Notice under a 90/10 share that increasing the ceiling price by 5 has increased the ceiling cost by 5.6 while reducing profit by 0.6 from 8.9 to 8.3 percent. Increasing the ceiling price to 130 from 120 would add to the cost ceiling 11.1 while reducing the profit from 8.9 to 7.8.

FIXED-PRICE INCENTIVE PROFIT MATRIX

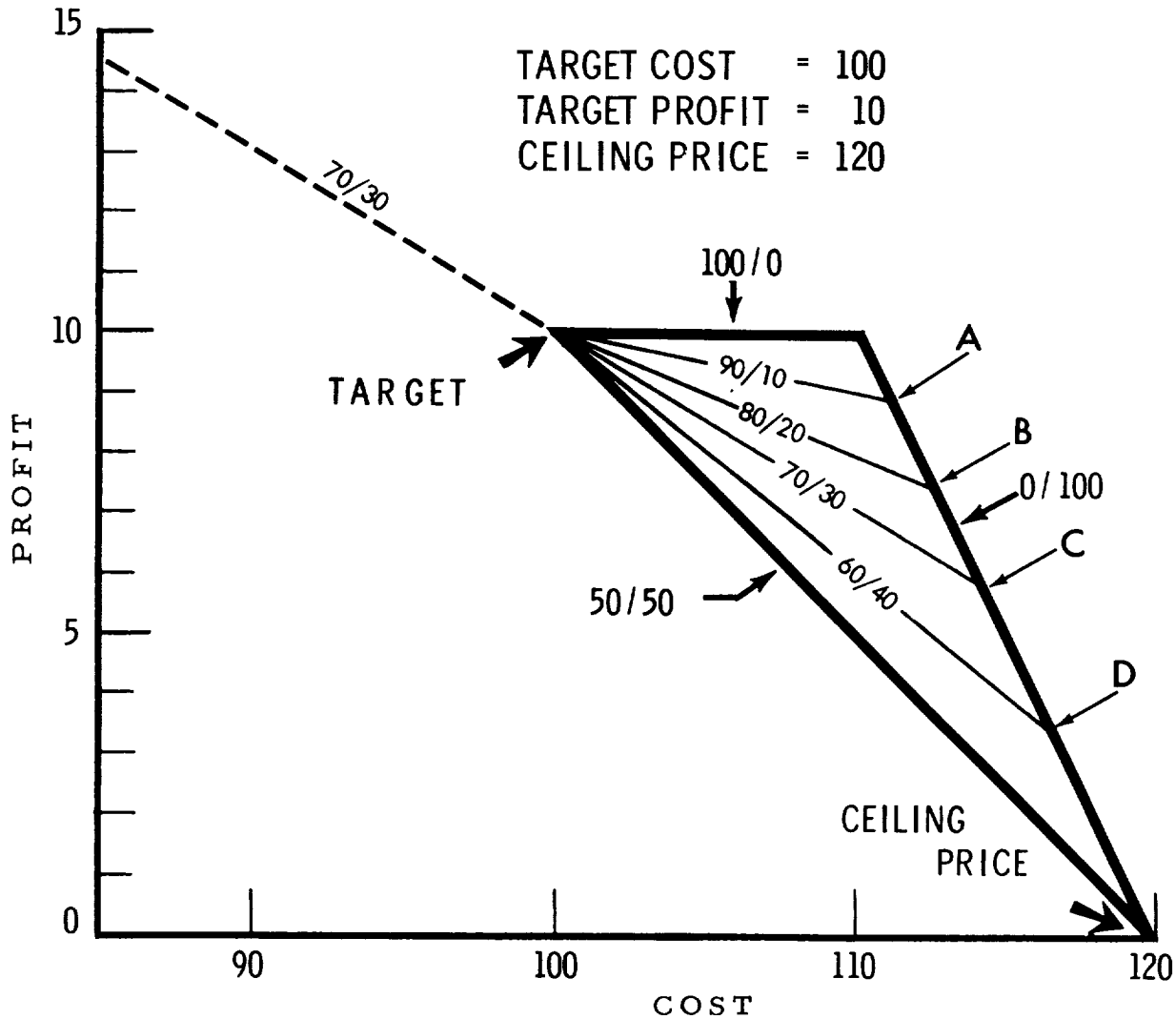

FIGURE 2

Even an 80/20 share ratio has little effect on changing the ceiling price from 120 to 130. The cost ceiling is increased by 12.5 while the profit is reduced by 2.5 percent.

The reverse will be obvious. When the ceiling price is reduced the cost ceiling will decrease by the amount of the differential plus the contractor's share in the difference (i.e. 130 to 120 at 80/20 decreases the cost ceiling by 10 plus 2.5 or 12.5).

What is not so obvious is that this amount varies with each share ratio and each ceiling price. This is depicted below:

	CP-120 Cost Ceiling	Percent Increase	CP-125 Cost Ceiling	Percent Increase	CP-130 Cost Ceiling	Percent Increase
90/10	111.1)		116.7)		122.2)	
		1.4		2.1		2.8
80/20	112.5)		118.8)		125.0)	
		1.8		2.6		3.7
70/30	114.3)		121.4)		128.7)	
		2.4		3.6		4.6
60/40	116.7)		125.0)		*133.3)	
		3.3				
50/50	120.0)					

* Over Ceiling

Effect of Profit on Ceiling Cost (PTA)

The basic principle for use of contract types stated in the Armed Services Procurement Regulation is that:

> "Profit, generally, is the basic motive of business enterprise. Both the Government and its defense contractors should be concerned with harnessing this motive to work for truly effective and economical contract performance required in the interest of national defense."

This is a primary reason for using incentive contracts where the prerequisites for firm-fixed price contracts are not present. However, there have been occasions when the cost value of profit has not been clearly communicated to the contractor. Hopefully the following chart will help to demonstrate the Government's assessment of cost value -- or the cost equivalent of profit.

Share Ratio	Cost Equivalent Per 100 Dollars
90/10	1,000
80/20	500
70/30	333
60/40	250
50/50	200

Another method of demonstrating the cost-value of profit is to compare the ratio of increased target profit to the profit at cost ceiling at selected share ratios, as follows:

Assume an increase from 8% to 12% in target profit
@ 120% Ceiling Price

Share Ratio	8%	12%	Profit Increase	Profit Increase @ Ceiling Cost
90/10	6.7	11.1	4.0	4.4
80/20	5.0	10.0	4.0	5.0
70/30	2.9	8.7	4.0	5.8
60/40	0.0	6.7	4.0	6.7
50/50	(-4.0)	4.0	4.0	8.0

In other words, the contractor profit at ceiling cost varies from an increase of 10 percent at 90/10 to 100% at 50/50 with any increase in target profit -- or double the increase in target profit on a 50/50 share at ceiling cost.

The conclusion is therefore obvious. Neither profit nor ceiling cost increases vary as much under shallow share ratios as under steeper slopes. Therefore, reduction in one and an increase in the other can compensate for the change in either.

Probably a more dramatic illustration comes from the comparison of cost ceiling (PTA) at various combinations of profit and share ratio as shown below:

Cost Ceiling at Various Profit Rates

	120% Ceiling Price					130% Ceiling Price				
Share Ratio	8% TP	9%	10%	11%	12%	8%	9%	10%	11%	12%
90/10	113.3					124.4	123.3			
80/20	115.0	113.7					126.3		123.7	
70/30		115.7	114.3				130.0			125.7
60/40				115.0	113.3					130.0
50/50					116.0					

The natural effect of this relationship in cost ceiling between share ratios and ceiling price applies, of course, to profit. The contractor's profit, for example, is 6.7% at either 90/10 at 8% target profit or 60/40 at 12% target profit at 120% ceiling price.

It is certainly not necessary to attempt to evaluate every possible combination of variables that exist. As a minimum, however, the negotiator should evaluate his alternatives, the contractor proposals and what appears to be the final result in terms of this analysis. The few minutes involved should be justified by the increased knowledge of the alternatives available during negotiation.

Again, the two simple formulas needed are:

$$\text{Cost Ceiling (PTA)} = \frac{\text{Ceiling Price - Target Price}}{\text{Government Share}} + \text{T. C.}$$

and

$$\text{Contractor's Share} = \frac{\text{Profit Pool}}{\text{Range of Incentive Effectiveness}}$$

C. COST-PLUS-INCENTIVE-FEE - COST ONLY

Again, the cost-plus-incentive-fee (CPIF) contract should be used where the uncertainties of contract performance and the related cost of performance cannot be estimated with sufficient reasonableness to permit the use of any type of fixed-price contract, and where an appropriate positive profit incentive is likely to provide significantly more motivation for cost effectiveness than is found in a CPFF contract.

The ASPR Manual for Contract Pricing states (see page 33):

> "In recognition of the cost-reimbursement situation, there are three characteristics which distinguish CPIF from FPIF and FPIS contracts. One is the absence of a ceiling price. Second, in the CPIF situation, costs are reimbursed in accordance with ASPR Section XV and terms of the contract, while in FPI contracting, final cost is established in accordance with a negotiated agreement. Third, under a CPIF contract, the maximum fee the contractor can receive is subject to ASPR limitations. Maximum fees in excess of the ASPR limits require approval as deviations."

It is the objective of this section to expand on these distinguishing "characteristics" in an effort to explain the Government's preference for fixed-price-incentive over the CPIF form -- where the prerequisites for FPI exist.

Ceiling price under a FPI-cost-only contract as previously stated is the maximum dollar liability of the Government under the contract. Of greater interest to Government personnel, however, is the fact that the FPI contract carries with it the guarantee on the part of the contractor to deliver on schedule a product meeting minimum specifications for that dollar amount. Of less interest to the Government but of great interest to the contractor is that failure to comply with the requirements stated he is subject to Default termination with full reprocurement rights under the terms of the appropriate clause.

It is for this reason that the Guide stresses the use of a FPI contract only when the technical (and cost) uncertainties are reasonably foreseeable and can be evaluated in terms of risk to the contractor.

This characteristic also reinforces the need for evaluation of the cost ceiling (PTA) -- and profit -- or ceiling price in an FPI contract, because this is the critical item for negotiation. While the negotiation of target cost and profit are extremely important in any contract, target price can more easily be accepted as a function of cost ceiling and share ratio in an FPI than in a CPIF contract. Obviously, the exception to this is where ceiling price is a function of target price (i. e. where target price is negotiated independently and ceiling price is some arbitrary percentage such as 120%) rather than ceiling price representing the maximum price the Government is willing to pay for the contract. Again, any approach taken is correct if all the elements have been evaluated and are satisfactory to the parties.

In a CPIF contract target cost, RIE and the fee pool (maximum minus minimum fee for the RIE) are all critical because they are generally interrelated. In every instance RIE and fee pool are inextricably interrelated. They represent the limits of the incentive arrangement. Everything outside the constraints of fee pool and RIE represents a cost-plus-fixed-fee environment. This is coupled, of course, with the lack of a guarantee on the part of the contractor to deliver a required product, on time, at a stated price. It is for this reason that rewards and penalties associated with product performance and schedule -- as well as cost -- has increased substantially during the past several years. Multiple incentive contracts will be discussed in detail in Chapter IV.

The second distinguishing "characteristic" between FPI and CPIF contracts mentioned above regarding the use of the ASPR Section XV applying to CPIF while "in FPI contracting, final cost is established in accordance with a negotiated agreement" is the stated policy of DoD and NASA. However, this distinction has not always been fully understood in the past.

The third characteristic identified was that under a CPIF contract, the maximum fee the contractor can receive is subject to ASPR limitations. Maximum fees in excess of the ASPR limits require approval as deviations.[1/] This applies equally to NASA as well as DoD and is subject, in each case, to the one-time deviation procedure established by the individual Department or Agency involved. In establishing this requirement for a deviation from the 15% maximum fee (10% for supply contracts) it should be clear that higher profits can be negotiated in exceptional cases -- but, appropriately only in exceptional cases. An example of this would be a relatively small contract or subcontract for an extremely complex or critical item or component. Another instance might be where the value to the Government for outstanding performance far surpassed the "face-value" of the contract. Generally, this would be in multiple incentive contracts rather than cost only CPIF contracts, but each case should be individually assessed. In the past, it appears that the failure to fully utilize the profit motive to stimulate outstanding performance was more a factor of misapplied maximum fees rather than the regulations controlling them. Often in earlier contracts maximum fees were either too low -- 1 1/2 % bonus for a 30% underrun, or not achievable as where the contract provided for a 14% maximum profit at 25% under target when, in fact, the contractor had to exercise extreme cost control measures in order to deliver a quality product at target cost.

Quite naturally -- and equally unfortunate for the Government -- there have been cases when the negotiation resulted in a target cost and/or target fee that were too high thus, again, completely eliminating the contractor's incentive. For this reason the Guide stresses the evaluation of every element of the arrangement and emphasizes the obvious point that the elements of an incentive arrangement are inextricably tied together and cannot be treated discretely or as severable.

The ingredients of a cost-plus-incentive-fee contract (CPIF) are:

(i) Target Cost (the most probable cost for target performance)

(ii) Target Fee (a reasonable fee for target performance)

(iii) Maximum Fee (subject to Agency control)

(iv) Minimum Fee (may be a "negative fee")

(v) Share Formula (the arrangement for establishing final fee)

You will have observed that the definition of target cost above as "the most probable cost for target performance" is different than the definition given previously for target cost under the fixed-price incentive contract coverage as the cost "against which to measure final costs". For

1/ Maximum fees are administratively limited - not limited by statute.

either contract type the latter description of "most probable cost" applies to target cost. However, we are trying to draw the distinction between the "most probable cost for target performance" under a CPIF-cost-only contract and the obligation to deliver a product meeting minimum specification at ceiling price (or cost ceiling plus profit) under an FPI arrangement. This distinction is fundamental. Target cost may not always represent the target performance level. This can be illustrated by the fact that often -- especially under multiple incentives and in many cases under cost only CPIF contracts -- less than target performance is acceptable. In many cases this has not been recognized in the past. Often a product meeting less than target levels -- at higher than target price -- has been the basis of contractor's quotations. This point will be covered in greater detail later under multiple incentive contracts.

The major difference between the elements of the CPIF and FPI cost-only contract forms -- as mentioned previously -- is the removal of the ceiling price and performance guarantees and the introduction of the "artificial constraints" of the maximum and minimum (including negative) fee levels. We have previously stated that the boundaries of an incentive contract are bordered by the RIE and the difference between minimum and maximum fee levels (fee pool). Beyond the RIE the contractor's share is zero in the sense that all costs are reimbursable to the degree allowable by ASPR.

Similar to the failure of the fixed-price incentive contract to mention the inherent existence of the cost ceiling or point of total assumption, nowhere is the all important range of incentive effectiveness mentioned in the "distinguishing characteristics" of the CPIF contract. Because it prescribes the total area of the incentive arrangement most of those involved in structuring and administering incentive contracts consider the range of incentive effectiveness as the key element for consideration. Hopefully this will be demonstrated in the many structuring approaches used in CPIF contracts.

Structuring Techniques

While the Guide suggests that there are two basic techniques applicable to the structuring of an FPI cost-only contract, there will be no attempt made to identify all the variations used to reach agreement under a CPIF cost-only contract. However, the most common examples for developing a negotiating position have been to:

a. Establish target cost and use pre-determined percentages for all other elements (e.g. Target Fee 7%, Maximum Fee 10% (+3%), Minimum Fee 4% (-3%), Sharing Ratio 85/15, RIE $\pm$ 20%. This technique is representative of many of the earlier incentive structures. It is possible that there are at least two explanations for negotiators taking this approach:

first, the lack of understanding of the basic objectives of an incentive contract and second the failure of earlier guides and training courses to properly express these objectives. The natural consequence was for the un-initiated to apply the Government's propensity for concentration on target cost as the key -- and in the case of incentives, the only -- element of importance in the pricing of a contract.

A variation of this method is to negotiate both target cost and target fee but still let all the other factors "fall out" on the basis of predetermined or arbitrary percentage or equal ratios without a decisioned judgment for them.

b. Establish target cost, target fee and apply a "confidence factor" to the sharing ratio above and below target cost to "selected" maximum and minimum fees, thus allowing RIE to fall out. This could or could not vary the RIE on each side of target cost depending upon the respective share ratio and fee level established. This approach is little -- if any -- better than the above because the so-called "confidence factor" was usually subjective in nature and seldom reflected the actual conditions which could have been reasonably estimated for cost outcomes above or below target cost.

c. Establish target cost, target fee, RIE, and sharing ratio and let the maximum and minimum fees "fall out". While this technique is superior to either of the above it assumes that the sharing ratio and the RIE have been evaluated and represent an expression of "value to the Government". This has not always been the case.

d. Establish through cost analyses the most probable cost (target), the most optimistic cost (minimum), and the most pessimistic cost (maximum), establish a reasonable fee for each and calculate the sharing ratio between maximum fee and target and between target and minimum fee. This has the advantage -- at least for the pre-negotiation position or the evaluation of contractor proposals -- of separately evaluating each of the essential ingredients of the incentive pricing arrangement.

It should be recognized, again, that any approach is satisfactory if it conveys the Government's desired objective to the contractor for all of the elements involved.

D. RANGE OF INCENTIVE EFFECTIVENESS

It is axiomatic that cost incentive provisions in CPIF contracts should be effective over the entire range of possible deviations from foreseeable cost. The idea is to reduce the probability that the incentive provisions will run out at an early point in contract performance, thereby creating a CPFF

situation in which little or no emphasis will be placed on cost control. Equally to be avoided, would be to extend the sharing arrangement beyond the reasonable limits of probable cost outcomes thus, in effect, reducing the fee pool in the "actual" incentive range. The application of this principle assumes that the maximum fee, if earned, will be the reward for an outstanding job and that the cost at which minimum fee is paid will represent a low level of accomplishment.

Range of incentive effectiveness (RIE) is an evaluation of what contract costs are likely to be, expressed in terms of high to low, or most pessimistic to most optimistic. RIE is a judgment of the range of probable costs and not an estimate of the range of possible costs above or below that range. The RIE is the product of cost and price analysis. It is a conclusion reached after analysis of facts and cost projections based on those facts. RIE is that conclusion translated into dollars of target cost, share lines and either price ceiling or fee floor and fee ceiling. It operates in both CPIF and FPI contracts.

RIE is built up using a series of conclusions which identify the reasonable limits of individual cost elements and it expresses the conclusion that actual costs can be expected to fall within the sums of those individual limits. It also implies the further conclusion that final costs anywhere within the sums of those limits will be characterized as probable, that they will not be characterized as too high or too low. Basic to the RIE concept is the expectation that the contractor will look at contract costs as work progresses and project, each time, the likely costs at completion. Basic also is our desire that the incentive arrangement structured at the outset should stay alive to influence decisions every time the contractor evaluates his current position to determine probable final costs.

In effect, then, the contractor sets a new target, a new goal, every time he updates his estimate of costs at completion. The whole idea of RIE is to make sure the incentives are alive when he does this so that he will consider alternative costs, so that he will always decide in favor of the lowest cost alternative which promises results which meet the contract requirements.

The range of incentive effectiveness is put together during analysis of the costs supporting a company's proposal. It is built up cost element by cost element. To illustrate (quite simply):

> The company says it will take 10,000 hours to do a job. Analysis of the hours leads to the conclusion that the work could be done for 7900 hours or might take as many as 11,000, but should be done for about 8600 hours. This conclusion is tested in fact finding sessions with the contractor, adjusted if necessary and then combined with similar conclusions about hourly wage rates,

purchased parts, subcontracts, engineering labor, overheads and profit/fees. The results are added up, the lows with the lows, the highs with the highs and the most-likelies all together. The totals of each category then must be evaluated to see if the straight arithmetic results also represent acceptable final cost results. Again, simply:

	Low	Likely	High
Parts	$12,000	$12,900	$13,000
Subcontracts	35,800	39,600	40,500
Direct Labor	28,000	34,000	58,000
Engineering	43,000	50,300	75,500
Overhead & G&A	174,000	195,200	230,000
Total Costs	$292,800	$332,000	$417,000
Assume then profit/fee should be:	38,000[2]	30,000[1]	18,000[2]
Price	$330,800	$362,000	$435,000

[1] Determined by the technique of profit analysis required by the department or agency.

[2] Value judgment - the dollars you would be willing to pay at that cost level.

Evaluation of the totals in the three columns, which might include a deep look at costs of similar work on earlier contracts, may lead to adjustment of any or all of the three and obviously, negotiation may reveal facts which will cause adjustment of elemental and total values.

Assuming the above numbers have been found to be sound, they can be read to say that the incentive will be effective over a range of costs between a low of $292,800 and a high of $417,000 and that variations from a target of $332,000 will be shared. The CPIF contract (assuming CPIF fits the procurement situation) should look like this, as the government team's negotiation objective:

Target Cost	$332,000
Target Fee	30,000
Minimum Fee	18,000
Maximum Fee	38,000

Share Ratio - 80/20 under target

$$CS = \frac{\text{Fee Pool}}{\text{RIE}} = \frac{8,000}{39,200} = .204 \text{ or } 20.4\%$$

Share Ratio - 86/14 over target

$$CS = \frac{\text{Fee Pool}}{\text{RIE}} = \frac{12,000}{85,000} = .141 \text{ or } 14.1\%$$

For our second example, assume that the only variables are engineering and direct labor and that parts, and subcontracts are reasonably firm and further that the contract is too small, by comparison, to effect overhead rates. The results would be:

	Low	Likely	High
Parts	$ 12,900	$ 12,900	$ 12,900
Subcontracts (FFP)	39,600	39,600	39,600
Direct Labor	28,000	34,000	58,000
Engineering	43,000	50,300	75,500
Overhead and G&A (144%)	177,800	197,000	267,800
Total Cost	$301,300	$333,800	$453,800
Assume profit/ fee should be	39,000	30,000	13,500
Price	$340,300	$363,800	$467,300

The range of incentive effectiveness over a range of costs would now be between a low of $301,300 and a high of $453,800 and the negotiation objective would look like this:

Target Cost	$333,800	
Target Fee	30,000	
Minimum Fee	13,500	
Maximum Fee	39,000	

Share Ratio - 72/28 under target

$$\frac{9000}{32500} - .277 \text{ or } 27.7\%$$

Share Ratio - 86/14 over target

$$\frac{16500}{120000} = .137 \text{ or } 13.7\%$$

Naturally, the above figures are subject to change during the negotiation thus effecting the final outcome. Even though the final agreement rounds the share lines off at say 70/30 and 85/15 (or to some other share ratio) as a result of a change in either RIE or minimum and maximum fee levels the final arrangement will be the result of an evaluation of the respective elements.

Much discussion centers on the question "What is a 'good' target?" It has been suggested that, "A good target cost is one about which both parties can agree there is an equal chance of either overrunning or underrunning basing their judgment on all complete and current facts available at a point in time."

First, note the emphasis on time. This is recognition of the fact that as experience is gained, cost estimating reliability improves, and the numberical value of a "good target" will change. There is no one good target for the life of a contract.

Second, the definition says that the estimated target cost should be one of equal chance of overrunning or underrunning, not equal magnitude. The idea of symmetry has somehow crept in and people tend to say a target cost is good + or - 20%. This is rarely true. The magnitude of the potential overrun usually will not equal the magnitude of the potential underrun. In the vernacular of the trade, "confidence limits" about a "good target" may be anything, such as + 30% - 3%, + 18% - 10%, +2% - 30%, and so on. The fact that confidence limits may be far apart (say + 30% - 20%) has nothing to do with whether a target is "good" or "bad".

Third, the sharing arrangement on an incentive contract should reflect the confidence limits. Where the magnitude of the overrun or underrun is

small, for a given fee swing, the share line should be steeper. Where the magnitude of the overrun or underrun is great, the share line should be relatively shallow. Note that the confidence limits establish a range of possible actual costs. The target is only one point in that range. Whether the target cost is at the upper end of the range (sometimes we say loose) or at the lower end of the range (we might say tight) will affect the share lines. Neither a tight target nor a loose target is necessarily a good or bad target. Again, we go back to the definition - equal probability of overrun and underrun makes a "good target."

Fourth, in incentive contracting, the following characteristics are associated with the contract types:

	Probable Magnitude of	
	Underrun	Overrun
Fixed Price (FP)	Small	Small
Fixed Price Incentive (FPI)	Medium	Medium
Cost Plus Incentive Fee (CPIF)	Medium	Large

Normally, for FPI contracts, we would expect confidence limits of -5 to -10%, +10 to +20%. This means that the target cost could well be toward the upper end of the range of possible actual costs, or what some people might call a loose target. Not so, if we have stayed with the definition.

Fifth, there is a tendency to confuse target cost with actual cost and assume that they are directly comparable. People who follow this logic would say that a "good" target cost is equal to or less than the actual cost. This logic is fallacious. We expect variance, in individual cases, between target cost and actual cost.

Sixth, sight should not be lost of the function of target cost. It has two main purposes: (1) It serves as the basis of obligation of funds to the contract, and to company management in establishing a goal. There is usually direct correlation between negotiated target costs and internal corporate budgets. Hopefully, the company goal will be less than target cost. When a close relationship does not exist, there was not a real meeting of the minds that a "good" target cost had been established. (2) The target cost usually sets the profit level and effects the slope of the sharing arrangement. The impact on level arises from the fact that profit is established as a percentage of estimated (target cost). Obviously, this level will change based on our "confidence" in the negotiated target cost.

In summary, there is considerable misunderstanding about the meaning of target cost. Care should be taken to establish the most realistic target cost possible and nothing said here should imply otherwise. However, it is important to recognize: (i) That a good target cost represents a good estimate at a point in time. It will change with time. (ii) That a target cost is not absolute, but is a point in a range of possible actual costs. (iii) Where the target cost falls in the range of probable costs it will be reflected in the slope of the share lines. (iv) That target cost and actual cost are not comparable on individual cases for purposes of determining good or bad target cost. (v) That the main functions of target cost are (a) to provide a goal for internal management, (b) to establish the profit level (with target profit) of the sharing arrangement, and (c) to provide a basis for funding the contract. It should also be clearly recognized that very often a target cost is established on the basis of the relative strengths or weaknesses of the negotiating parties and not on the basis of that point which represents an equal chance of either overrunning or underrunning a cost.

Should the target cost bear any particular relation to the estimated cost that might be negotiated for the same procurement on a CPFF basis or, for that matter, on an FFP basis? The target cost should represent the best, mutually determined estimate of what costs will actually be when incurred, or, stated another way, that target cost should represent that figure at which there is equal probability of either a cost underrun or overrun. These, of course, are the same criteria used for establishing the estimated cost of a CPFF or an FFP contract, so we may conclude that the incentive target cost should be the same as the CPFF or FFP estimated cost. In other words, differences in risk inherent in various contract types should be reflected, not in the cost estimation process, but in the establishment of profit (or fee) rates and the range over which the incentive is effective. It goes without saying that achieving target costs that meet these criteria is not an easy task. Complete familiarity with the ASPR Manual for Contract Pricing is essential in this regard.[1/] The attitude with which each party approaches cost negotiations is important. Realistic targets will be unachievable if the Government uses competition to force unreasonable concessions, or the contractor is permitted to meet the competitive situations successfully with buy-in prices. Satisfactory targets cannot be negotiated if the sole-source contractor approaches the bargaining table intent only in securing the highest possible cost arrangement. On the other hand, when both parties are genuinely seeking realism and adequate time is given during negotiations to analyzing the task completely, targets meeting the stated criteria should be possible.

E. GRAPHICS - FIXED-PRICE-INCENTIVE - COST ONLY

In Chapter I, the FPI contract elements were listed as follows: target cost, target profit, ceiling price, and share ratio. All of the factors

1/ See page 3 regarding Selection of Contract Types

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will be agreed upon in the simultaneous agreement on the price. The graphic structure of the FPI contract depicts the variable cost and profit outcomes and shows how the contractor's profit increases or decreases as audited costs incurred and negotiated are below or above the contract target cost.

Figure 3 shows again a simple FPI structure with the following features:

Target Cost : $10.0 million
Target Profit: $1,050,000 (10.5%)
Ceiling Price: $12.0 million (120% of Target Cost)
Share Ratio : 65/35

The first step in drawing an FPI contract assumes that the selection of the FPI type was based on the fact that there was a relatively firm definition.

In Step 1 of Figure 3A , assume that the initial rough order of magnitude estimating resulted in an RIE ranging from $8 million to $12.5 million; assume that later definition, proposal evaluation, fact-finding, analysis, and negotiation have narrowed this range to $8.5 million - $12 million. Plot the RIE on the graph.

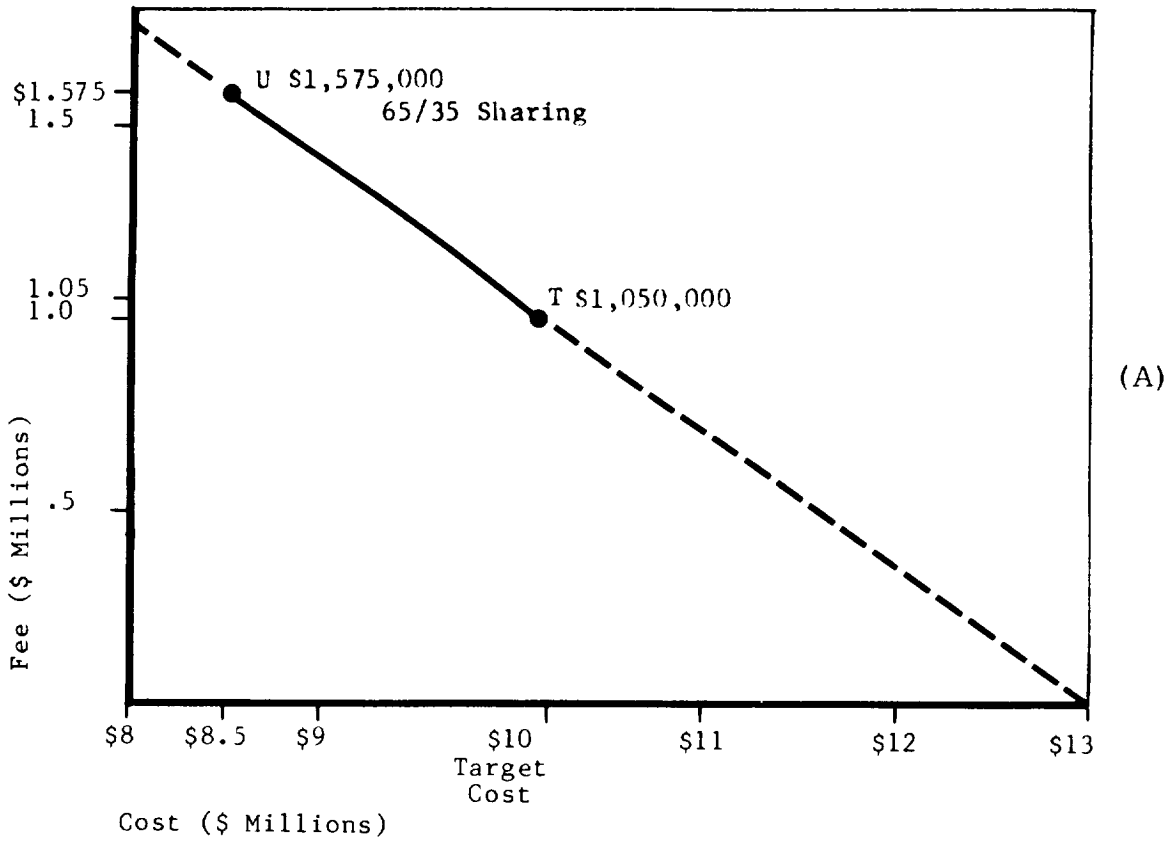
Step 2: Locate the intersection of the $10 million target cost line and the $1,050,000 target profit line. Locate this point on the graph in Figure 3A (T) (Target)

Step 3: Assume any cost outcome other than target and apply the cost sharing ratio. For example, assume a cost position of $8.5 million, at the probable extreme underrun point of the RIE. The cost sharing ratio of 65/35 equates to 35% of the assumed underrun of $1.5 million. This has the effect of increasing the profit by $525,000 above the target profit of $1,050,000. The intersecting point of the profit line and the assumed cost line would be opposite the profit position of $1,575,000. Locate this point on the graph in Figure 3A.

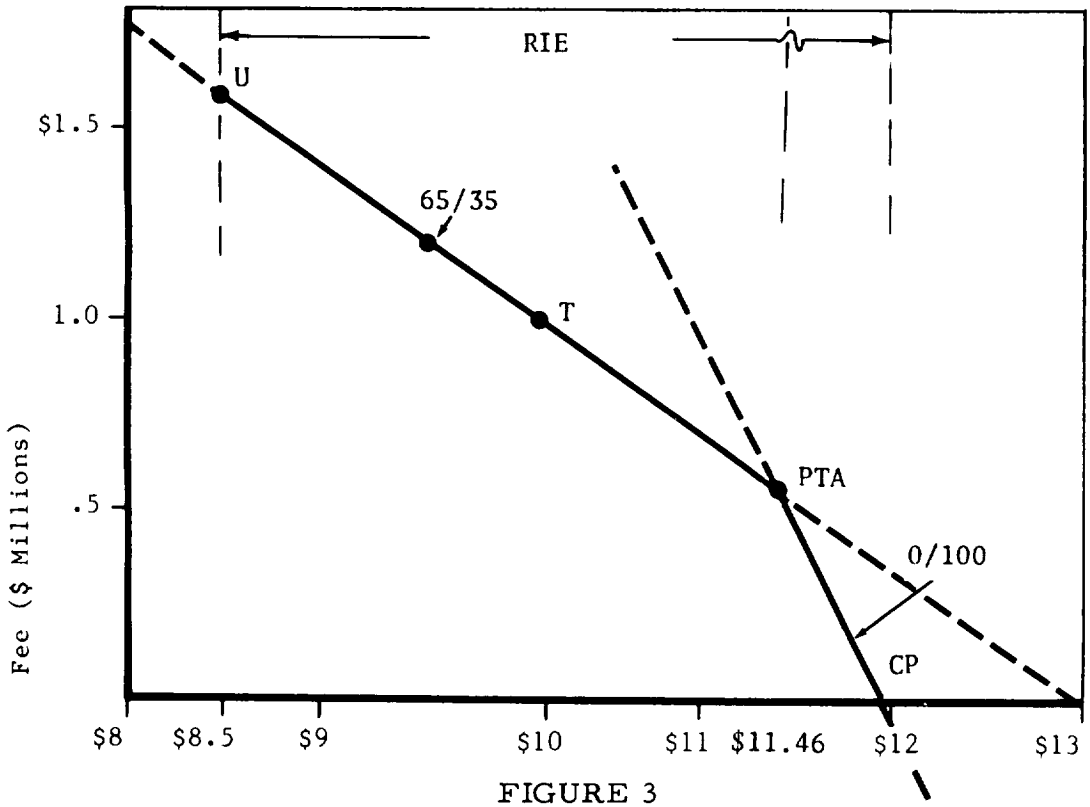
Step 4: Connect points T and U, extending the line beyond either point. This connecting line and the extended line is the 65/35 sharing line.

Step 5: At this point, note that there are no maximum and minimum fee points as were used in the CPIF structures. Thus, there is no contractual maximum profit point in the FPI structure; however, there is a zero profit point which is reached at the ceiling price point. Generally,

FIXED PRICE INCENTIVE
(STRUCTURING GRAPHICS)



(A)



(B)

FIGURE 3

the ceiling price is at some cost point below the point that would be reached if the cost share line was extended to the zero profit point. In this example, the cost share line can be extended to $13 million; however, a ceiling price (the maximum value to the Government) of $12 million was negotiated (120% of target cost). Locate this point on the graph in Figure 3B (CP) (Ceiling Price)

Step 6: It is apparent that the 65/35 sharing cannot be applied at all cost positions greater than the target cost if the ceiling price of $12 million is to be effective. As the contractor expends cost dollars beyond $10 million, profit is reduced by 35 cents for each dollar of expenditure until suddenly a cost point is reached beyond which all expenditures must be assumed by the contractor at the rate of sharing $1 of profit for each $1 of expenditure. This is the point of total assumption. The PTA can be found by constructing a 0/100 share line at the ceiling price point.

In this example, count back $1 million on the graph from the ceiling price of $12 million to the $11 million point on the cost RIE. Next plot the point immediately above this point where the $1 million fee line intersects the line representing a $1 million cost reduction. This mechanically produces a point that can be connected with the ceiling price point. The connecting line is a firm-fixed-price line, or a 0/100 share line. On this graph, the point is opposite the $1 million profit position and above the $11 million cost position. This could have been mechanically constructed by using a $750,000 point, or a $1,500,000 point, or any amount that would produce a connecting line (0/100 share line) which intersects the 65/35 share line. The simple mechnical construction is graphically made by assuming any point where profit dollars are equal to changes in cost dollars. This equates to the FFP formula which reduces profit by one dollar for each dollar of cost expenditure. Naturally, the mechanical construction method will not plot precise dollar amounts which can be used as a contract amount; however, the precise amounts can be mathematically computed by a formula as previously explained.

In this example, the intersecting point of the 65/35 share line and 0/100 share line is immediately above the cost position of $11.46 million. Thus, at a cost which is approximately $540,000 below the ceiling price, there is a profit of approximately $540,000 (accurately $538,500). Locate this intersecting point on the graph. (PTA) (Point of Total Assumption)

The point of total assumption appears to be at a graph point of approximately $11.45 million. This approximation is close enough for use in developing an approximate PTA position or for use in developing several alternate objective points. The simple mechanical method to find the PTA point by counting back a certain dollar amount from the ceiling price and counting up an equal dollar amount on the profit scale is an acceptable short cut in graphics. This is just one example of using graphics

to provide pictorial information that is useful in describing various incentive provisions. Graphics can be easily applied to show the effect of various interdependency arrangements or to develop and portray curvilinear structures. As one becomes more familiar with graphics, he achieves a greater understanding of the potential of incentives. For some people it is much easier to move a plastic triangle or straight edge around the assumed cost points, recognizing the vertical axis as fee or profit and the horizontal axis as the cost line, than it is to compute the mathematical problems during the development of alternative incentive arrangements.

Referring to the example in Figures 3A and B, what is the effect of decreasing the target profit amount from $1,050,000 to $1 million and increasing the target cost from $10 million to $10,142,860? If the ceiling price remains at $12 million, there is no significant effect on the picture of the incentive structure. Theoretically, the target profit point could be any place on the share line between $1.5 million and the PTA point where the profit is $538,500. It is likely, however, that the contractor may increase the budgeted objective by $142,860 if the target cost is increased by that amount, but this may be an assumption without a realistic basis.

Viewed another way, what is the effect of increasing the target profit amount from $1,050,000 to $1,200,000 and decreasing the target cost from $10 million to $9,571,430? Again, there is no significant effect on the picture of the incentive structure. It was mentioned earlier the target profit (fee) point could be traded off for cost at any point on the share line if the RIE remained constant. Good judgment must be exercised, however, in making this type of trade-off because the target cost point should be the best, mutually determined estimate of cost at that point in time, and there should be an equal probability of actual costs being on either side of the cost target.

The question concerning the increase and the decrease in profit was asked because this type of trade-off might appear to be an obvious mathematical solution to compensate for "tight" or "loose" cost targets. This is not wholly true. The example started out with a target price of $11,050,000. Reducing profit and increasing cost resulted in a target price of $11,142,860 in the situation posed by the first question, while the answer to the second question resulted in a target price of $10,851,430. Thus, it is seen that there can be a significant effect on the price. The difference in price in these situations would amount to $271,430, or the difference between a price level of $11,142,860 and $10,851,430. The response to "tight" and "loose" target costs might be partially offset by increased target profits for "tight" target

costs and counteracted by significantly reduced target profits for "loose" target costs. The trade-off does not necessarily follow the sharing line that has been the objective, and the ceiling price (0/100 line) also may be a subject for additional negotiation.

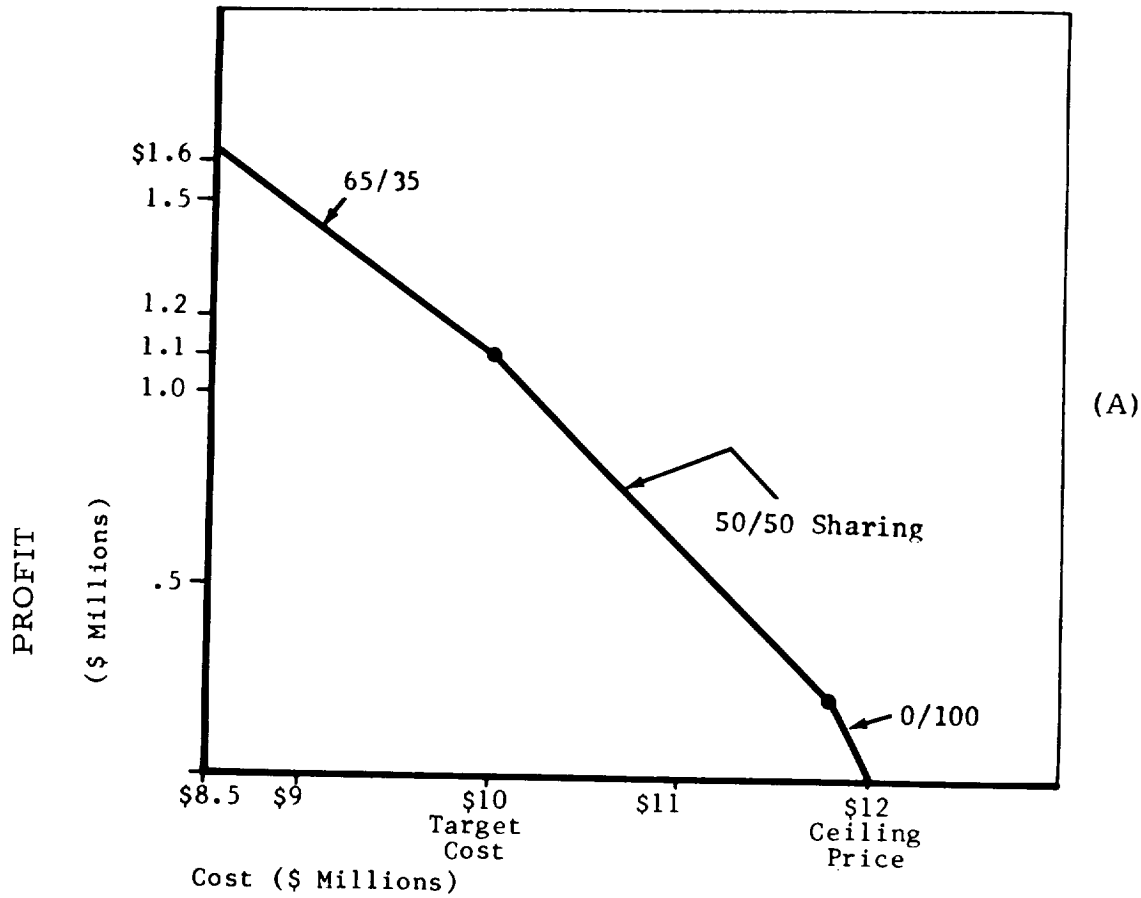
In considering the sharing arrangements for an FPI contract, the simplest arrangement is usually the most effective, and is certainly the easiest to accept contract changes. Straight-line sharing, or two broken lines at the most, will easily identify the profit lost or gained for each cost dollar expended or saved.

The general slope of the share line on either side of the target point will be determined after a case-by-case analysis of several factors, including consideration of the extracontractual factors. Precise analysis is impossible. After all, it is inconceivable that there might be a variation in the effect between a 60/40 sharing rate and a 58/42 sharing rate. At the same time, it is easy to understand the effect of the difference between a 50/50 rate and a 65/35 rate. The rate should be as steep as possible -- steep enough to serve as positive motivation for efficient management and steep enough to motivate the achievement of higher performance goals. Naturally, as the share line becomes more shallow, approaching the 75/25 rate, the ceiling price is generally a higher figure. On the other hand, there is no precise formula for this decision, and the ceiling price is not extended just because of a shallow sharing rate.

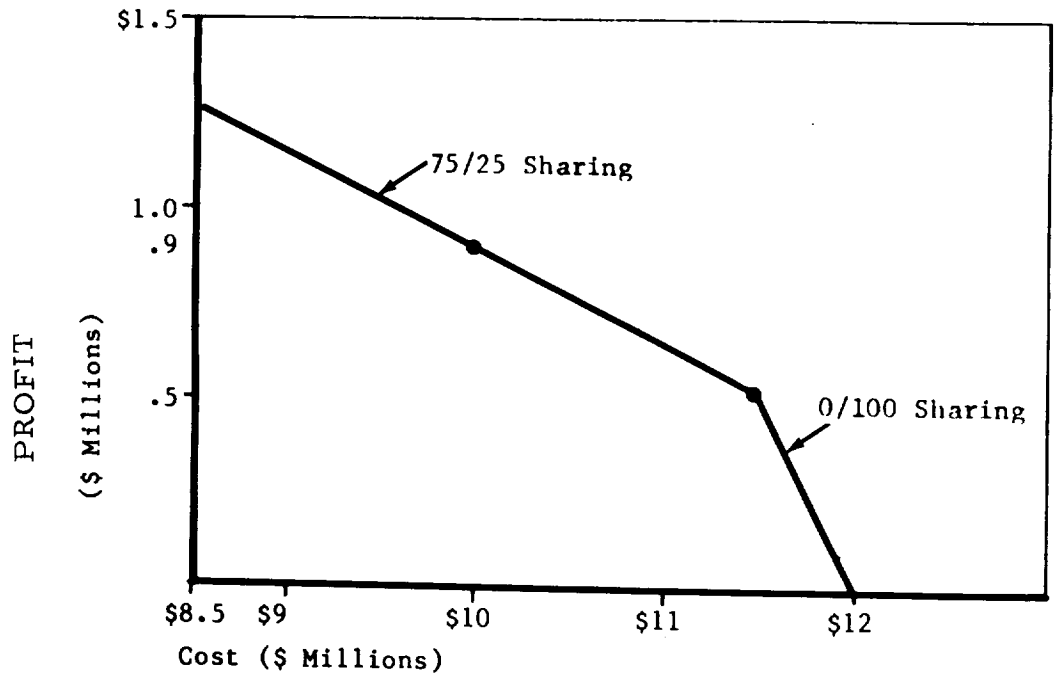
Figure 4B and 4A show graphic portrayals of the 75/25 sharing rate over and under the target cost and the 50/50 sharing rate for over target and 65/35 under target applied to the same RIE which has been used in previous examples. While the RIE has been retained between the amounts of $8.5 million and $12 million, with the same target cost of $10 million, assume the amount of profit has been increased through negotiation to $1.1 million (11%) in the 50/50 sharing example (A), and the amount of profit has been decreased to $900,000 (9%) in the 75/25 sharing example (B). Obviously, these structures represent different situations, and represent the effect of changing target profit during negotiation. This can result, of course, in a broken share line as shown in Figure 4A. The one thing that both examples have in common is the ceiling price -- the maximum price of $12 million which the Government is willing to pay. This price is effective at all cost points which are equal to or greater than the cost ceiling or PTA in all of the FPI examples.

The FPI arrangement always reflects the fact that the contractor is guaranteeing the scheduled delivery of products meeting the minimum specification of the contract. Thus, the different situations reflected by

FIXED PRICE INCENTIVE
(SHARING EXAMPLES)



(A)



(B)

FIGURE 4

the different arrangements in Figures 4A and 4B might be caused also by the difference in changing the minimum acceptable specifications and firm delivery schedule negotiated for each of the previous two examples. If exceptions are taken which relax specifications, the effect will be to decrease target cost or over-stated target cost will result. It is particularly important to note that there can be degrees of uncertainty in meeting higher performance goals under multiple incentive contracts but there must be no uncertainty in the fact that the target cost under a cost-only FPI contract is based on measurable, minimum acceptable performance goals.

As previously stated, the ceiling price in combination with the level of minimum acceptable performance is the actual risk indicator of the contract. Diligence and good judgment in pricing should define a reasonable target cost. The amount of potential profit above the target profit which is attainable at the lower end of the RIE is the increased profit potential payment for increased value. Thus, the higher profit potential should not be used as a balancing feature to make an "equitable adjustment" for the effect of the ceiling price. The balancing aspect, if one is considered, is found in the amount of the target profit.

The ceiling price represents the maximum price the Government is willing to pay for the product -- above the ceiling price (as above the PTA) the contractor pays 100% of all costs -- below the ceiling price, all profits (above the cost line) should represent earned profit.

The DoD preference for FPI contracts is appropriate for development effort whenever based on reasonably firm technical definition even though the cost uncertainty suggests a high ceiling price.

F. GRAPHICS -- COST-PLUS-INCENTIVE-FEE - COST-ONLY

The ASPR Manual for Contract Pricing described the graphic structure of the CPIF contract as two horizontal CPFF lines representing minimum and maximum fee and separated by an incentive share line -- or broken share lines. Thus, there are three possible contracts in the one structure. If the incentive provisions run out at an early point in contract performance because of unforeseen technical difficulties or because the RIE was not adequately defined, the contract will revert to a CPFF situation in which little or no emphasis may be placed on cost control.

It is easy to mechanically construct a straight cost incentive. The graphic structure depicts the variable cost and fee outcomes and shows how the contractor's fee increases or decreases as actual costs incurred are below or above the contract target cost. The first consideration in graphics usually centers around the construction of the share line.

While the Guide has already stated that the share line may have been "automatically" determined by the minimum/maximum fee points and the RIE, it is not that simple. Share line while not totally dependent on other factors should not be totally independent. It is interdependent with several factors and therefore must be a part of the simultaneous negotiated agreement on all factors. Figure 5 graphically portrays some of the infinite number of incentive share lines available.

Figure 6 in this part will show a negotiated CPIF contract with a 75/25 share line. This means, of course, that the contractor has assumed through the share ratio effecting profit a portion of the risk for every dollar of cost which is incurred within the RIE. The contractor shares 25 cents through profit adjustments of the cost of every dollar spent in the range of incentive effectiveness. Another view could be that the contractor earns 25 cents out of every dollar saved, not only the dollars below the target cost, but in every dollar below the most pessimistic cost point (i.e. $12 million). Thus, the entire sharing arrangement is designed to motivate cost control. It can be viewed as a positive motivator in all respects, although the sharing beyond the target cost is often viewed as an incentive "penalty".

Figure 6 shows the construction of a 75/25 share line. The share line is constructed after the RIE has been determined and after a tentative target cost and target fee are determined as appropriate objectives.

In Step 1, assume that an RIE ranging from $8.5 million to $12 million has been determined to be the most probable range of cost outcome and that a reasonable profit at those points are $1,175,000 and $300,000. Also assume that the most probable target cost is approximately $10 million and the fee value at that point is tentatively established at $800,000.

Step 2: Locate the intersection of the $10 million target cost line and the $0.8 million fee line. Locate this point on the graph. (T) (Target)

Step 3: Assume a cost position of $8.5 million; locate the intersection of the $8.5 million cost and the intersecting fee line. The

SHARE RATIOS

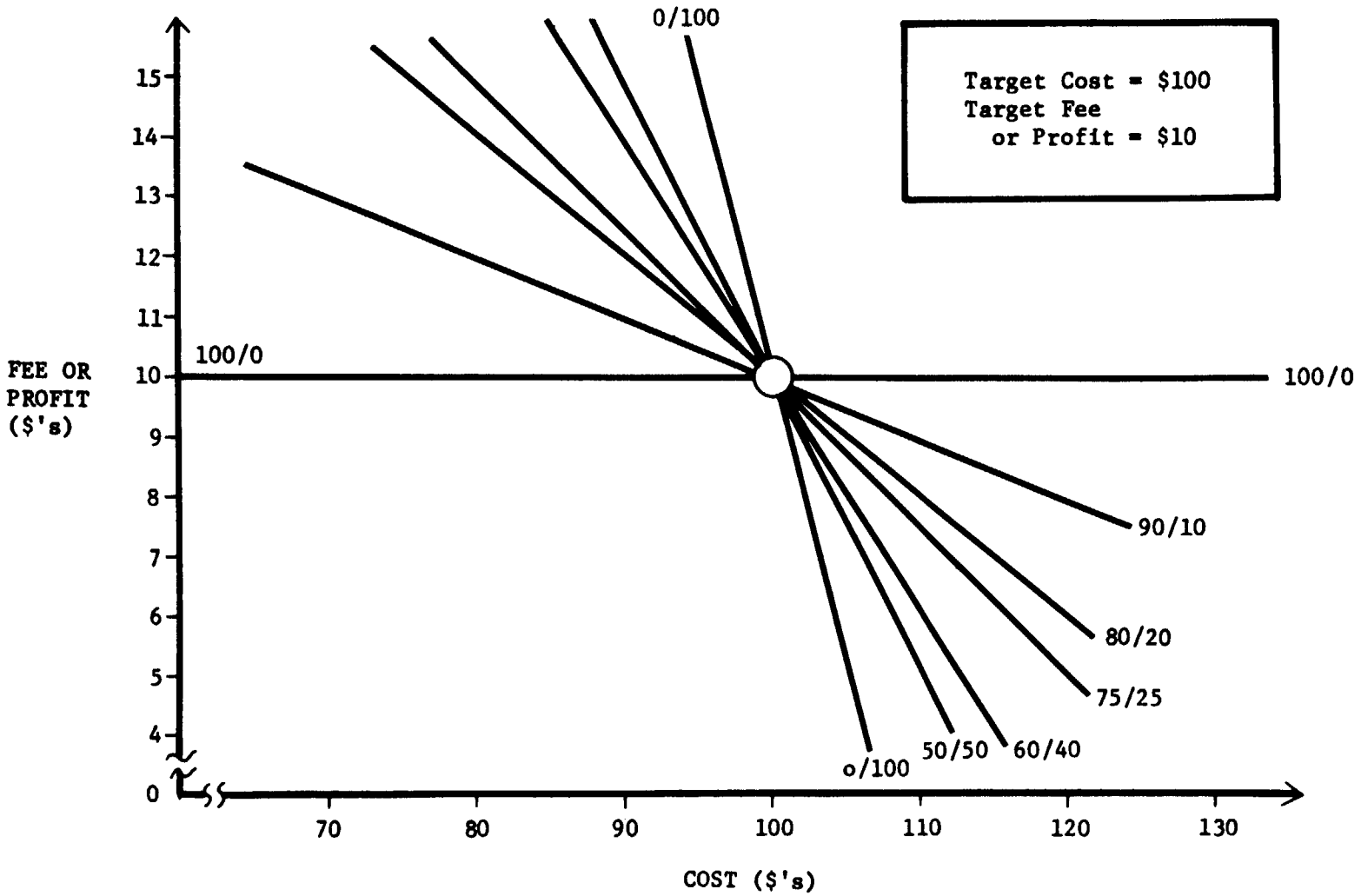


FIGURE 5

COST PLUS INCENTIVE FEE

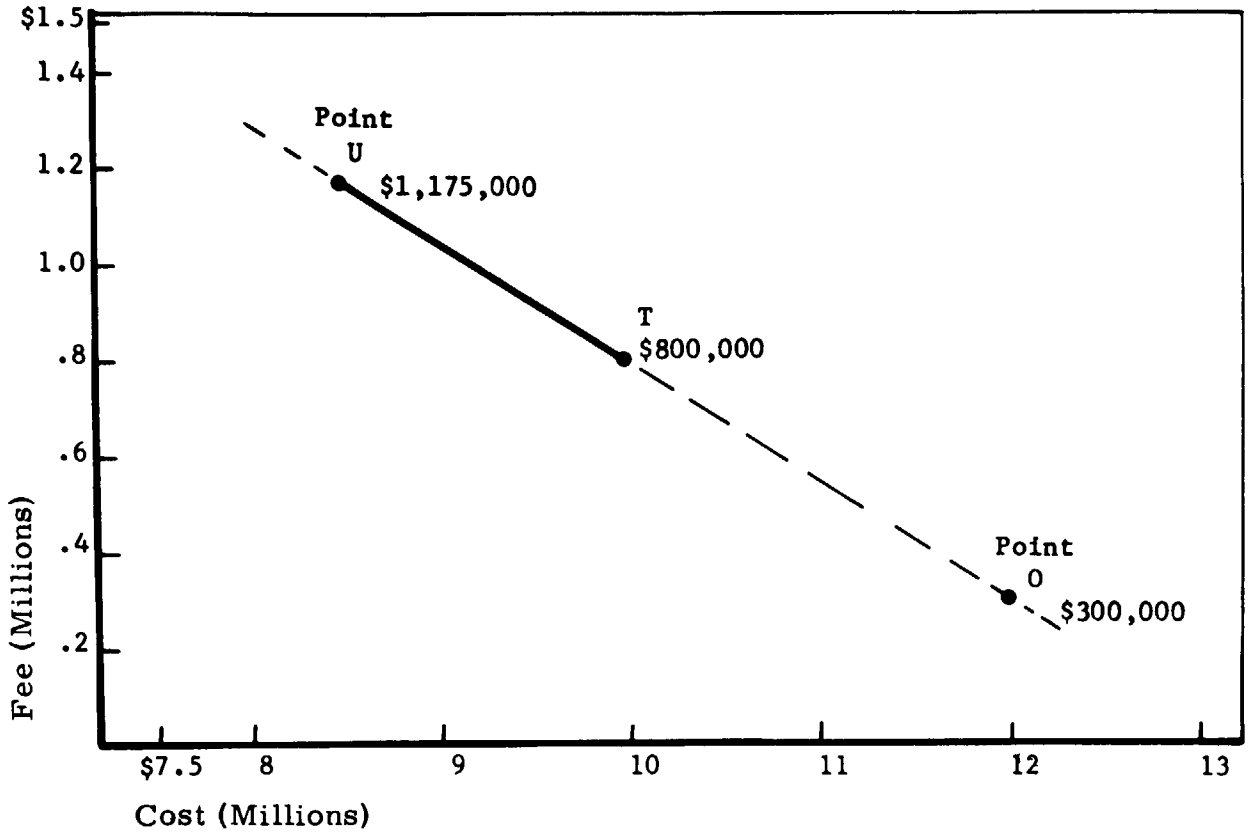


FIGURE 6

fee value is associated with the assumed cost. The sharing rate of 75/25 determines that the incentive reward will be 25 per cent of the underrun -- in this example, 25 per cent times $1.5 million equals a fee increase of $375,000. The intersecting point would be opposite the fee position of $1.175. Locate this point on the graph. (U) (Underrun) Connect point T and point U, extending the line beyond either point.

Step 4: Assume a cost of $12 million. The intersecting point of the $12 million cost line and the $300,000 fee line will be at point O.

The formula - $CS = \frac{\text{Fee Pool}}{\text{RIE}} = \frac{875,000}{3,500,000} = .25$ identifies the 75/25 sharing rate. This can be proofed by applying the share to the assumed overrun. At the assumed cost of $12 million, the 25 per cent contractor's sharing in the overrun would equal $500,000. Thus, the intersecting point would be the $12 million cost point and opposite the $300,000 fee point on the graph. Point O (Overrun) is found to be on the extended 75/25 share line.

Any of the points would represent earned fee.

The slope of the share line is constrained by the minimum/maximum fee points and the RIE. In the example, in order to hold a 75/25 share line in Figure 6 and achieve a maximum fee rate of 15 percent and a minimum fee rate of zero per cent would require the RIE to extend from $7.2 million to $13.2 million (28 per cent underrun and 32 per cent overrun -- see Figure 6). If it is highly unlikely that costs will be outside of a range of $8 million to $12.5 million, then the wider RIE is meaningless. If a maximum fee of $1.5 million and a minimum fee of zero and target fee of $800,000 and the RIE were predetermined in the example, the sharing rate would be automatically determined to be 65/35 for underruns and 68 / 32 for overruns. The very steep sharing may not always be appropriate for the CPIF situation. But clearly the final cost to the Government of $9,500,000 at minimum cost rather than $10,800,000 at target cost makes the fee value at $8 million worth a 18.8 per cent fee rate to the Government. Also, it clearly offers real motivation to the contractor.

Conversely, an overly conservative share line covering the same RIE may produce such a small fee pool between minimum and maximum fee that the effect is almost the same as a CPFF situation. A 90/10 share line would result in a fee swing around target between $550,000 to $1,000,000. This hardly represents any reward or penalty to the contractors and is little more than a CPFF contract.

Look at Figure 7. The graph permits a comparative view of the limiting or motivating effect of the three sharing situations which have been described.

G. BROKEN SHARE LINES

Now that we have seen a CPIF graphic example, there may be several other questions regarding the basic mechanics. One question usually centers around the construction of the broken share lines. All incentive guidelines have emphasized that the CPIF contract should be negotiated so as to provide the widest practicable fee pool that is appropriate for the individual situation. There may be occasions -- due to negotiation leverage -- where the differences in above and below target situations will result in different sharing rates for different cost variations. This may permit a wider fee pool in certain cases. The requirement for a different motivating effect may be another situation which dictates the use of different share lines above and below target cost. Often, however, an over-reliance on target cost position or negotiation weakness dictates the use of broken share lines in a cost-only incentive contract. Usually this takes the form of a decrease in contractor sharing in overruns. There have been instances where a break in a share line has been located at a point which is a variance of five or ten percent of target cost on either side of the target cost point. There have been examples, of course, of three or four, or more, different sharing arrangements in a single CPIF contract structure. This practice is not recommended. It becomes difficult if not impossible to develop a rationale for a 70/30 share in the cost to spend $100, and then state that the share in the next $100 should be 85/15. There is certainly no precise point where risk or responsibility or cost control opportunity should be doubled, or reduced by half. Generally, a contractor's reward for cost control should start with the planning to spend the first dollar and should be constant and as high as is justified.

Multiple sharing arrangements are also difficult to administer because the effect of changes may completely change the original intent concerning the risk and the probability of cost incurrence which was structured into the original contract. The contractor's indicated cost incurrence position, either over or under target, should be taken into consideration when changes are introduced into the incentive structure having multiple sharing arrangements.

Relatively shallow sharing slopes near target or a plateau (no sharing) are not recommended. There is no sound rationale for creating a CPFF arrangement in the middle of the RIE and incentive structure. The plateau should not be used to resolve impasses because it eventually impacts adversely on the contractor as well as the Government. The plateau degrades the incentive. Thus, the practical effect is to accede to the contractor his negotiation position.

COST PLUS INCENTIVE FEE

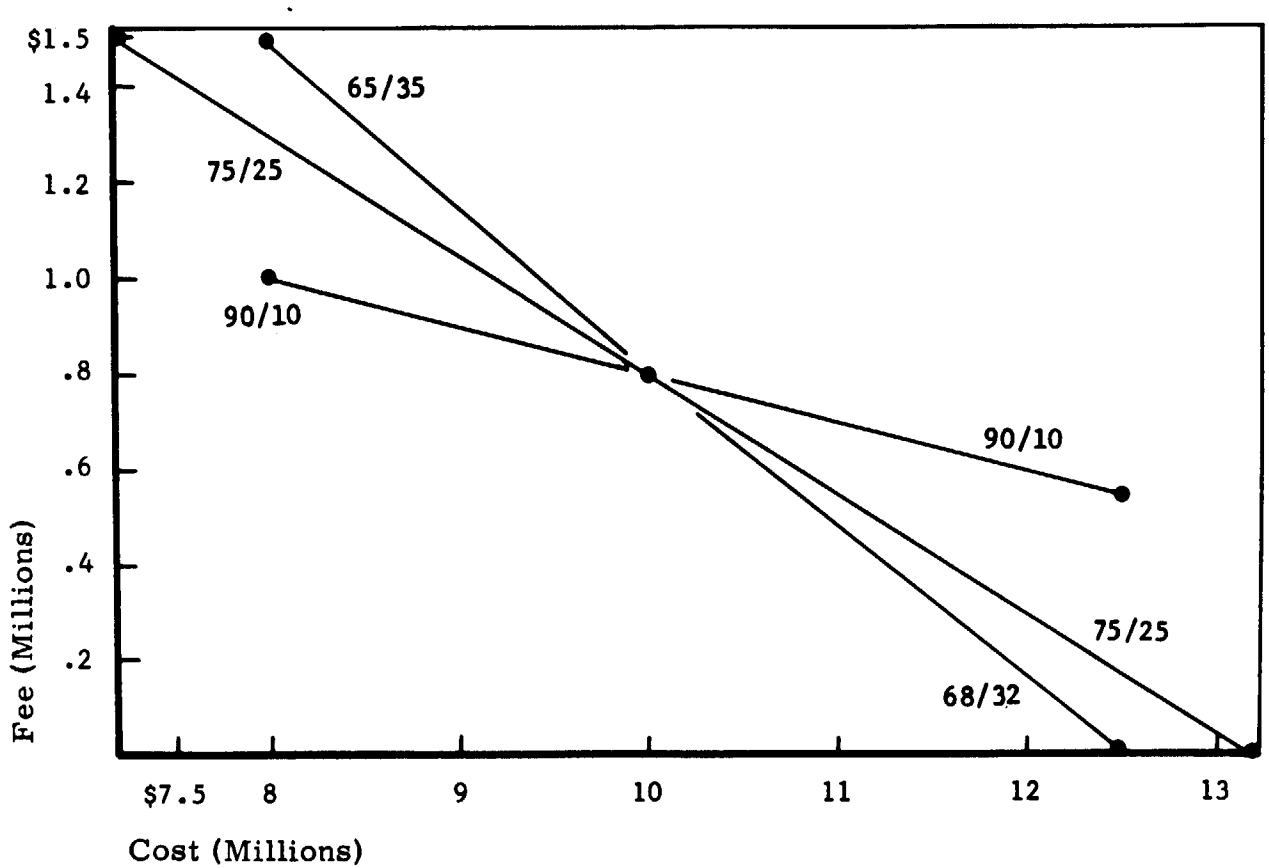
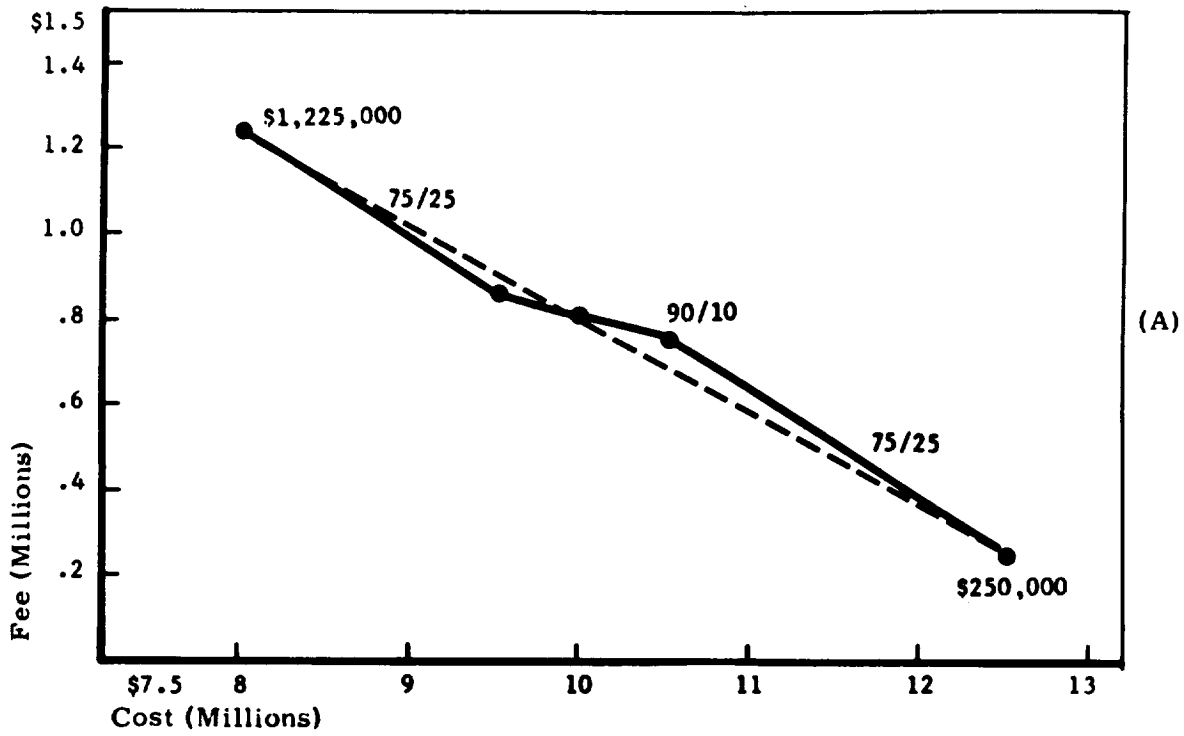


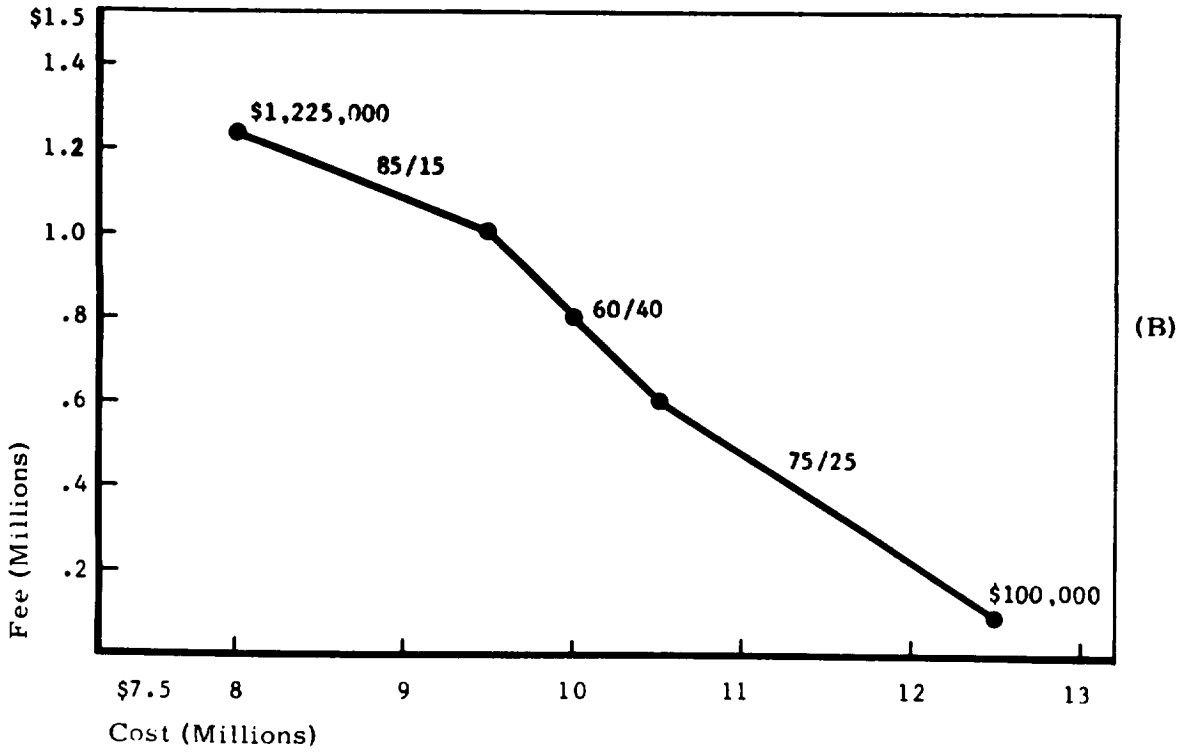
FIGURE 7

COST PLUS INCENTIVE FEE

(BROKEN SHARE LINES)



(A)



(B)

FIGURE 8

Figure 8 illustrates two types of broken sharing arrangements. Figure 8B is generally preferred over 8A because it provides the strongest motivation in the relatively narrow area where the cost outcome should be most probable. It also provides strong, continuing motivation to control cost in the extended area of possible cost overruns because of the lower minimum fee.

The dotted line drawn through Figure 8A, however, shows what little effect the broken share line has on the total agreement. It appears that the arrangement has been unnecessarily complicated and confused.

H. BROKEN SHARE LINES - MULTIPLE INCENTIVES

The usual objection to broken share lines in cost-only incentive is that they generally tend to over-complicate the agreement or result solely from a weak or poorly conceived negotiating position and are seldom an improvement over a straight line. The objection to their use in multiple incentive contracts is that they can negate or even reverse the Government's proposed trade-off objective if not properly evaluated.

When broken share lines are used in multiple incentives and evaluated in terms of the visibility tools explained in the next chapter, they can be effective. If they are not properly evaluated through trade-off curves, performance ordering tables, nomographs, etc., as discussed later, they can destroy the Government's value statement completely.

This can be illustrated by the following case example. Figure 9 shows a straight cost curve and a rather elaborate performance curve. When combined in the trade-off curve shown in Figure 10 the following is revealed. From 0 to 750 points and from 6000 to 12000 performance points the contractor can spend from $80 million to $120 million with very little loss of fee. Actually, the $40 million could be spent and the contractor would remain on the same iso-fee line by going from 0 points at $80 million to 450 points at $120 million. On the minus $5 million iso-fee line, however, the contractor can go from $80 million to $110 million if he gains an increase of only 300 performance points but in order to stay on the same fee line from $110 million to $120 million he has to gain 3600 performance points.

Another way of expressing the inconsistency in the way this contract "communicates" the Government's value statement is in terms of fee above and below target. At target cost, the contractor needs to earn 3600 performance points to move from the minus $5 million up to the minus $4 million iso-fee line. However, at target cost and 6000 points, an additional 3600 points will earn $12 million in fee.

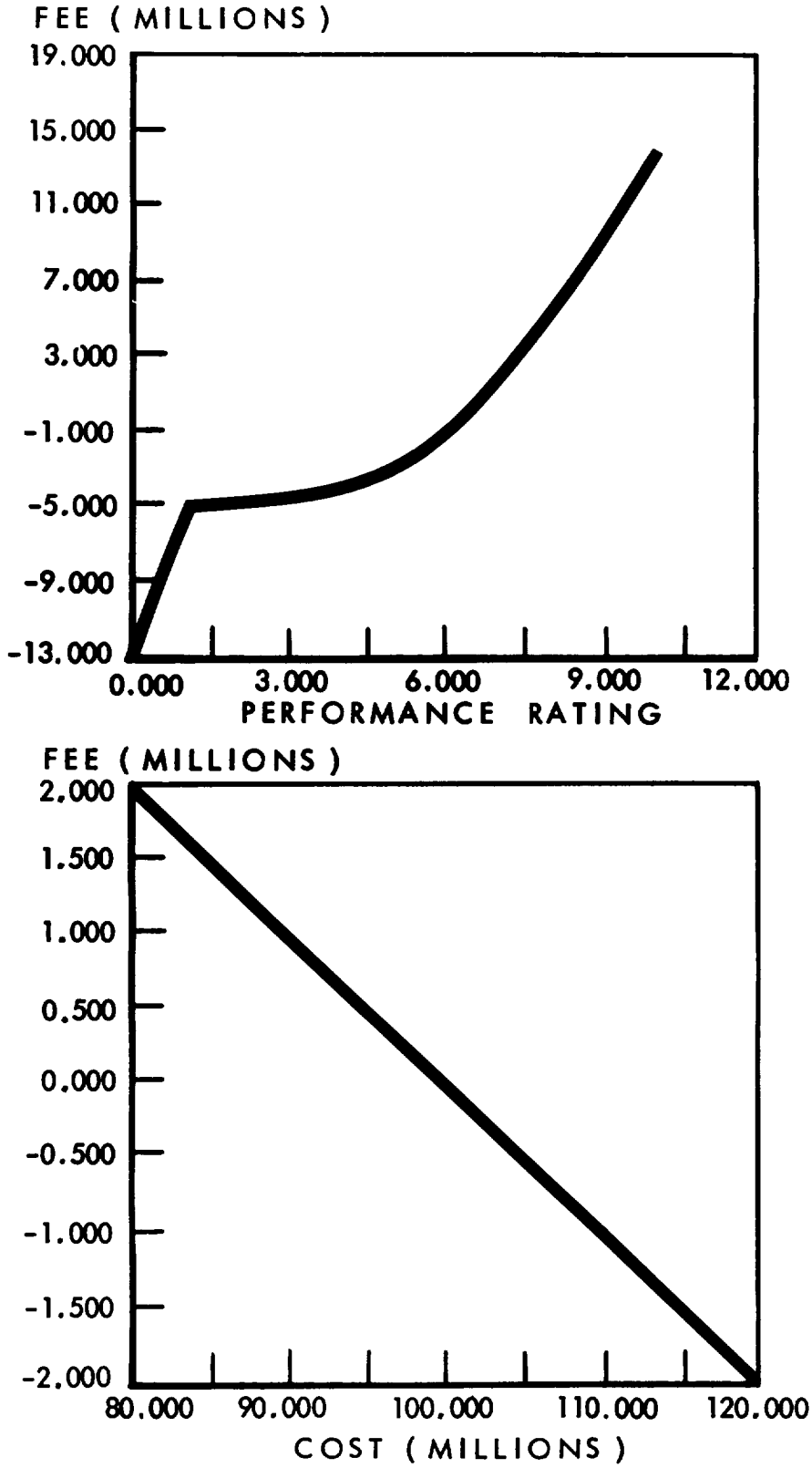


FIGURE 9

364-685 O - 69 - 8

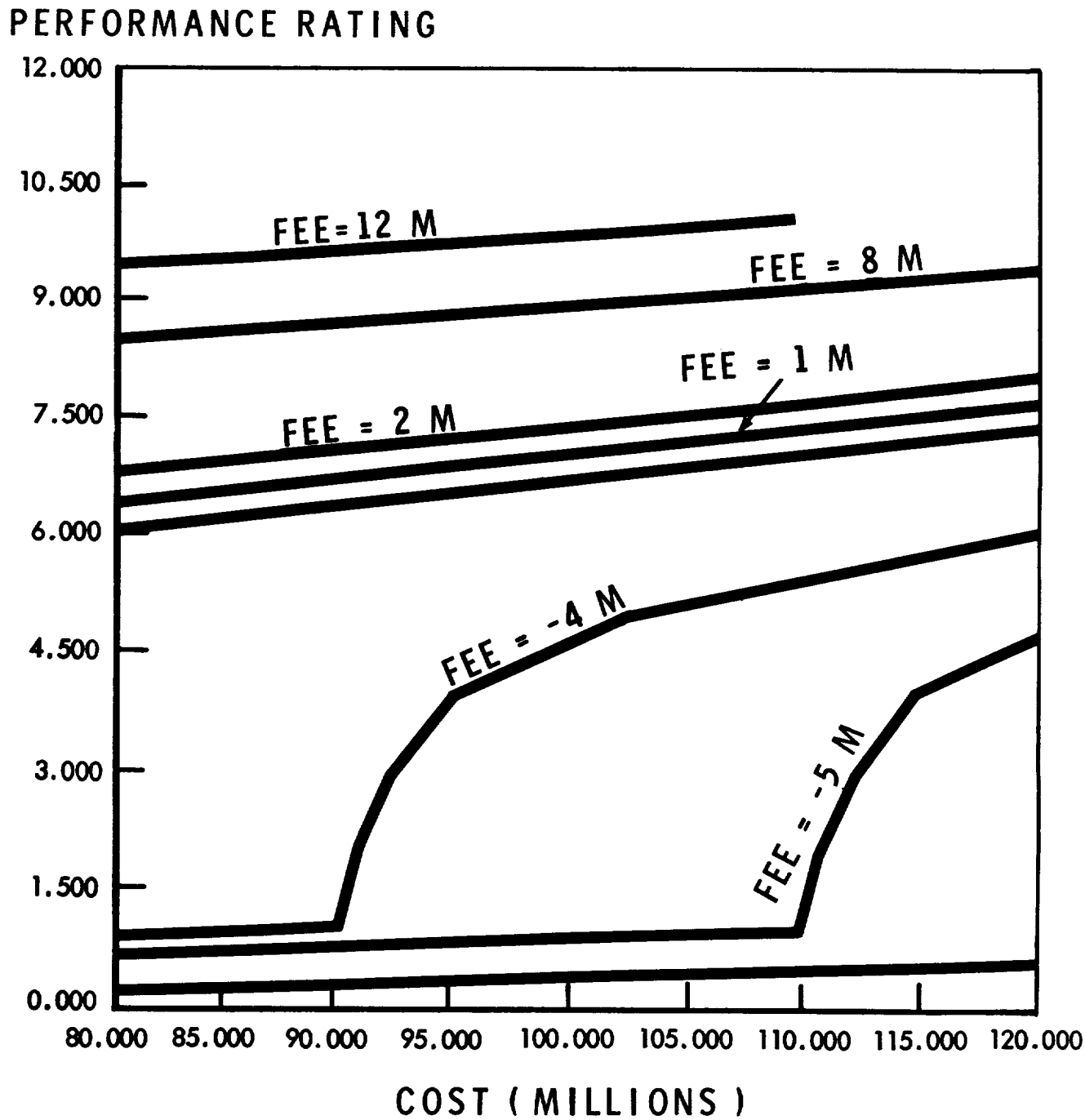

PERFORMANCE RATING
12.000
10.500
9.000
7.500
6.000
4.500
3.000
1.500
0.000
FEE=12 M
FEE = 8 M
FEE = 1 M
FEE = 2 M
FEE = -4 M
FEE = -5 M
80.000
85.000
90.000
95.000
100.000
105.000
110.000
115.000
120.000
COST (MILLIONS)

FIGURE 10

It is difficult to understand why 3600 points above target are "worth" 12 times as much above target as 3600 points below target.

With the visibility tools -- both manual and computer generated -- discussed in the next chapter, a complete trade-off capability related to value can be easily achieved.

CHAPTER IV

MULTIPLE INCENTIVE CONTRACTS

A. INTRODUCTION

Multiple incentive contracting combines the motivation for technological progress, timely delivery, and effective cost control with the ultimate objective of attaining an appropriate balance between performance, schedule, and cost control -- not necessarily the lowest cost. Obviously, in cost-only incentives, the emphasis is on the attainment of the stated performance achievement level at the lowest cost.

To be sound, the concept of multiple incentive contracting must quantitatively relate profit motivation directly and in accordance with the Government's objectives. Multiple incentives must identify the alternative technical levels of performance and place the relative value on the alternatives as affected by the inherent interrelationship between cost, performance, and schedule decisions. Quite naturally, the objective is to emphasize the appropriate application of multiple incentives because multiple incentives can be useless, even detrimental, if they are either improperly developed or inappropriate.

Multiple incentives should be negotiated within a structure which gives appropriate weight to basic procurement (and program)objectives. This includes a balancing of the range of cost and performance goals. The proper balancing of objectives achieves two important results that have not always been achieved in the past: first, it communicates the Government's objectives to the contractor; second, and of greater significance, it establishes the contractor's profit in direct relationship to the value of the combined level of performance in all areas. It should be assumed that the contractor might be concerned with trade-offs between cost and performance during the execution of the contract and, thereafter, the multiple incentive structure should guide him in revising his plans as expectations might change. In the absence of a clear communication of the desired Government objectives, this is impossible. The contractor's program and administrative management procedures must provide visibility for trade-offs. Further, the time to establish the desirable trade-offs for the Government is prior to the award of a contract or definitization of a change order; after the agreement is signed, it is often too late.

In earlier guidelines, it has always been the premise that the contractor should be motivated to strive for outstanding results in all three incentive areas of cost, performance, and schedule, as if all

three were achievable. In the event that it was apparent that all three outstanding results could not be achieved, the trade-off decisions should be made in consonance with the balancing of the mutual interests of the Government and the contractor.

It does not necessarily follow that multiple incentive contracts in the past have been designed to achieve this objective. The reason for this failure seems to fall under two headings. First, the achievability has not always been fully considered by either party to the agreement. As a result, the contractual "maximum fee" was neither achievable nor meaningful. Much of the fee assigned was wasted as a motivating force. In other words, the probability of meeting maximum performance at minimum cost -- thus, earning maximum fee -- did not exist. Second, the practice has usually been to treat all elements of the incentive arrangement independently and therefore as competitive with each other rather than recognizing that there is no such thing as an independent variable in a multiple incentive contract.

All multiple incentives must have a cost incentive. 1/ Even a firm-fixed price contract with performance incentives has a sharing ratio (i.e., 0/100). Specifically, all performance weighting is ultimately reduced to a profit base. For this reason, all performance elements are automatically related to the cost sharing ratio. For example, under a FFP contract, the cost/performance correlation is 1 to 1. Under a FFP contract with a performance bonus, for every dollar the contractor spends, a dollar must be earned of performance incentive profit in order to break even. Similarly, under an 80/20 share, the contractor can spend $5 to earn a dollar of performance incentive profit and retain the same profit.

In order to determine the dollar cost-equivalent ratio a contractor can spend to achieve a level of performance, divide the percentage fee assigned -- or the incremental difference in fee -- by the contractor's portion of the cost sharing ratio. For example:

Assume an 80/20 sharing ratio and 1 percent performance fee,

Then: $.20 \overline{)1.00}$ = 5.

Thus, for each dollar of performance fee the contractor can spend $5 of the cost RIE and remain on the same total fee curve or level (i.e., 1% fee = $1 fee, $1 fee x 5 = $5 cost equivalency).

1/ ASPR 3-407.2(c), NASA PR 4-307.2(c)

Obviously, this applies equally to the determination of cost-equivalency regardless of whether the fee is assigned to the cost incentive or the performance incentive (i. e., under an 80/20 cost incentive, the contractor earns $1 for every $5 he avoids spending).

It is axiomatic that under multiple incentive contracts, the performance incentive and cost incentive are inextricably interrelated -- through profit. They are not discrete elements that can be considered independently.

Quite apparently, the RIE's constrain -- or eliminate, if you will -- this relationship. Also, a change in sharing ratio (e.g., the point of total assumption breakpoint in an FPI contract) would change the cost-equivalency ratio and could thus disrupt the planned trade-off relationship. This is one of the reasons a single share line is usually preferred. Section D. on Performance Incentives will discuss techniques for arriving at varying values of performance increments where appropriate: in other words, the methods to be used where the value of performance changes between minimum and maximum levels.

It is reasonable to assume that trade-offs are made by contractors' management during the prenegotiation phase, at the negotiation table, or during the contract budgeting effort. Later trade-offs are limited generally to relatively minor decisions or where a major difficulty has occurred. It is essential, therefore, that the Government execute a contract agreement based upon a complete evaluation and understanding with the contractor regarding the expected trade-off results -- or the profit to be earned for any given combination of results.

Most contractual situations are constrained by the practical consideration of technical knowledge, budgetary limits, and changing conditions which affect either technical performance or the availability of funds within certain periods. It may not always be feasible or desirable to hold the same objectives throughout the duration of a developmental effort. Therefore, it is necessary to recognize the need for redirection and flexibility. This does not mean that the original selection was incorrect -- many factors may change conditions from those originally foreseen, however, redirection must be by contractual means.

As a simple introduction to multiple incentives, under FPI or CPIF structures, assume as an example that a target profit (fee) of $7 and a target cost of $100 have been negotiated as part of a multiple incentive structure; the other factors involve a cost sharing arrangement of 75/25, a performance incentive reward of +$3, a performance

incentive penalty of -$1, and a schedule incentive penalty of -$1. At a realized cost of $84 under the 75/25 incentive share, and at maximum performance on schedule, the contractor's earned profit would be $14 ($7 target, plus $4 cost share, plus $3 performance incentive). At a realized cost of $116 under the 75/25 incentive share, and at par performance and late delivery, the contractor's earned profit would be $2 ($7 target, less $4 cost share, less $1 schedule penalty). Assuming outstanding technical performance under the latter example, the contractor's earned profit would be $5.

If we look at the relative weightings of the simple multiple incentive example (assuming a cost RIE of ±20% and the single 75/25 sharing ratio) utilized in the previous paragraph, we see the following:

	Positive Incentives (Rewards)	Negative Incentives (Penalties)
Cost	+$5.00 (62.5%)	-$5.00 (-71.4%)
Performance	+ 3.00 (37.5%)	- 1.00 (-14.3%)
Schedule	None	- 1.00 (-14.3%)
Total	+$8.00 (100%)	-$7.00 (100.0%)

Maximum Fee = $7.00 + $8.00 = $15.00 (15%)
Minimum Fee = $7.00 - $7.00 = $0 (0%)

This is a compartmentalized incentive structure with each factor presumed to be operating independently; however, as stated earlier there is always an inherent interrelationship where one factor impacts on another factor.

In the past, many incentive contracts were "structured" as simply as the example used. Specifically, the factors were either assumed or backed into by selecting predetermined limits (such as 75/25 share, 15% fee pool and "weighting" the pool -- cost 10% fee, performance 4% fee and schedule 1% fee). The question that should be asked now is how these factors were selected. For example, why the 15% fee pool? Was it because that is the regulatory limit imposed, which requires higher level approval to exceed?1/ Or was it because 15% was considered a fair profit for maximum performance, on time, and at minimum cost?

What about the assignment of weight between cost, schedule, and performance? Was it because the cost saving of $40 was worth $10

1/ ASPR 3-405. 4(c) and NASA PR 3.450(f). Under these provisions, fees in excess of 15% for R & D must be referred to higher level for approval.

and therefore on a cost equivalent basis that schedule was worth

$\$4 \left(\frac{1}{.25} = 4\right)$ and performance worth $\$16 \left(\frac{4}{.25} = 16\right)$

Another series of questions which should be asked:

- Is minimum performance, and late delivery, at minimum cost worth $10 of fee?
- Is minimum performance, and late delivery, at target cost worth $5 of fee?
- Is maximum performance, and late delivery, at target cost worth $9 of fee?
- Is maximum performance, and late delivery, at maximum cost worth $4 of fee?

There is really nothing wrong with this approach if the answers fit the questions -- the key to a successful structure is asking the right questions and then being able to supply the right answer. As can be demonstrated from this simple example, some of the answers can be quite complex.

In this case, we have told the contractor that the "value" to the Government of going from minimum performance to target performance is "cost equivalent to $4" ($1 fee),while going from target performance to maximum performance is worth $12 ($3 fee). Why then is it worth three times as much to exceed target performance as it is to achieve target performance? Why should the Government be willing to pay 20 actual cost dollars ($80 to $100) to achieve target cost and only 1 actual dollar to achieve target performance when it is willing to spent 40 actual dollars ($80 to $120) but only penalize the contractor a fee of 5 actual dollars for "poor" performance?

Or as in this case, why should the Government pay only $95 ($80 Cost + $15 fee) for maximum performance in all three parameters when it is also willing to pay $120 ($120 + 0) for minimum performance in all three parameters? Is the minimum system really worth $25 more than the best results?

Wouldn't the Government achieve a better arrangement by offering the contractor the $95 for target performance at minimum cost or, even more realistically, pay him $115 ($100 cost + $15 fee) for maximum performance at target cost?

In the past, nearly all incentive contracts have been structured so as to require the contractor to deliver a product meeting maximum performance requirements, at earliest delivery, and at minimum cost in order to "earn" maximum fee. If our previous definition of target cost--the most probable cost outcome at target performance -- is correct, then is it realistic to assume that the contractor can achieve minimum cost at maximum performance? If it is, then the incentive is meaningful. If it is not, then, of course, the so-called maximum fee is meaningless and wasted.

It is suggested that in most CPIF-multiple incentive contracts that the Government's best interest would be served by receiving a product satisfying the "maximum performance" requirements at target cost--thus, justifying a maximum fee to the contractor.

Certainly, it seldom appears reasonable that the "value" to the Government is such that it would pay less actual dollars--in terms of cost equivalency--to reach target performance than to exceed target performance. While the cost/performance relationship could well be equal above and below target, it seldom--if ever--should be less between minimum acceptable and target than above.

Where target performance is of significant value to the Government, the contract may provide that no cost incentive fee can be earned unless target performance (or where appropriate, an acceptable performance level) is obtained.

The other side of the coin is to prevent massive overruns by charging to performance fee, costs exceeding a specified amount. (See page 174, Protection Against Massive Overruns.)

Techniques for properly developing the relative value to the Government for incremental changes in performance will be discussed in Section D. 1.

B. TARGET COST

This Guide will consciously over-emphasize the establishment of the minimum and maximum position of the range of incentive effectiveness, because it is believed that often not enough attention has been devoted to these critical elements in past incentive contracts. As stated, however, the target cost is usually basic to the successful completion of an incentive arrangement. Especially in multiple incentive contracts it is essential that the target cost be based upon a specified performance level.

In a cost-only incentive arrangement the target cost is based upon minimum acceptable performance. In a multiple incentive contract this may or may not be the case. Here, however, there should always be a deliberate effort to evaluate any cost variation between minimum, target and maximum performance. If there is a real possibility of variation from target cost based upon the levels specified then consideration should be given to the techniques described in Chapter VII, Exceptional Method of Structuring Multiple Incentive Contracts. Often this element can be accommodated by the proper assessment of the "value statement"--e.g., placing maximum fee on achieving results on other than outstanding performance in all areas. As previously stated, the Government's objectives maybe satisfied by either receiving target performance at minimum cost or receiving maximum performance at target cost. Paying maximum fee under either condition will often result in a lower cost to the Government. It should naturally follow that minimum fees for failing to achieve target cost or performance would be lower than under the so-called conventional arrangement.

Obviously, the essential ingredient is the establishment of good targets within a determined range of incentive effectiveness.

The precision with which the performance objectives can be defined and measured will largely determine whether or not a multiple incentive is appropriate.

A multiple incentive contract with performance aspects interrelated with the range of probable cost is designed to motivate the contractor to achieve or surpass stated performance levels or goals. Multiple incentive features provide for increases in the fee to the extent that performance levels are reached or exceeded, and provide for decreases to the extent that these levels or goals are not met.

Performance incentives in multiple incentive contracts can be either rewards-only (usually recommended for FPI contracts) or penalty-only, or can be a combination type with a potential for rewards for performance achievements which surpass stated goals and penalties for achievement levels which are below stated goals but above minimum acceptance levels.

By the selection of a CPIF contract, both parties have agreed that the cost and performance uncertainties are such that a wide range of outcomes is possible. If the design, specification, and performance requirements are relatively firm, an FPI contract would have been considered. At the same time, the cost and performance uncertainties in

a CPIF type must not be unlimited. The range of probable cost and the range of performance must be realistically defined within limits that still permit meaningful incentives to operate. It is not enough to have "some incentive" in this type of arrangement as "token incentives" can be more detrimental than no incentive at all.

A multiple incentive which includes performance may cost money in a contractual sense in the instant contract, but can have a strong potential for lower overall cost, or increased cost effectiveness. At times it may cost more money to improve performance but it does not cost more money to provide effective management to assure improved performance. It will be presumed that the multiple incentive can guide as well as influence contractor efforts toward improved performance. If the level of performance will occur anyway, without the multiple structure, the incentive is useless and may be costly.

It is important that the phrase "balanced incentive structure" is properly understood. A balanced incentive does not mean that half of the incentive fee pool is allocated to rewards and half is allocated to performance, or a 33-1/3 percent allocation to each of the cost, performance, and schedule areas. A balanced incentive structure will identify alternative technical levels of performance, and the relative fee value for each of the alternatives at various cost positions and will communicate the Government's priority for preferred actions. The fee level for any combination of achievements should be in direct relationship to the Government's value statement for that particular level of overall achievement. Thus we see that equal allocation is not implied -- but rather that the desired emphasis is properly balanced with the procurement objectives.

Even in the simplest multiple incentive contract, there will be a large number of combinations of cost and performance which may yield the same fee. This effect is called a constant fee curve when it is plotted on a graph. For many operations, manual mathematical computations may be used to produce rough plots of the curve. For complex contracts, for major contracts, or for any arrangement involving several performance parameters, it is recommended that available computer programs be used to develop the curves. The computer plays a time-saving role in comparing the proposed structures with the objectives.

C. MULTIPLE INCENTIVE CONTRACTING SERVICES

The Program Office for Evaluating and Structuring Multiple Incentive Contracts (POESMIC) has been established to provide all Army, Navy, Air Force, and NASA procurement installations with the following services:

- A computer capability to aid in analyzing, evaluating, and structuring of multiple incentive contracts.

- Technical advice and assistance to program users.

- Research in advanced multiple incentive methodologies and related topics.

The Air Force Space and Missile Systems Organization (SAMSO) of the Air Force Systems Command was assigned responsibility to provide these services on 1 April 1968. The use of POESMIC's services is required on all new Army, Navy, and Air Force multiple incentive contracts over $5,000,000 and is encouraged by NASA.

The primary mission of POESMIC is to assist procurement and technical personnel throughout the Department of Defense and NASA in structuring multiple incentive contracts which will reflect and communicate the requirements and goals of the Government. The use of the computer makes achievement of this mission easier through additional visibility; it does not independently develop more complex structures. POESMIC strives to assist in developing simple, clear incentive arrangements which have only the sophistication necessary to express meaningfully and closely the Government's requirements and objectives.

Because the structuring of a multiple incentive contract is an iterative process, POESMIC's services should be used several times during the acquisition cycle. For instance:

- In preparing the incentive portion of the Request for Proposal (RFP)

- In evaluating the incentive portion of contractors' proposals

- In preparing the incentive portion of the Government's pre-negotiation position

- In evaluating alternative incentive structures during negotiation

- In evaluating the incentive portion of the final negotiated contract

- In evaluating the effect that proposed changes have on the incentive arrangement during the administration of the contract, and in restructuring, if appropriate.

Government employees can use POESMIC's services at all (or any) of these stages in the acquisition cycle. The optimum time to contact POESMIC is before the issuance of the RFP. By establishing contact early in the procurement cycle, POESMIC can provide services throughout the life of the contract. Late utilization of POESMIC's services, however, does not preclude an evaluation of an existing contract structure or assistance in handling follow-on changes to that structure.

POESMIC operates and maintains computer programs which provide the following visibility tools:

- Performance versus Performance Points Curves
- Performance versus Incentive Fee (Profit) Curves
- Performance Ordering Tables
- Performance Nomographs
- Cost versus Incentive Fee (Profit) Curves
- Trade-off Curves (Constant Fee (Profit) Curves)
- Cost-Performance-Schedule Ordering Tables
- Cost-Performance-Fee (Profit) Nomographs

These visibility tools and their use will be discussed in detail in the following portion of the guide.

The services provided by POESMIC are relatively new to the procurement field. Therefore, personal contact is best. If circumstances will not permit a personal visit, initial contact can be made by writing:

HQ SAMSO (SMKPD)
AF Unit Post Office
Los Angeles, California 90045

or phoning 643-2591 (Area Code 213) or Autovon 833-2591. To accomplish an evaluation of an incentive arrangement or to assist in structuring a new or revised incentive arrangement, POESMIC needs only information which should already be available. For a summary of the data they require, see Section D. 4. c., page 165.

To help procurement agencies understand the services and visibility tools provided by POESMIC, special training sessions can be arranged through POESMIC.

D. MULTIPLE INCENTIVE STRUCTURING

The process of including performance in an incentive structure must logically begin with the determination of the "value" of the characteristics which will be incentivized. The multiple incentive contract should reflect the importance to the Government of various cost, schedule and performance outcomes by relating the dollar value of these outcomes, through the profit assigned, to each part of the multiple incentive structure. To accomplish this goal a multiple incentive structure should be developed in a logical sequence; this can be done manually or may be supplemented by the visibility tools provided by POESMIC or a combination of the two. It should be stressed that either manual structuring or computer techniques are designed to assist in communicating effectively the Government's objectives to the contractor by assigning profit in direct relationship to the value of the combined level of performance in all incentivized areas.

This section explains the sequence for developing a multiple incentive structure either manually or by computer techniques. At the conclusion of this discussion, on page 165, a general listing of the data requirements needed by POESMIC has been included for reference.

In parts 1 and 3 (POESMIC Steps I - VIII) of this section, the zero (incentive dollar) level of the performance incentive will correspond to target or par, with rewards and penalties around that level in relation to the "value" differential to the Government of performance changes; this assignment is based upon the assumption that the contractors proposed or will be proposing to the target system. This, of course, will not always be the case. It should be kept in mind in developing an appropriate incentive structure that a contractor should not be any better or worse off at the outset of a multiple incentive contract than with any other type of contract where he proposes to a minimum system. If the contractor(s) proposed or will be proposing to a minimum system (i.e., their proposed target cost will be based upon that system), then a rewards-only performance incentive would be appropriate; however, if target cost is based upon a target performance system, then that would be the zero performance incentive level, with rewards and penalties above and below that target level, respectively.

Schedule incentives will not be treated in this section since they would generally not be handled any differently than a performance parameter (i.e., weighted within the 100 performance points). See Chapter V for a discussion of schedule incentives.

The techniques used in structuring a multiple incentive contract suggests a seven-step procedure summarized as follows:

Step I is to identify those key parameters whose improvement will add to overall mission accomplishment.

Step II is the formulation of minimum and a maximum level of performance (RIE) for each parameter selected. The minimum must be high enough to satisfy the mission; the maximum should not be so high that it is unattainable.

Step III is rating the performance parameters by weighting each parameter according to its relative importance, and assigning this weight to the maximum performance level. The sum of the weights (of the maximum levels) of each of the parameters should be 100. Zero is assigned to the minimum level for each parameter. Then, the number of points assigned to target performance for each parameter is chosen.

Step IV is the evaluation of the performance arrangement. Tools available to assist in this evaluation are performance versus performance points curves, performance versus incentive fee curves, performance ordering tables, and performance nomographs. An analysis using these tools will assist technical personnel in selecting the best technical combination possible.

Step V relates the Government cost estimates with the technical combinations selected in Step IV. Estimates such as range of probable cost and target cost should be arrived at through a cooperative effort between procurement and technical personnel. At this point, an in-house estimate is probably not final, but it will serve to establish a cost-performance relationship which can be used for the initial Government negotiation position as well as for the RFP planning and preparation, and proposal evaluation.

Step VI is the development of the cost-performance relationship. This step is an iterative process where the cost versus fee (profit) curve is developed and then compared with the performance structure(s), developed in Steps I through IV, by using cost versus performance trade-off curves, cost-performance-schedule ordering tables, and cost-performance-fee nomographs.

Step VII is the final analysis of the entire incentive structure. This includes analyzing the trade-off curves, tables, and nomographs from Step VII to determine acceptability of the cost-performance trade-offs (value statements) developed.

The first four of the above steps comprise the development of appropriate and acceptable performance parameters.

1. Performance Structuring (Steps I thru IV)

Step I: If the planned contract is intended to contain incentives on cost, performance and possibly schedule, then it is imperative that technical personnel identify the critical system's factors (potential incentive parameters) as early as possible in the procurement planning cycle. The selection of performance parameters by technical and procurement personnel is one of the most important steps in the entire structuring process. It is important to realize that performance incentives should be used only when the Government desires improvements in product performance, and not simply to counterbalance the cost incentive. These improvements in performance must be based upon military worth or Government "value"; a determination must be made, even if subjectively, that there is value in performance increases, since this is the basis for determining whether or not there should be performance incentives.

The criteria for selecting incentive parameters depend primarily upon the mission of the system or subsystem to be developed. Technical specialists must determine which parameters are the best measures of mission effectiveness. It is important that they re-evaluate them as thoroughly as possible to make certain that only proper and necessary parameters have been selected. The number of parameters selected is not critical; but their relationship to total performance is essential to the proper balance of the structure. However, as the number of parameters increases, the performance incentive dollars available for each parameter decreases. Therefore, the contractor's motivation or emphasis on a given parameter may decrease even if he understands the parameter's relative role in total mission performance. Also, the performance parameters selected should be as independent as possible (not direct functions of each other). For instance, if the only reason for incentivizing weight was to get more speed, it would probably be better to place the extra incentive dollars on speed and make weight a "guarantee".

As an example, assume that for an aircraft development contract, the Government selects altitude, weight, maintenance hours per flight hour, and airspeed as the performance characteristics most representative of mission effectiveness and that the contractor will be asked to develop his cost proposal on target performance.

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Step II: After selecting the performance parameters, then identify a minimum acceptable, a par, and a maximum desirable level for each performance parameter. Be careful to set each minimum at an acceptable level so that the overall system effectiveness will be satisfactory, even if the contractor does poorly (minimum acceptable) on all incentivized parameters. Also, the upper limit of each range should be attainable by the contractor without any significant technological breakthroughs or major variances from the design approach. Just as the aggregate of minimum performance levels must define a level of performance acceptable to the Government, the aggregate of maximum performance levels must be achievable within the scope of the procurement. As stated previously, the par (or target) levels, in this example, are the performance levels desired by the Government and will be the levels for which the contractor(s) will estimate and propose their target cost(s).

The technical performance criteria can be, in most cases, precisely defined for specific system elements such as a missile propulsion system, a fire control system, or a radar surveillance system. The criteria (minimum, par, and maximum) should be expressed in terms such as pounds of thrust delivered, combat radius, speed, or similar measures that can be determined by fairly direct measurement. Continuing from the example introduced in Step I, assume the following ranges and targets have been defined.

	Minimum	Par	Maximum
Airspeed (kts)	1,300	1,400	1,550
Maint Hrs/Flight Hr	40	25	15
Altitude (ft)	50,000	60,000	75,000
Weight (lbs)	38,000	35,000	30,000

Step III: Assign the percentage of importance to each performance parameter selected. This percentage determination is based upon the technical personnel's best judgment from all information currently available. The problem becomes one of splitting the 100% available among the performance parameters. Determination of the importance of one performance parameter as compared to another may assist in this rank ordering. In the example assume that, for the first cut, airspeed is considered to be about three times more important than altitude, slightly less than three times for maintenance hours per flight hour, and seven times more important than weight; thus, in percentages of 100%, the relative weighting of each parameter would be as shown at the top of the next page.

PARAMETER	% IMPORTANCE
Airspeed (kts)	55
Maint Hrs/Flight Hr	20
Altitude (ft)	17
Weight (lbs)	8
	100%

To determine if these weightings reflect the Government's desires, an evaluation of the trade-off possibilities should be made among these performance parameters.

For simplicity, performance is rated on a 0 to 100 point scale. When there are several performance parameters, the minimum point for each parameter is designated zero, and the sum of the maximum points of each parameter is 100. The performance points a contractor can earn measure from 0 points for minimum achievement on all parameters to 100 points for maximum achievement on all parameters. The maximum points for each performance parameter is determined by multiplying the parameter's percentage weighting by 100 points. In the example, the maximum points attainable for airspeed would be: (55%) (100 points) = 55 points. Once the minimum-maximum point range is identified for each performance parameter, the points for target performance are determined. As an example, the performance rating scale data for airspeed, maintenance hours per flight hour, altitude and weight might be:

PERFORMANCE RATING DATA

Performance Elements	Points		
	Min	Par	Max
Airspeed (kts)	0	35	55
Maint Hrs/Flight Hr	0	17	20
Altitude (ft)	0	11	17
Weight (lbs)	0	5	8

Step IV: With this information, the next task is to evaluate the performance arrangement to ensure that the spectrum of performance combinations from minimum acceptable to maximum desirable reflects the Government's requirements and objectives. The visibility tools available to assist in this evaluation are (i) performance versus performance-points curves or performance versus performance fee curves, (ii) performance ordering tables, and (iii) performance nomographs.

Once the data is defined as shown below, performance points curves can be manually drawn or computer generated by a curve fitting process as illustrated in Figure 11. A performance point curve defines the number of points that will be awarded for each level of performance.

PERFORMANCE WEIGHTING DATA

Performance Parameter	Measurement			%	Points		
	Min	Par	Max	Weight	Min	Par	Max
Airspeed (kts)	1,300	1,400	1,550	55	0	35	55
Maint Hrs/ Flight Hr	40	25	15	20	0	17	20
Altitude (ft)	50,000	60,000	75,000	17	0	11	17
Weight (lbs)	38,000	35,000	30,000	8	0	5	8

The horizontal axis of Figure 11 represents the technical performance range and the vertical axis is the performance points.

Unless the value for performance for a given constant increment is approximately the same throughout the range of performance (from minimum to maximum), a curve fitting process (or many broken straight lines) may be more appropriate than two broken straight lines as changes in performance can have many different values, depending upon the level of performance of the system. To illustrate, when an increase in performance on a below-par system has a larger value (Point Value A - Figure 11) than the same increase in performance on a system that has exceeded par performance (Point Value B - Figure 11), we might assume that if we took several increments, that as we increase performance the value for each given increment would be decreasing.

AIRSPEED PERFORMANCE POINT CURVE

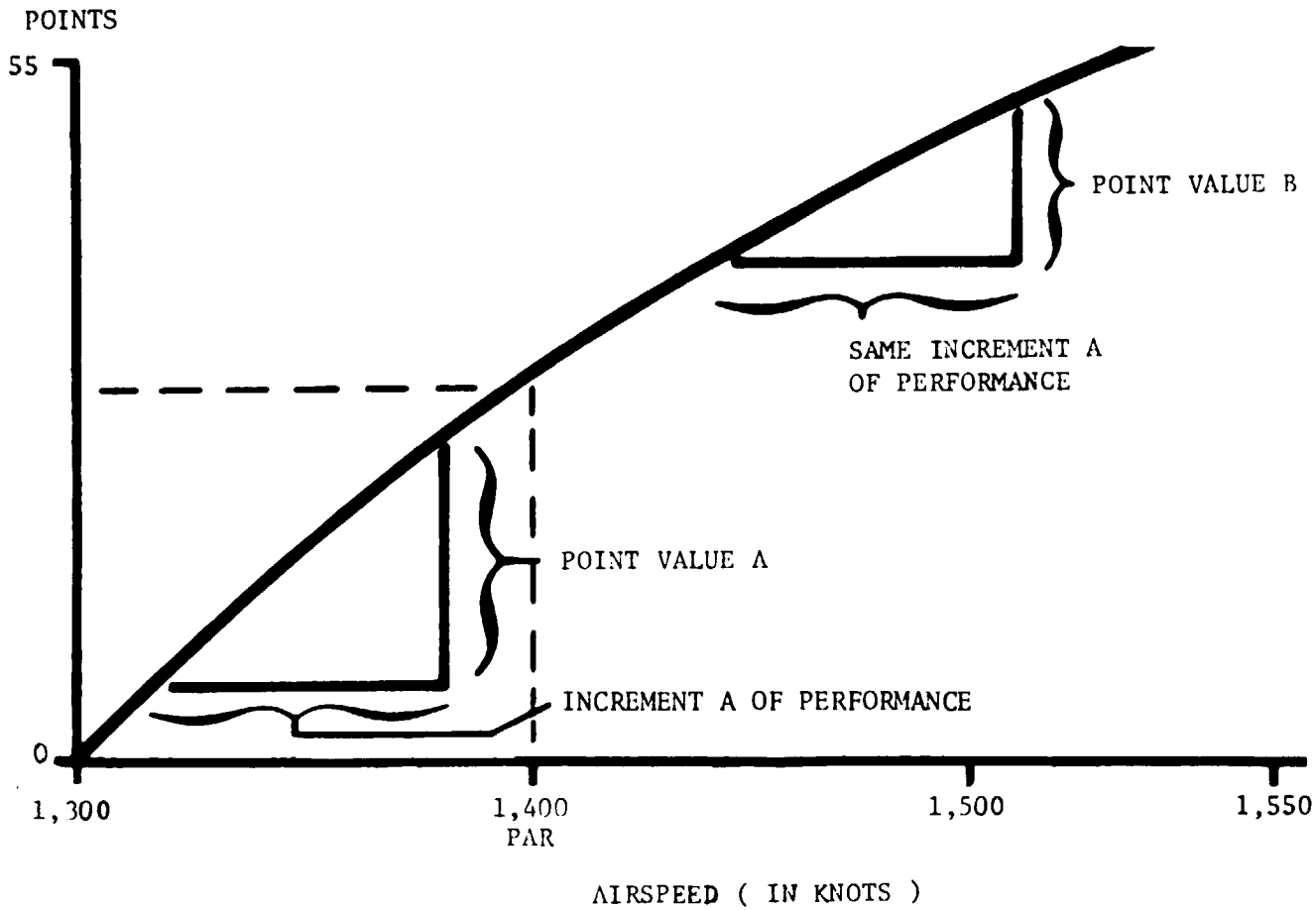
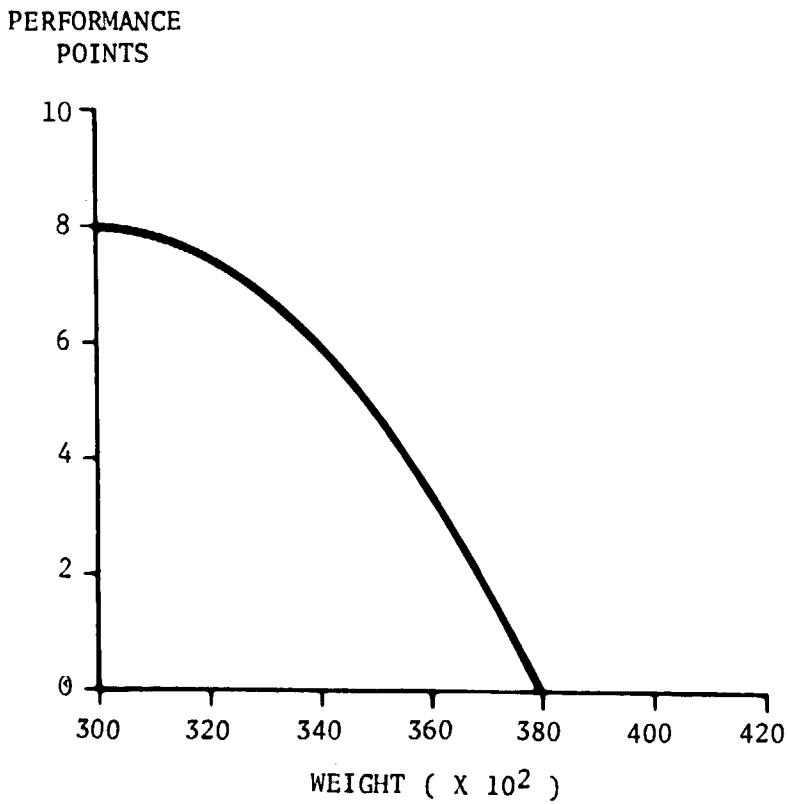


FIGURE 11

PERFORMANCE POINT CURVES



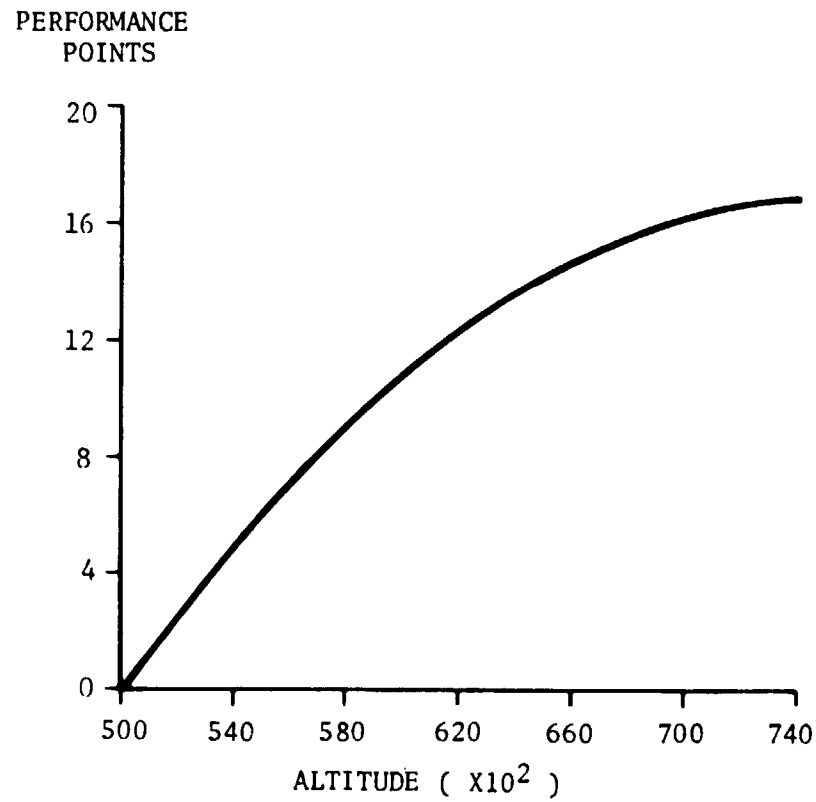
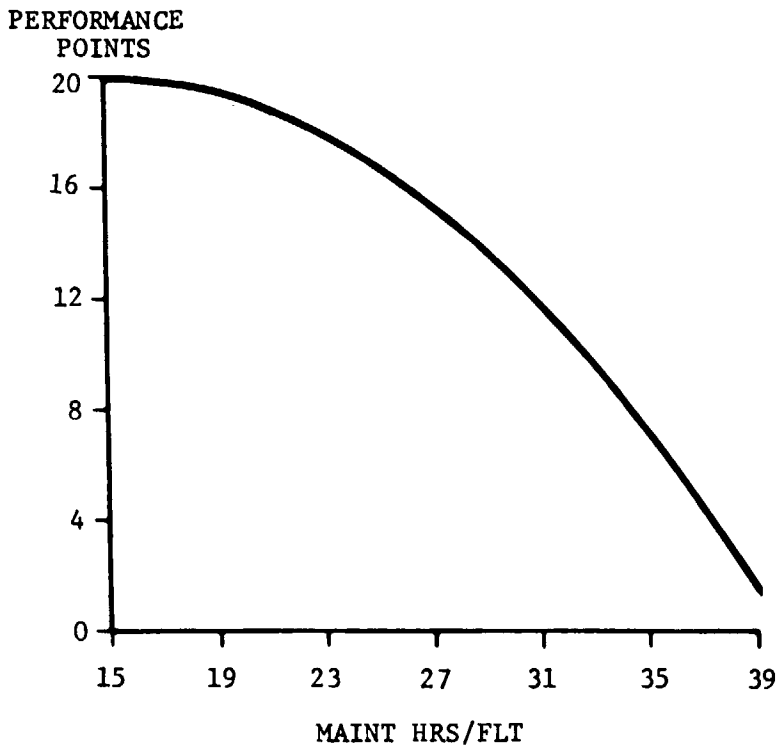


FIGURE 12


PERFORMANCE POINTS
20
16
12
8
4
0
15
19
23
27
31
35
39
MAINT HRS/FLT

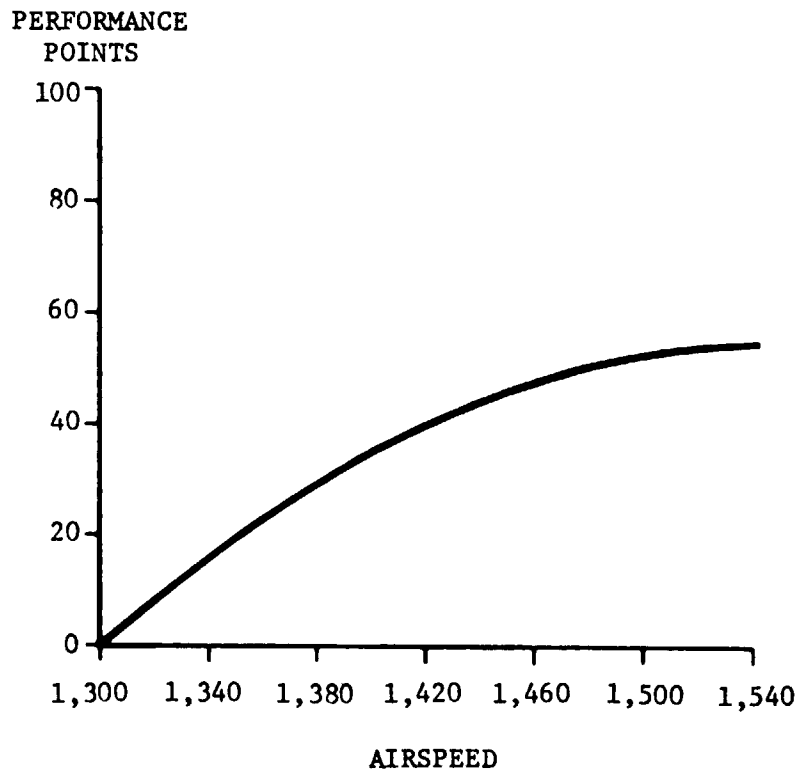

PERFORMANCE POINTS
100
80
60
40
20
0
1,300
1,340
1,380
1,420
1,460
1,500
1,540
AIRSPEED

FIGURE 13

Thus, the point value, which corresponds to a performance incentive fee, should be decreasing per increment. To achieve this relationship, computer programs are available which can fit a curve through three determined points. From the example, the three points for airspeed are: 1,300 knots, 0 performance points; 1,400 knots, 35 performance points; 1,550 knots, 55 performance points. Once the airspeed performance curve has been generated (Figure 11) the points assigned any level of airspeed achievement can be identified.

Given the data on page 122, graphs of performance versus performance points can be plotted for each of the performance parameters as shown in Figure 11 for airspeed and in Figures 12 and 13 for all four parameters. As shown by the dash lines, these graphs could be drawn manually quite easily for the purpose of evaluation. If curved lines (or multiple broken lines) are ultimately desired -- denoting continually decreasing value -- the computer would need to be used.

While most of the basic structuring and evaluating techniques can be developed manually with relatively little effort, there are three areas where the visibility offered by the computer is of obvious benefit to the procurement/technical team; these are Performance Ordering Tables (also called Equivalency Tables), Cost-Performance-Fee Nomographs, and Trade-off Curves. All of these visibility tools are available through POESMIC. Trade-off curves and nomographs -- and conceivably, the Performance Ordering Tables -- could be developed manually if given the time and expertise. In view of the almost infinite number of variable combinations inherent in a multiple incentive structure, any analysis that does not resort to the simple expedient of the computer programs developed may be incomplete.

a. Performance Ordering Tables. The most useful of these computer visibility tools -- especially for technical personnel -- is the Performance Ordering Tables. If properly used these tables can provide a sound -- although intuitively determined -- basis for making the necessary and critical performance weighting decisions; also, they are useful in developing or verifying the relative value statements essential for assigning fee to both cost and performance.

The Performance Ordering Tables should be most useful to the technical team in establishing the relative weighting of the individual performance parameters. Naturally, where there is only one performance feature being incentivized, there would be no need for the Performance Ordering Tables. Further, when related parameters can be expressed in terms of one parameter, via a mathematical model, the Performance Ordering step can be omitted.

A studied analysis of the Performance Ordering Tables will either reinforce the original determination of the relative weighting of the performance parameters -- which will ultimately be expressed in the contract in terms of fee and the cost sharing ratio -- or in forming the foundation for valid decisions regarding their change. Such an analysis might suggest that the original weighting should be adjusted, or that the RIE or target position of one or more of the performance parameters should be modified.

As previously stated, the number of performance parameters is not critical (even though the fewest necessary to express and measure increased mission effectiveness is a recommended guideline), as long as their relationship to total performance is properly structured. This is accomplished by assigning relative weights within 100 points and then using the Performance Ordering Tables (or Nomographs, see page 131) to verify their relative importance.

There are three types of tables of performance parameter combinations which can be generated to assist in checking whether the performance elements have been properly weighted and point structured. The laborious task of generating these tables is done by the computer, but checking the tables must be done by the procurement/technical team. All or any combination of the tables may or may not be used.

The first table, Table I, is a randomly selected series of performance parameter combinations yielding overall performance point totals ranging from the aggregate minimum acceptable system to the aggregate maximum desired system (0 to 100 points); the procurement/technical team, with the help of POESMIC, would select the desired point totals.1/

1/ Instead of performance point totals, performance incentive fee totals can be used on all tables if preferred by the user. It is important to understand that performance points directly correspond to performance incentive fees and that performance points are useful only in that they readily depict parameter weightings as percentages of 100%. For example, if $5 million performance incentive fee corresponds to 100 performance points and -$3 million corresponds to 0 performance points, $1 million would correspond to 50 points.

TABLE I

PERFORMANCE ORDERING TABLE (TOTAL RANGE)

WEIGHT	ALTITUDE	MAINT HRS/ FLT HR	AIRSPEED	POINTS
38000.00	50000.00	40.00	1300.00	0.00
33787.03	61983.41	37.48	1305.91	25.00
35450.14	57197.96	28.75	1307.81	30.00
34122.06	59244.76	35.53	1322.26	32.00
37722.69	60332.46	25.83	1314.17	34.00
30511.32	54651.05	28.50	1319.20	36.00
34846.19	62972.75	31.41	1320.10	38.00
31239.07	65960.77	32.52	1317.03	40.00
36482.26	70609.46	31.27	1327.02	42.00
33356.00	63058.50	38.62	1356.76	44.00
30967.37	63487.70	15.72	1311.01	46.00
31844.37	75853.82	16.32	1308.04	48.00
37874.20	72483.68	39.37	1388.10	50.00
34002.14	60780.84	18.98	1336.82	52.00
32841.69	65084.47	22.16	1335.01	54.00
37126.59	61614.77	16.55	1357.23	56.00
30846.51	68619.89	19.00	1336.02	58.00
37434.09	64286.45	38.54	1432.06	60.00
37887.96	73552.26	34.79	1408.45	62.00
35923.54	69431.32	20.72	1366.21	64.00
33400.47	52592.17	29.16	1430.92	66.00
36643.81	73599.05	36.81	1437.17	68.00
37797.19	57192.89	24.42	1438.52	70.00
32016.47	52204.40	18.93	1444.13	75.00
32865.03	59395.55	21.11	1437.42	80.00
30501.60	70963.47	27.34	1477.26	90.00
30000.00	75000.00	15.00	1550.00	100.00

By reviewing these combinations, the technical team can check to see whether or not each of the higher overall point systems and its contributing performance parameter outcomes is technically more desirable. If, in fact, this review identifies performance combinations which are inconsistent with the overall point total, or ordering, then the initial weightings, performance point curves, or ranges should be revised to assure that the inconsistency has been corrected.

Let us assume that the area around par is of particular interest to the engineers. On this basis the second table, Table II, will provide information peculiar to a given region. Also, assume that

the 1350 airspeed is really considered as a key measure when related to the other parameters. While this is not patently obvious, it should coincide with the heavier weighting on airspeed (i.e. 55%) and, thus, might represent a baseline for comparison.

This computer program will hold the combinations within a specified range -- and of greater significance -- can hold any one or more parameters constant. This allows the engineer to test the interrelationship of the less critical parameters with each other and with the most important parameter or parameters, and vice versa.

TABLE II

PERFORMANCE ORDERING TABLE (REGION)

WEIGHT	ALTITUDE	MAINT HRS/ FLT HR	AIRSPEED	POINTS
38000.00	55000.00	30.00	1350.00	38.72
38000.00	55000.00	25.00	1350.00	42.72
38000.00	60000.00	30.00	1350.00	43.48
35000.00	55000.00	30.00	1350.00	43.59
38000.00	55000.00	20.00	1350.00	45.12
32000.00	55000.00	30.00	1350.00	46.22
38000.00	65000.00	30.00	1350.00	46.88
38000.00	60000.00	25.00	1350.00	47.48
35000.00	55000.00	25.00	1350.00	47.59
35000.00	60000.00	30.00	1350.00	48.35
38000.00	60000.00	20.00	1350.00	49.88
35000.00	55000.00	20.00	1350.00	49.99
32000.00	55000.00	25.00	1350.00	50.22
38000.00	65000.00	25.00	1350.00	50.88
32000.00	60000.00	30.00	1350.00	50.98
35000.00	60000.00	25.00	1350.00	52.35
38000.00	65000.00	20.00	1350.00	53.28

In this example, airspeed has been held constant at 1350 in order to determine representative performance outcomes for the remaining performance parameters within a limited range of overall performance points. The reviewing team can then determine whether or not such performance combinations accurately reflect the point values indicated.

Now let us assume that the technical team feels that a certain point area deserves special attention. The third program can furnish a

print-out of any given point total to provide visibility on several performance parameter combinations which could contribute to the selected point system.

The following table, Table III, is the computer output generated by requesting one 0 point system (all minimum), twenty 40 point systems, and one 100 point system.

TABLE III

PERFORMANCE ORDERING TABLE (POINT)

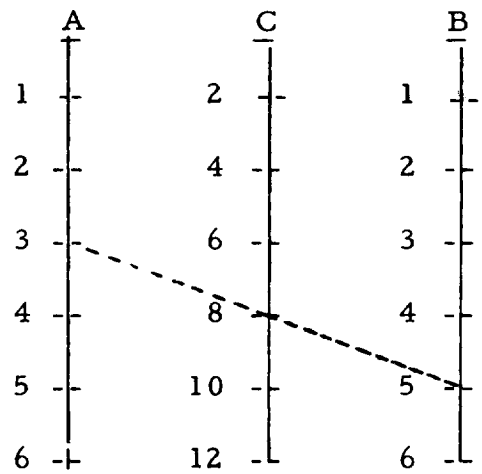
WEIGHT	ALTITUDE	MAINT HRS/ FLT HR	AIRSPEED	POINTS
38000.00	50000.00	40.00	1300.00	0.00
37151.75	63810.17	37.41	1353.08	40.00
32937.94	68977.72	26.93	1303.72	40.00
33445.51	50498.18	32.10	1356.86	40.00
33562.29	61909.19	25.87	1311.70	40.00
33374.73	69166.92	31.36	1313.81	40.00
34454.04	55994.41	35.91	1354.30	40.00
32268.86	68948.95	32.71	1315.68	40.00
30990.92	68929.31	27.88	1303.27	40.00
33931.02	68303.68	29.51	1311.36	40.00
32197.88	59967.22	26.50	1313.98	40.00
35572.57	51780.91	33.62	1364.28	40.00
34900.96	65229.27	16.63	1301.56	40.00
34807.38	61635.40	15.21	1306.33	40.00
32105.87	59696.80	25.72	1313.07	40.00
32842.37	50553.90	35.83	1368.93	40.00
31809.16	64074.89	39.11	1342.90	40.00
36916.49	72845.94	35.16	1334.46	40.00
30320.43	54956.95	28.93	1329.34	40.00
30505.54	72225.60	30.00	1305.61	40.00
31196.59	65110.86	24.73	1301.98	40.00
30000.00	75000.00	15.00	1550.00	100.00

These combinations of performance parameter outcomes yielding the single point total selected, provide the technical team with additional visibility of possible combinations to determine their consistency with the given overall performance total.

Performance ordering tables can provide the reviewer with a random sample of performance combinations which yield a given overall

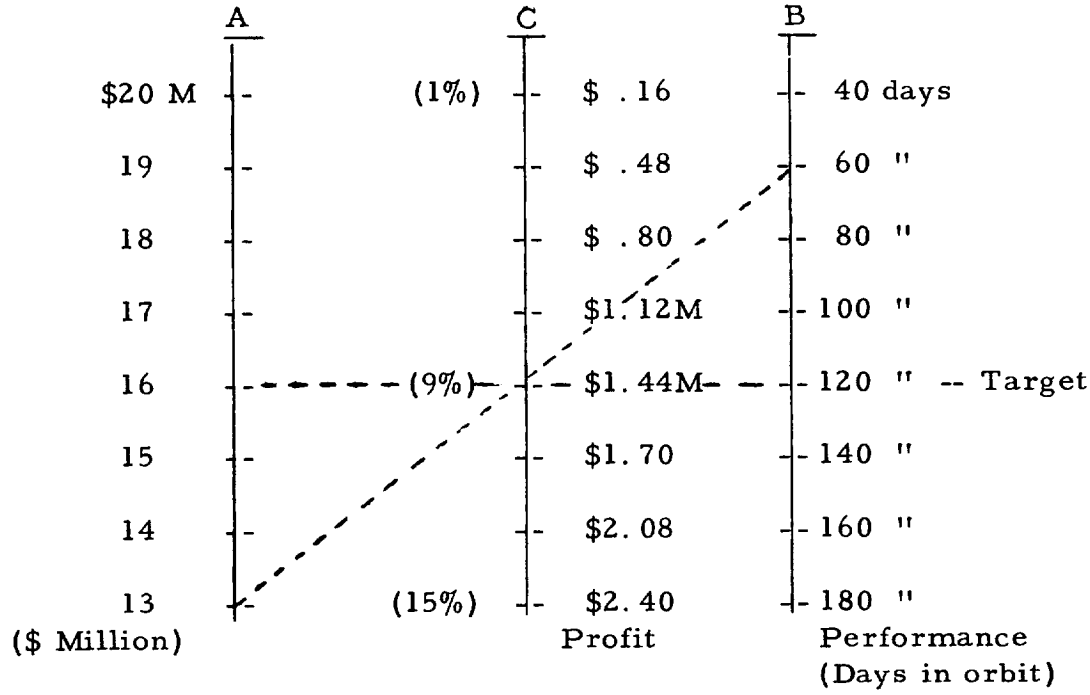
performance point total; supplemental evaluation using nomographic techniques can provide visibility of the complete range of performance combinations possible for a given overall point total and provides another valuable aid to the evaluators.

b. Nomographs. A nomograph is a diagram of three or more scales which when joined together by a tieline represent a mathematical relationship. Nomographs enable one to locate the value of an unknown quantity (usually profit) given the value of two or more known quantities, such as cost and performance. The following simple nomograph shows the relationship of adding a value on line A to another on line B to obtain the sum of A and B on line C.



Shown in the diagram is the addition of the number 3 on the A line with the number 5 on the B line resulting in the number 8 on the C line. By laying a straightedge across various combinations of A and B, it is easy to find the result of the combination on the reference line, C. Although addition is shown in the above nomograph, other mathematical operations (e.g., subtraction, multiplication and division) can also be displayed.

In the structuring of multiple incentives, the nomograph can be used to determine the profit corresponding to outcomes of the incentivized elements. Nomographs may be constructed either by hand or generated by a computer in which case the computer considerably simplifies nomograph construction to a few seconds of computer time. The following diagram relates various combinations of cost (Line A) and performance (Line B) to the resulting fee outcomes on Line C. This diagram is conceptually the same as the above diagram which illustrated various combinations of whole numbers.



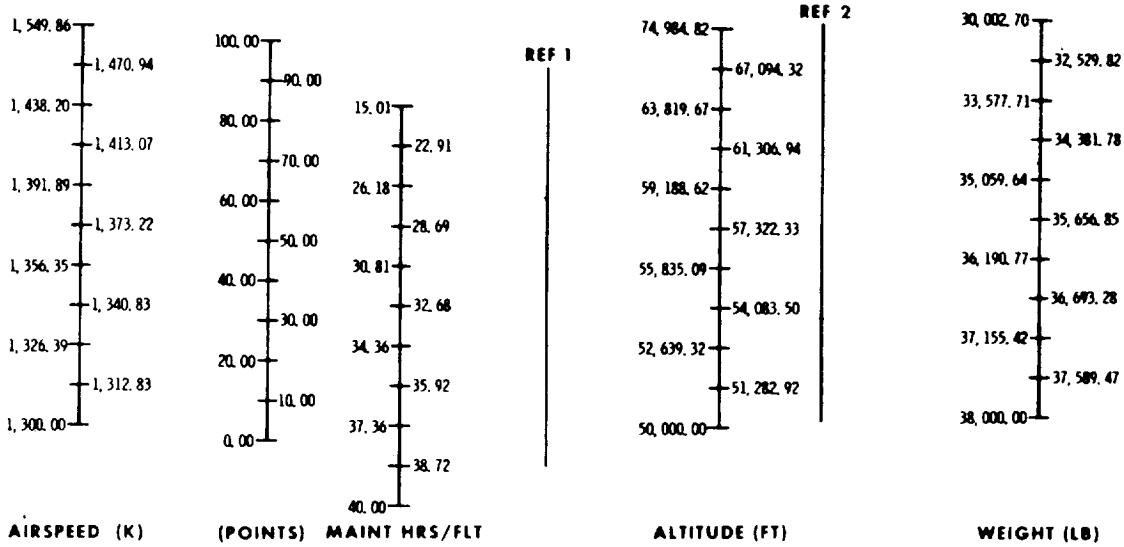
In this diagram, a combination of cost at $16M and performance at 120 days in orbit results in a profit of $1.44M (9%). The same profit can be realized by a cost of $13M with 60 days in orbit. By manipulating a straightedge over various combinations on Line A and Line B, it is easy to find the result of the combinations on Line C, called the profit "reference" line. It is useful to note that a nomograph can illustrate trade-off relationships. For example, if we rotate a straightedge around the $1.44M (9%) profit point (Line C), the resulting combinations would be the same as those shown by a $1.44M iso-profit curve on a cost-performance trade-off graph (see page 138 for a discussion of trade-off analysis).

For performance nomographs, individual performance parameters like airspeed, altitude, or weight, are generally the independent variables, and the point value for a parameter combination, the dependent variable. For example, consider again airspeed, weight, altitude, and maintenance hours per flight hour as the performance parameters. The information required to generate the nomograph is:

- The range of incentive effectiveness (minimum to maximum),
- The points to be assigned to minimum acceptable, par, and maximum desirable for each parameter, and
- The percentage of relative importance of each parameter.

Using the same four performance parameters, their performance levels and points as assigned on page 122, the following nomograph would result.

PERFORMANCE NOMOGRAPH



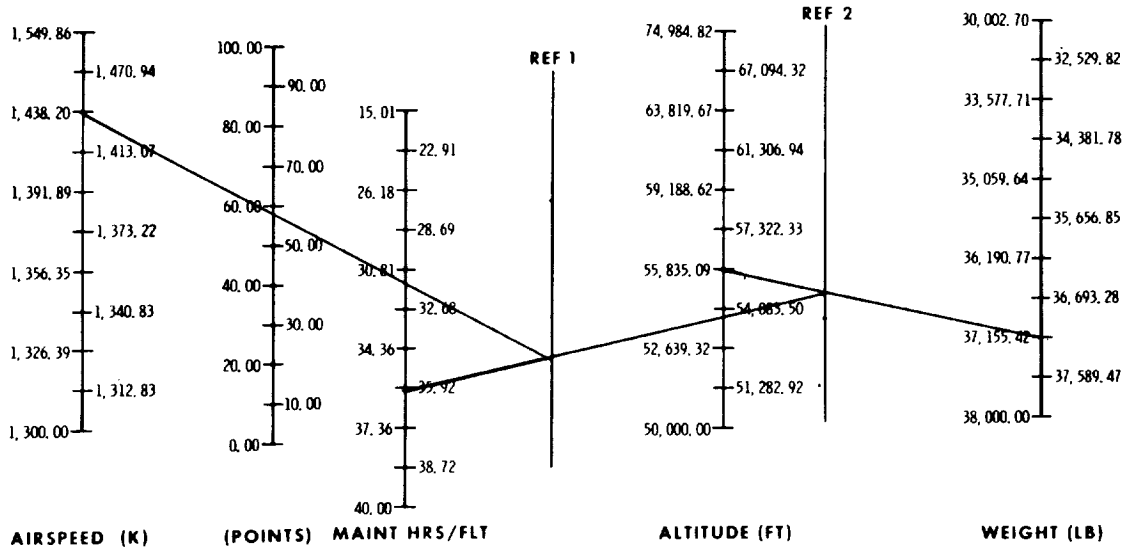
To determine the performance points which result from the following combinations:

Weight (lb)	37,155.42
Altitude (ft)	55,835.09
Maint Hrs/Flt Hr	35.92
Airspeed (k)	1,438.20

The following stepping procedure would be used:

Connect the values of weight (37,155.42 lbs) and altitude (55,835.09 ft) by a straightedge. This locates a reference point on the scale "Ref 2". Next, connect the value of the maintenance hours/flt hr (35.92 hrs) to the "Ref 2" point. This locates a point on the scale "Ref 1". Last, connect the value of airspeed (1,438.20 knots) to the point previously identified on "Ref 1". This locates the number of performance points which this specified combination produces. In this example, it is 59 points.

PERFORMANCE NOMOGRAPH



Similarly, of course, a nomograph can be used to determine the performance points which can be earned by other performance parameter combinations. It should be remembered that there are practical limits to the number of parameters which a person could work with, because the number of reference lines necessary increases rapidly.

The advantage of the nomograph over performance ordering is that all possible performance combinations can be displayed on one nomograph. Its disadvantage, vis à vis performance ordering, is that each combination has to be individually determined. Both tools together can provide almost complete visibility of the performance trade-offs.

2. Cost-Plus-Incentive-Fee - Multiple Incentives

Referring back to the seven-step procedure, Steps I through IV were combined for the purpose of our discussion because they all related to the identification, weighting, and evaluation of the key performance parameters whose improvement will add to overall mission accomplishment. Steps V through VII are combined because they relate the performance elements to cost and profit -- and thus should be the basis for conveying the Government's objectives to the contractor through the proper establishment of quantitative cost equivalents.

It should be clear that not every one of the steps suggested will apply to every procurement. Neither are the steps clearly discrete;

rather, often they over-lap. These steps and the computer programs which support them are most helpful in the structuring and evaluating of multiple CPIF incentives. However, as the Guide has attempted to emphasize, a computer is not essential to the satisfactory structuring of a multiple incentive contract. The following two sections -- at the risk of redundancy -- will develop steps V through VII first manually and then by the Cost Performance Correlation Method using the computer programs available at POESMIC. Again, the process of including performance in a multiple incentive structure must logically begin with the determination of the value statement for the characteristics which will be incentivized. Performance above the minimum acceptable level or above some stated goal must have a significant value to the Government or it would be inappropriate for incentive consideration.

A simple multiple CPIF contract is the compartmentalized[1/] type with straight share lines covering cost, performance, or schedule. In the compartmentalized type, the contractor can earn maximum fee only when maximum achievement is attained in each area. Also, minimum fee can be reached only when performance is at the minimum acceptable level and under maximum cost variation above target cost.

Assuming simple, straight-line sharing arrangements, CPIF contract structure covering the following situation would be as shown in Figure 14B.

Cost Range	:	$8 million - $12.5 million
Target Cost	:	$10 million
Target Fee	:	$800,000 8%
Maximum Fee	:	$1,400,000 14%
Minimum Fee	:	$240,000 2.4%
Cost Sharing	:	80/20
Performance Incentive	:	+$200,000 (increase simulated altitude from 350 miles to 450 miles)
Schedule Incentive	:	-$60,000

1/ Where incentive fees for cost, schedule and performance equal the fee pool (NO OVERLAP).

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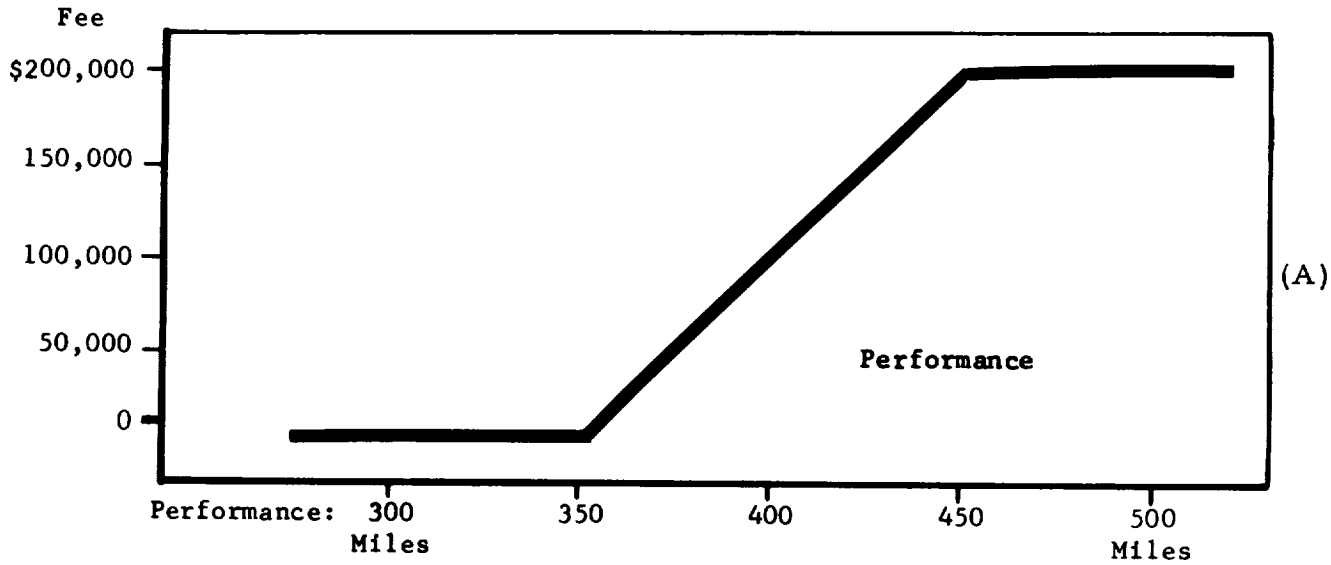
CPIF
MULTIPLE INCENTIVE EXAMPLE



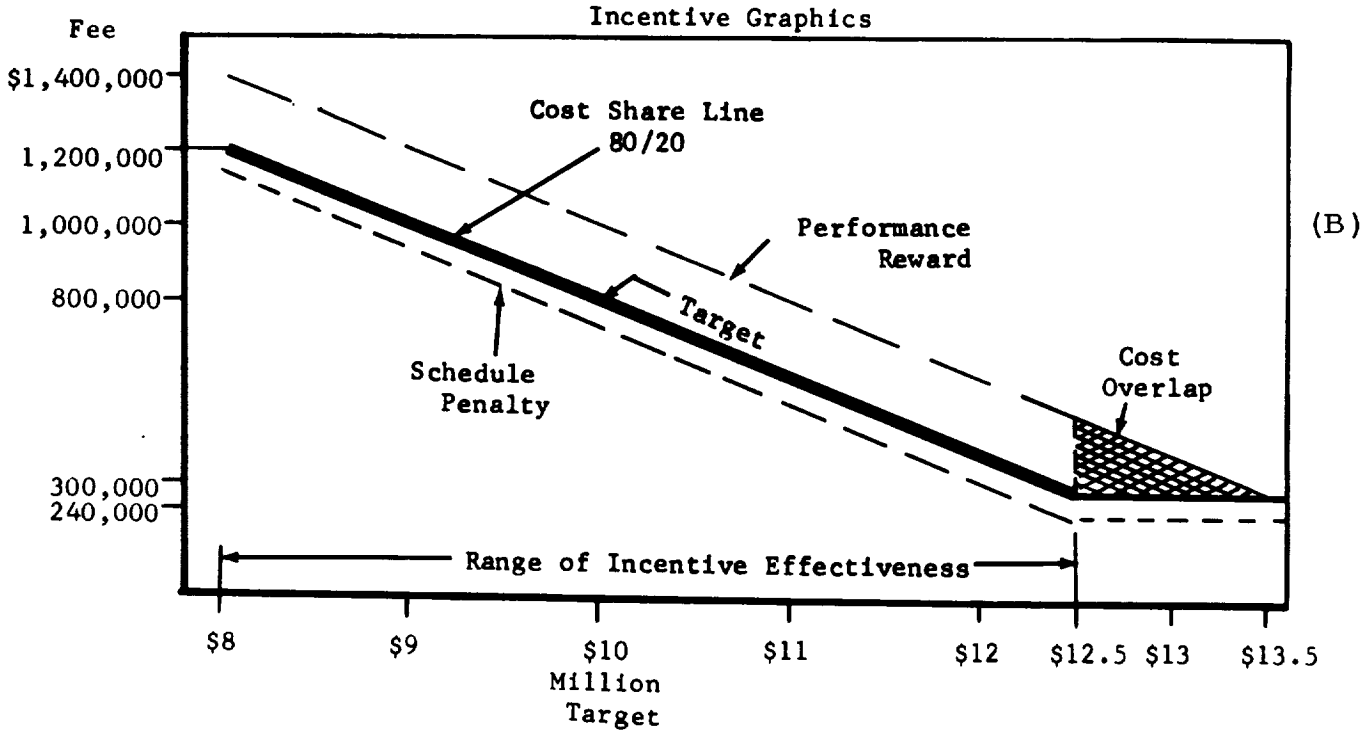


FIGURE 14

The equipment to be procured is a piece of test equipment for simulating space environment. The specifications cover a 12-foot diameter, 12-foot high thermal-vacuum chamber to be designed, fabricated, and installed. The performance of prior units of this size has reached simulated altitudes between 200-250 miles; however, it is recognized that strong management skills together with utilization of advanced technological know-how will be required to design new high vacuum pumping systems to produce the simulated cold black effect of space at 450 miles altitude.

There are narrative restraints in the contract which state that a minimum acceptable altitude simulation is 350 miles and the contractor cannot share in cost variations under target cost unless a performance level of 350 miles is reached. The performance incentive is rewards-only and is operative over a range of 350 to 450 miles.

If delivery is on schedule, the Government is looking for a target cost of $10 million, and will pay a price of $11 million -- with the $1 million fee -- at that cost point if maximum simulated altitude can be reached. In other words, at any place on the cost range between $8 million and $12.5 million, the Government will pay up to $200,000 profit for performance improvement that is in a range of 350 miles to 450 miles (actually, $2,000 for each mile of increase in simulated altitude). Thus, the price range (over which the incentive is effective), assuming delivery is on schedule with maximum performance, is from $9.4 million to $13 million.

There are an infinite number of combinations of cost, schedule, and performance between the maximum fee rate of 14 percent and the minimum fee rate of 2.4 percent. If the schedule incentive were applied to Figure 14, a delivery 20 days late, with a cost of $11 million, and a performance achievement of 400 miles, would result in a price of $11,660,000. This is calculated as follows:

Actual Cost	:	$11,000,000	
Fee on Cost	:	600,000	(Target fee of $800,000, less $200,000 cost sharing at 80/20 applied to $1 million cost over Target)
Fee on Performance	:	100,000	($2,000 earned for each mile over 350-mile goal)
Fee on Schedule	:	(40,000)	(Schedule penalty of $40,000 for 20-day late delivery)
Earned Fee		$ 660,000	
Price		$11,660,000	

If the performance achievement were 450 miles at the same cost and schedule position, the earned fee would have been $760,000. If the performance achievement were 375 miles, the earned fee would be $610,000; and if the performance were 310 miles, the earned fee would have been $560,000.

If an assumed combination of cost, performance, and schedule resulted in a cost variation under target cost of $1 million with a performance of 400 miles and delivery which is 20 days late, the price would be $10,060,000, built up as follows:

Actual Cost	:	$ 9,000,000	
Fee on Cost	:	1,000,000	(Target fee of $800,000 plus $200,000 cost sharing at 80/20 applied to $1 million cost under target)
Fee on Performance	:	100,000	($2,000 earned for each mile over 350-mile goal)
Fee on Schedule	:	(40,000)	(Schedule penalty for 20 days late)
Earned Fee		$ 1,060,000	
Price		$10,060,000	

In this combination, a 30-day late delivery would have resulted in an earned fee of $1,040,000, or an on-schedule delivery would have produced a fee of $1,100,000.

The maximum fee rate of 14 percent can be achieved by maximum cost variation under target cost to the cost point of $8 million, and by maximum performance which reaches a simulated altitude of 450 miles, on schedule. The minimum fee rate of 2.4 percent can be reached only by expending funds up to the maximum cost point on the RIE of $12.5 million, and by reaching a simulated altitude which is 350 miles or below, with a delivery schedule which is 30 days or more late. There are, however, many combinations which will result in the same earned fee amounts between the minimum and maximum rates. For example, the following combinations are only a few of the situations which would produce an earned fee of $900,000 ($100,000 more than the target fee).

(i)	Cost	: $10.5 million	=	Fee $700,000
	Performance	: 450 miles (100 mi. x $2,000)	=	Fee $200,000
	Schedule	: on time	=	-
	Earned Fee			$900,000
(ii)	Cost	: $9.5 million	=	Fee $900,000
	Performance	: 350 miles (no reward)	=	-
	Schedule	: on time	=	-
	Earned Fee			$900,000
(iii)	Cost	: $10 million	=	Fee $800,000
	Performance	: 400 miles (50 mi. x $2,000)	=	Fee $100,000
	Schedule	: on time	=	-
	Earned Fee			$900,000
(iv)	Cost	: $10 million	=	Fee $800,000
	Performance	: 420 miles (70 mi. x $2,000)	=	Fee 140,000
	Schedule	: 20 days late (penalty $40,000)	=	(40,000)
				$900,000
(v)	Cost	: $10.2 million	=	Fee $760,000
	Performance	: 430 miles (80 mi. x $2,000)	=	Fee 160,000
	Schedule	: 10 days late (penalty $20,000)	=	(20,000)
	Earned Fee			$900,000
(vi)	Cost	: $9.7 million	=	Fee $860,000
	Performance	: 390 miles (40 mi. x $2,000)	=	Fee 80,000
	Schedule	: 20 days late (penalty $40,000)		(40,000)
	Earned Fee			$900,000
(vii)	Cost	: $9.2 million	=	Fee $960,000
	Performance	: 350 miles (goal)		-
	Schedule	: 45 days late (max. penalty $60,000)	=	(60,000)
	Earned Fee			$900,000
(viii)	Cost	: $10.3 million	=	Fee $740,000
	Performance	: 450 miles (100 mi. x $2,000)	=	Fee 200,000
	Schedule	: 20 days late (penalty $40,000)		(40,000)
				$900,000

The iso-fee chart shown in Figure 15 employs the sample contract cost RIE (Figure 14) as its horizontal axes and the performance RIE as its vertical axes. Because the sample contract cost and performance incentives were shown as straight lines in Figure 14 the iso-fee lines in Figure 15 also are straight lines and are parallel. The next section will describe the methods used to plot curved iso-fee lines. If the performance value had been determined on a curved line, the plotting of the iso-fee lines would have produced curved fee lines.

The various combinations which will produce an earned fee of $900, 000 can be pinpointed on the $900, 000 iso-fee line shown in Figure 15. This iso-fee chart shows the various combinations which will produce fee on the $1. 2 million fee line, the $1. 0 million fee line, the $800, 000 fee line, or any fee line between $1. 4 million and $240, 000. Note that there is only one combination which will earn a fee of $1. 4 million--maximum performance at a simulated altitude of 450 or more miles, a realized cost of $8 million and delivery on time; and there is only one combination within the RIE which will produce a minimum fee of $240, 000.

Any of the combinations which produce a given fee are presumed to be equally acceptable. As the example is structured in Figure 14, and also shown in Figure 15, the emphasis is directed primarily toward cost control and secondarily toward improved performance. The contractor's share of expenditures amounting to $1 million is equal to $200, 000 as a result of the 80/20 share line negotiated. Thus, the improvement in altitude from 350 miles to 450 miles is at least equal to a total cost of $1. 0 million, or a net cost to the Government of $1.0 million. If the contractor can make design trade-offs which have a good chance of assuring a performance increase of 100 miles, the contractor can expend up to $1. 0 million without any adverse effect on fee.

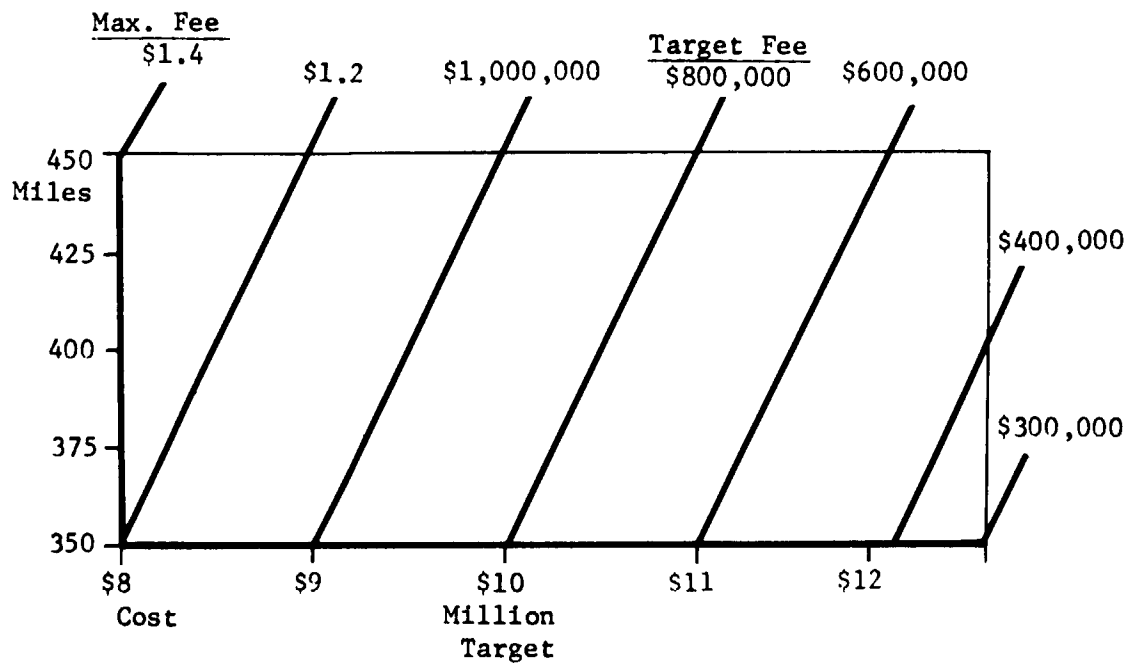
If the contractor could spend only an additional $500, 000 to develop a pumping system that would provide an operating altitude in a range of 350 to 450 miles, the contractor's share in the additional expenditure would amount to only $100, 000, or a net gain of $100, 000 to the contractor in earning the $200, 000 performance incentive.

Following the target fee line ($800, 000), if the contractor's performance achievement is 400 miles, significantly above the lower level of 350 miles in the probable range, the price of $11. 3 million ($10. 5 million cost + $800, 000) is understandably higher than the price of $10. 8 million which would cover target cost $10 million) at the lower performance level.

CPIF

MULTIPLE INCENTIVE EXAMPLE

ISO-FEE CHART



Note: The target fee of $800K can be earned at $10 million cost with a simulated altitude of 350 miles; this same fee can be earned at $11 million cost with an altitude of 450 miles (one mile of increased altitude has an incentive value of $2,000 in the structure), or the fee of $800,000 can be earned at $9.7 million cost, 350 miles altitude and 30 days late.

The lines connecting the combinations which earn the same fee are known as iso-fee lines. "iso" meaning "equal".

FIGURE 15

It is important to note here that an increased cost of $500,000 in the situation noted above is not an overrun in the usual sense. The contractor has deliberately made design trade-offs which in this case cost more money to improve performance. It was recognized during negotiations that performance and cost uncertainties might produce a realized cost anywhere within the range of incentive effectiveness from a minimum cost of $8 million to a maximum cost of $12.5 million. Thus, a performance evaluation, after the fact, should produce a determination that increased value was obtained.

The example in Figure 14 has shown an RIE from $8 million to $12.5 million. The graph shows that a cost overlap may be used as an additional restraint to extend the RIE to $13.5 million. This additional restraint can be used to discourage performance improvements at unreasonable cost (see page 174, Protection Against Massive Overruns). The cost overlap in the example in Figure 14 continues the cost sharing at a rate of 80/20 beyond the maximum RIE point of $12.5 million until the performance reward of $200,000 has been eroded. The cost overlap could have been extended at the rate of 0/100 sharing, and in this case, the performance reward of $200,000 would have been eroded on a dollar-for-dollar basis until the RIE point of $12.7 million was reached. The steeper sharing rate generally should not exceed 50/50, and in most cases it is recommended that cost overlap sharing should follow the pattern set within the RIE.

The cost overlap may be used on either or both ends of the cost RIE, and should be tailored for each contract in which it is applied. In the case of a narrow cost RIE, the sharing slope of the overlap should not be allowed to impact adversely on performance, because at this point the overlap changes to sharing of earned performance rewards and is not cost sharing in the usual sense.

The amount of $2,000 applied as the incentive value for each mile of simulated altitude in this example does not necessarily mean that this is the value of performance to the Government. Possibly there are several smaller chambers that can reach 450 miles simulated altitude, and possibly the use of a larger chamber with this capability would permit two or three tests of different equipment at the same time. Thus, the cost savings could be several times the amount of the incentive. The incentive amount is determined on a case-by-case basis and in this case represents the amount determined reasonable and realistic as a motivating factor.

If, for any one of several reasons, it was determined appropriate to increase the amount of incentive between 350 miles and 400 miles and decrease the amount of incentive between 400 miles and 450 miles, the varying incentive rate could be plotted on a curving line or on several increments of straight lines. Either method would

emphasize the immediate importance of exceeding the 350-mile level and might recognize that the first few miles above 350 miles is the area which will require the greatest amount of engineering breakthroughs or advancements.

Figures 16A and 16B show the RIE and fee limits established in the example previously shown in Figures 14 and 15, however, the performance and iso-fee lines are not plotted on a single straightline basis. Figure 16 (A) shows a curved plot for performance and Figure 16 (B) shows a broken-line plot.

Figure 16 (A) shows a performance versus fee curve and an iso-fee curve with decreasing increments of fee for progressive unit increases in performance after the first few miles of improvement. The curve shows that the average fee value for the first ten miles of improvement is $4,500 per mile, the second ten-mile range is valued at an average of $3,000 per mile; the range between 371 miles and 390 miles has a fee value of $2,500 per mile; the range from 391 miles to 420 miles has an average fee value of $1,500 per mile; and the range from 421 miles to 450 miles has an average fee value of $1,000 per mile.

Both the curve (A) and the broken-line example (B) have a cumulative fee value of $140,000 for improvement from 350 miles to 400 miles, and a fee value of $60,000 for improvement from 400 miles to 450 miles; however, instead of decreasing increments of fee for progressive unit increases in performance, the broken-line arrangement provides for a steady fee rate of $2,800 per mile for the first 50 miles, with a sharp decrease to $1,200 per mile for the second increment of 50 mile improvement.

The graphics in Figure 17 represent a composite of a segment of the situations shown in Figure 15 and 16 A and 16 B. Under the conditions assumed in Figure 15, all positions on any given iso-fee line are considered acceptable. Theoretically, at least, they should all be equally acceptable. The composite shows the relatively small effect of the curved lines on performance and fee even at the mid-point between their intersections. The effect of change from the straight line is obviously more pronounced.

There are no hard and fast rules for the use of a curved line with decreasing or increasing increments of fee for progressive unit changes in performance. The contracting officer and the contractor are looking for the most effective contracting structure, and the most effective may or may not include increased incentive emphasis on intermediate factors.

CPIF/MULTIPLE INCENTIVE ISO-FEE LINES

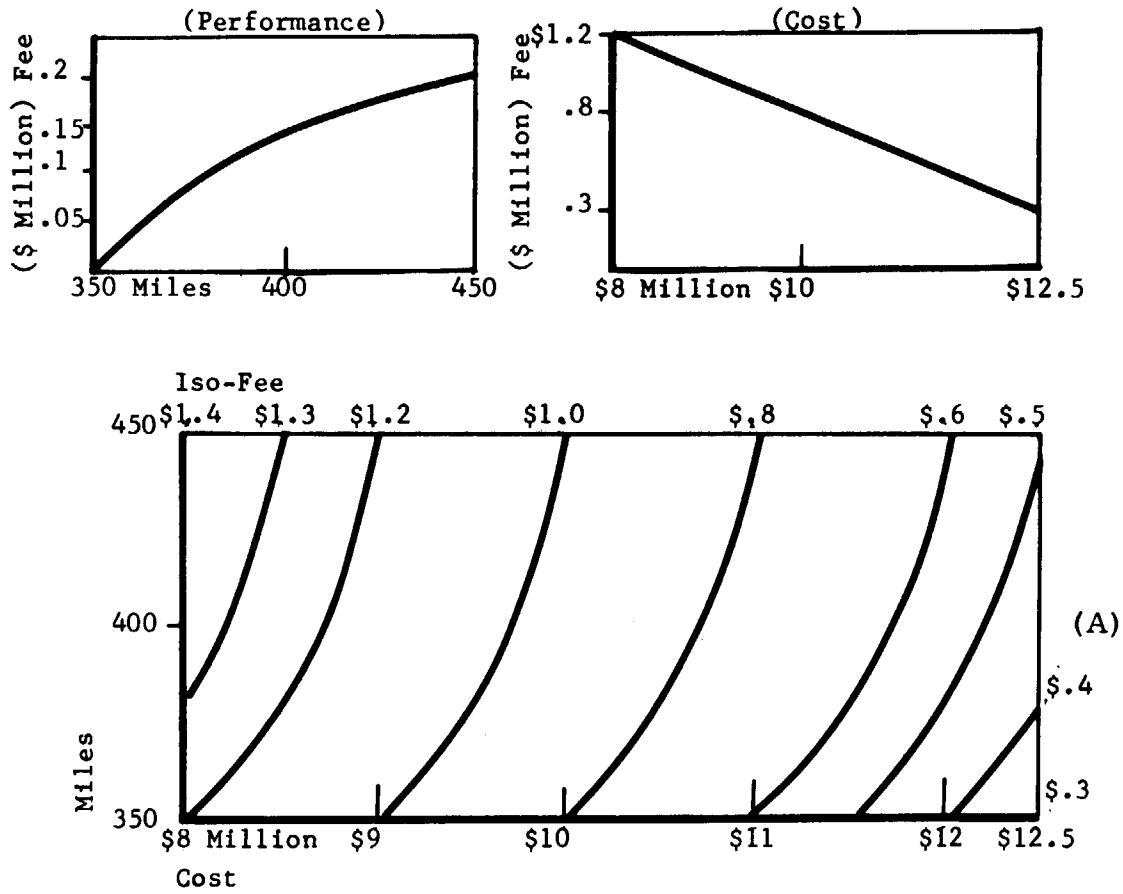


FIGURE 16A

CPIF/MULTIPLE INCENTIVE - ISO-FEE LINES

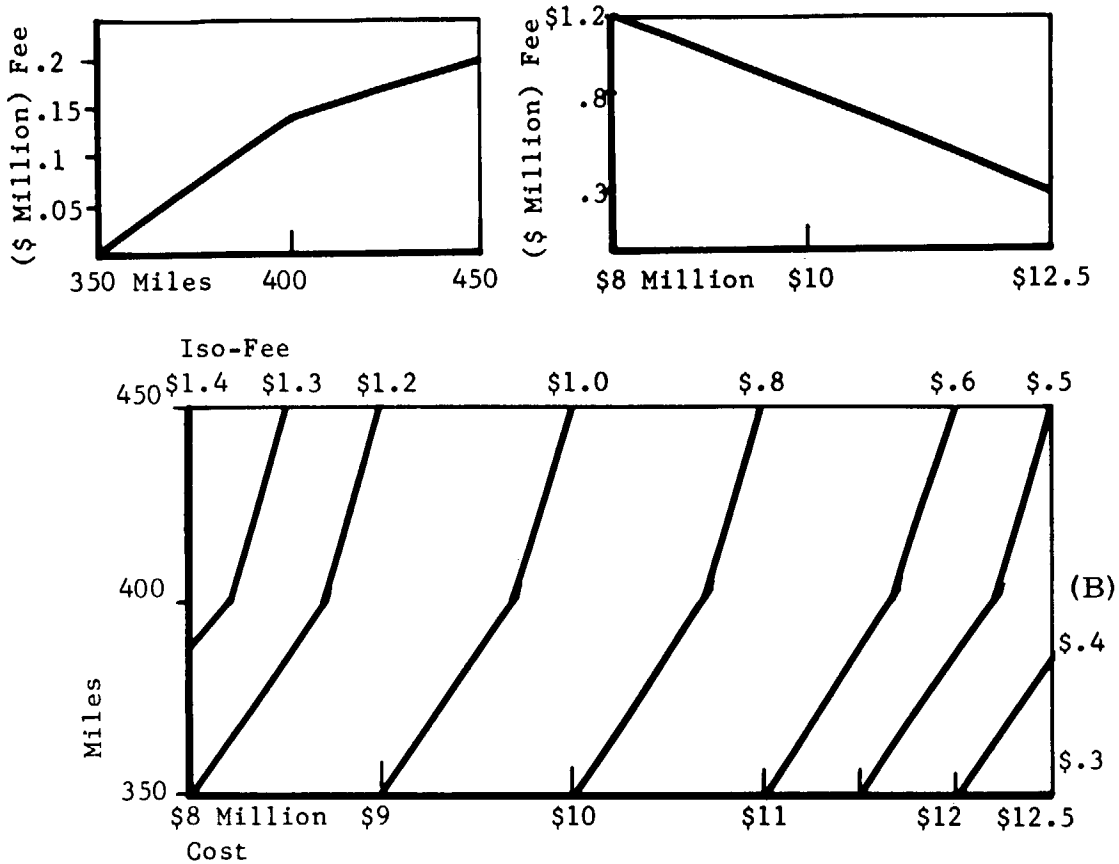
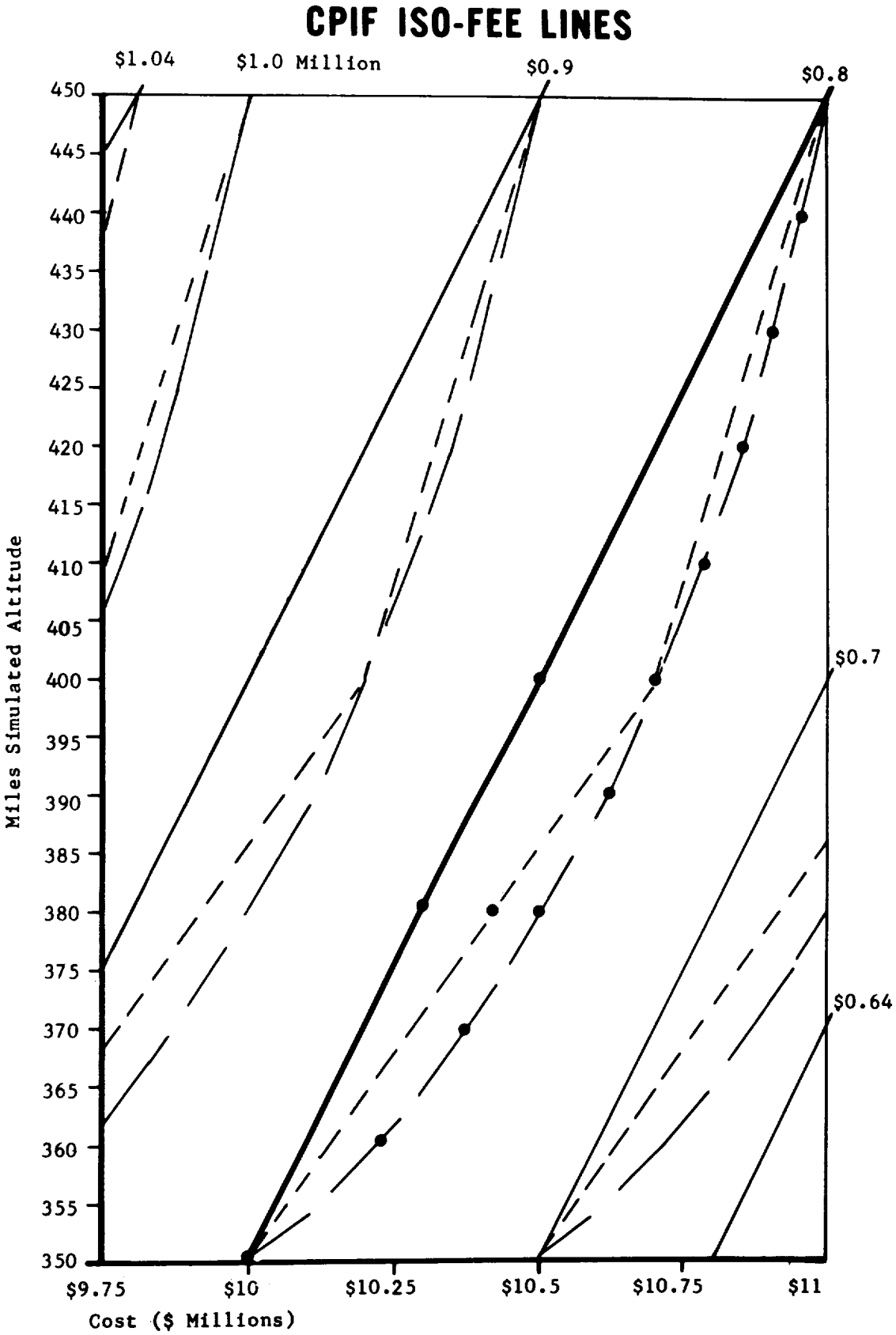


FIGURE 16B



(Composite, Figures 15, 16A and 16B)

FIGURE 17

3. Cost-Performance Structuring (Steps V-VII)(see page 118 and pages 119 through 134 for Steps I through IV)

As mentioned at the beginning of the previous section, this second structuring example will continue with the step-by-step process with a technique called the Cost-Performance Correlation Method. The Cost-Performance Correlation Method is only one of many techniques which attempts to offer guidance in the development of effective incentive structures and meaningful value statements. Again, at the risk of redundancy, many of the previously covered points will be repeated.

Cost-Performance Correlation Method

Steps V-VII: The Cost-Performance Correlation Method is a step-by-step process which attempts to determine the "value" of varying performance levels indirectly. 1/ It relies on quantitative data from the anticipated contract structure as well as a subjective determination of the relative importance of the cost and performance elements.

Using the Cost-Performance Correlation Method, the suggested procedural steps are:

(a) Develop cost RIE and Target Cost (See Section D, Chapter III, Pages 81 through 87)

An iterative process - repeat until Government value is appropriately reflected by an acceptable incentive structure

(b) Select the Total Incentive Fee Pool

(c) Allocate the Total Incentive Fee Pool between cost and aggregate performance

(d) Develop Cost Versus Incentive Fee Curve (sharing ratio(s) and cost incentive fees)

(e) Allocate the aggregate performance incentive pool among the individual performance parameters (if more than one)

(f) Develop Performance Versus Incentive Fee Curve(s)

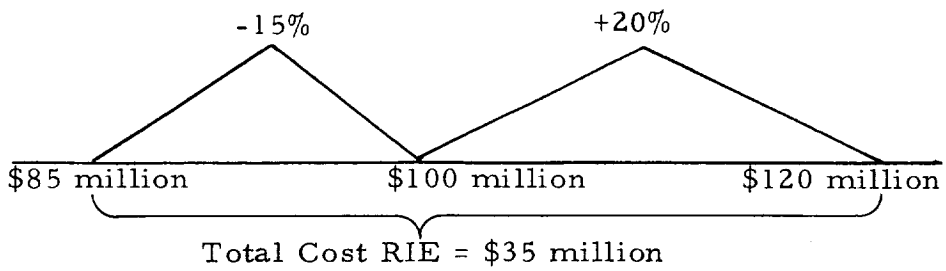
(g) Determine Government Value (for each performance parameter)

(h) Evaluate the total incentive structure - Trade-Off Curves, Nomographs, Ordering Tables - and check the resulting minimum and maximum fees.

1/ See next page for footnote.

For example, suppose the RIE and target cost for a proposed CPIF contract are estimated as follows:

Minimum cost for the target performance system = $85 million;
Target cost for the target performance system = $100 million;
Maximum cost for the target performance system = $120 million.



Then, assume that a total incentive fee pool of 14% ($14 million) is determined appropriate for this procurement, given the risks to be assumed by the contractor. Next, allocate this pool between cost and performance according to their relative importance. Using this example, if the total incentive fee pool is $14 million and cost is determined to be

_____ more important than

_____x_____ equal in importance to

_____ less important than

total performance, then the total incentive fee pool is split into $7 million for the cost incentive and $7 million for the performance incentive.

The next step is to generate a cost versus incentive fee curve. Assuming that only a single share line is planned, the cost curve is defined once the range of incentive effectiveness and the incentive fee pool for cost are known.

1/ It is important to understand that this method assumes that the "value(s)" of increased performance have not been developed; e.g., from life cycle costing data. If they were, the structuring process would be worked in reverse; i.e., from the value statements for the performance parameters, the desired emphasis on cost (vis à vis performance) or the cost RIE, and the desired total incentive pool, incentive fees (or profits) on cost and performance would be developed.

From this data, the sharing ratio (SR) can be calculated by the following formula:

$$SR = \frac{\text{Cost Incentive Fee Pool}}{\text{Total Cost RIE}} = \frac{\$7M}{\$35M} = .20 = 20\%.$$ [1]

Hence, the sharing ratio is 80/20.

Now, it is necessary to determine the distribution of fee on the cost incentive. Since the sharing ratio is 80/20 and the underrun RIE is $15 million, the cost incentive for the underrun is: $15 million X (.20) = $3 million. Similarly, the cost incentive for the overrun is: -$20 million X (.20) = -$4million. A graph of this cost incentive is shown in the following figure.

COST VERSUS INCENTIVE FEE CURVE

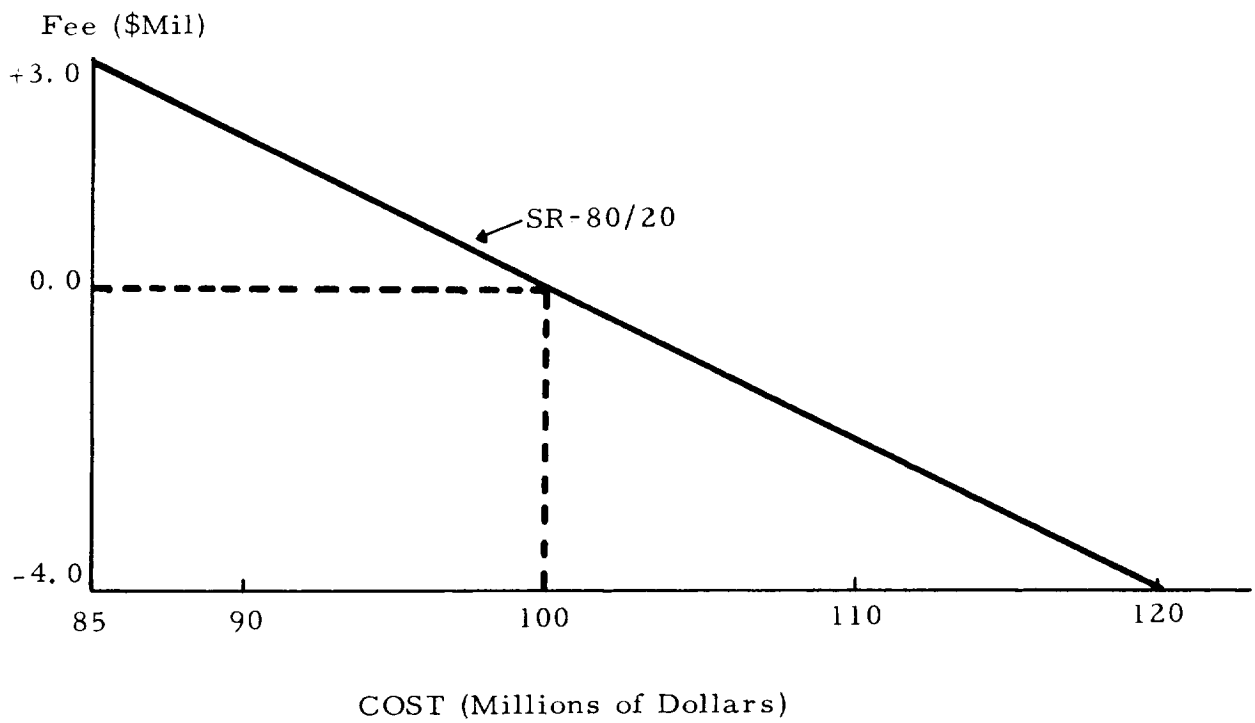


FIGURE 18

1/ In developing an appropriate sharing ratio, the impact of a contractor's fixed expenses on the sharing rate should be considered (see Section G, page 179, of this chapter).

Next, performance versus fee curves are developed (steps (e) and (f)). In this example, assume we have only one performance parameter so that the total performance incentive pool is applied to this one parameter. Otherwise, it would be necessary to break out the total performance incentive pool between the performance parameters in proportion to the maximum number of points given each parameter (See Part 1, Performance Structuring, Page 119).

Assume the performance parameter, called System Performance, is measured in percent and the target or par level is 40%. As mentioned before, we plan to have the zero incentive point at the par or target level (the level to which target cost is estimated). Additionally, the performance RIE ranges from 0 to 100%. From this it is relatively easy to determine the performance versus incentive fee curve.

Assume, for the first iteration of this structuring sequence, that the performance incentive is distributed along a straight line. Then, since zero incentive must occur at 40% (or 40 points), the maximum performance penalty (MPP) will be:

$$\text{MPP} = -\frac{\text{Perf. Range (Min to Target)}}{\text{Total Performance RIE}} \times \text{(Total Performance Incentive Pool)},$$

or

$$\text{MPP} = \frac{-40}{100} \times (\$7 \text{ million}) = -\$2.8 \text{ million.}$$

Similarly, the maximum performance reward (MPR) will be

$$\text{MPR} = \frac{\text{Perf. Range (Target to Max)}}{\text{Total Performance RIE}} \times \text{(Total Performance Incentive Pool)},$$

or

$$\text{MPR} = \frac{60}{100} \times (\$7 \text{ million}) = +\$4.2 \text{ million.}$$

A graph of this System Performance incentive is shown on the following page, Figure 19.

PERFORMANCE VERSUS INCENTIVE FEE CURVE

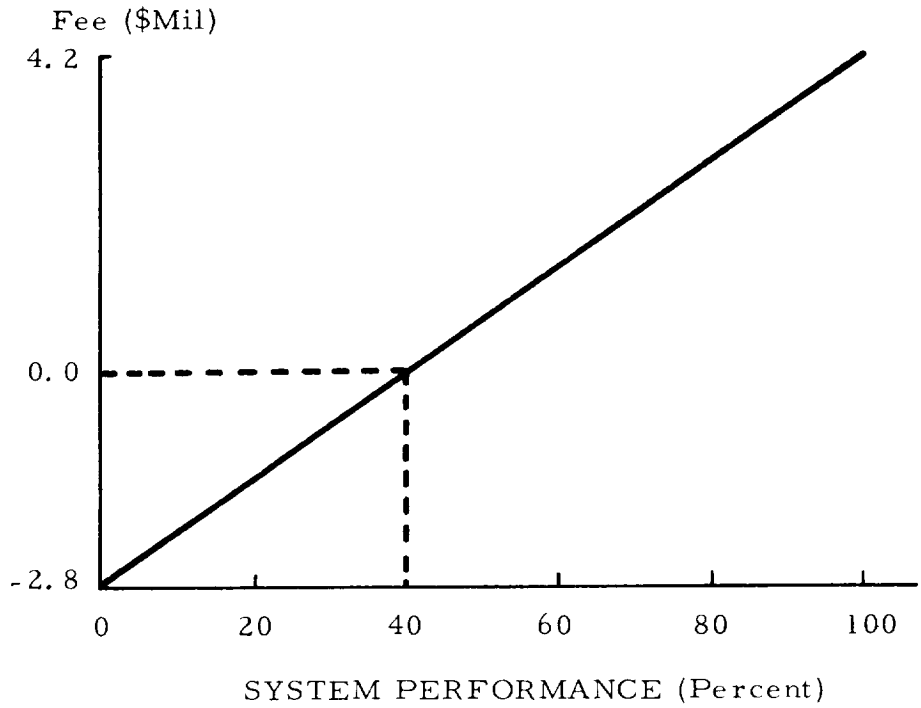


FIGURE 19

At this point both the cost and the performance incentives have been developed. The structure is based upon the selected magnitude of the total incentive fee pool and the selected cost and performance weighting; also straight line incentives were assumed. It is necessary to evaluate the effects of these initial assumptions; this is accomplished by determining the appropriateness of the implied performance "values" of this initial structure (Steps (g) and (h)).

Before proceeding to the value determination and the evaluation of our example, some general comments are appropriate.

In the evaluation of an incentive structure, two factors are of paramount importance. The first factor, the sharing ratio, is critical because it determines the amount of cost risk to be shared with the contractor. Second, the implied value statements (of performance) are of importance because they are the basic ingredients of the structure which communicate the Government's planned trade-off relationships to the contractor.

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In general, the iterative process described here enables us to control the sharing ratio by varying the total incentive fee pool. The larger the total incentive fee pool, the steeper the sharing ratio. Note that as long as there is only one cost sharing rate, and as long as no change is made to the performance incentive structure (its shape) or to the assessment of the relative importance of cost and performance, "value" does not change. This is because a change in the total incentive fee pool will change both the sharing ratio and the performance incentive magnitudes proportionately. If changes in the performance "values" are desired, this can be accomplished by changing the form (shape) of the performance incentive function or by changing the assessment of the relative importance of cost and performance. Note, however, that a change in the relative assessment of cost and performance will change the sharing ratio.

Returning to the example, the following "values" are calculated:[1/]

$$\text{Value from min to target performance} = \frac{\text{Change in incentive}}{\text{Sharing Ratio}} = \frac{-2.8 \text{ to } 0}{.2} = \$14\text{M};$$

$$\text{Value from target to max performance} = \frac{\text{Change in incentive}}{\text{Sharing Ratio}} = \frac{0 \text{ to } 4.2}{.2} = \$21\text{M}.$$

Suppose that the sharing ratio (80/20) is too shallow and that a 70/30 sharing ratio is deemed more appropriate. From the previous assessment of cost/performance importance, we know:

Cost Incentive Fee Pool = 1/2 (Total Incentive Fee Pool).

$$\text{Furthermore, SR} = \frac{\text{Cost Incentive Fee Pool}}{\text{Total Cost RIE}} \quad \text{or}$$

SR X (Total Cost RIE) = Total Cost Incentive Pool.

Hence, for a 70/30 sharing ratio, .3 X ($35M) = $10.5M; thus, the Total Incentive Fee Pool would equal 2 X ($10.5M) = $21M. The performance incentive would have to be recalculated as previously shown; after this is accomplished, a recalculation of value would show that value has not changed.

1/ To calculate the "value" of performance changes when there is more than one sharing ratio, a weighted average sharing might be used. The formula with two sharing ratios (e.g., one sharing ratio for costs under target and one for costs over target) would be:

$$\text{SR} = \frac{\text{SR}_1 \text{ X (Cost Range of SR}_1) + \text{SR}_2 \text{ X (Cost Range of SR}_2)}{\text{Cost Range of SR}_1 + \text{Cost Range of SR}_2}.$$

Returning again to the example, suppose that the 80/20 sharing ratio is considered appropriate, but that an examination of the performance "values" previously calculated indicates that more incentive emphasis should be placed on the performance region under par. In reality, it would be desirable to examine performance ordering tables, trade-off curves and nomographs before this conclusion is reached. Here, however, for the sake of simplicity, this will not be done.

Assume that after reviewing the value statements it is decided that a $4 million penalty for 0% system performance and a $2 million reward for 100% system performance is felt to be more appropriate. The restructuring of the performance incentive might appear as in the following figure.

PERFORMANCE VERSUS INCENTIVE FEE CURVE

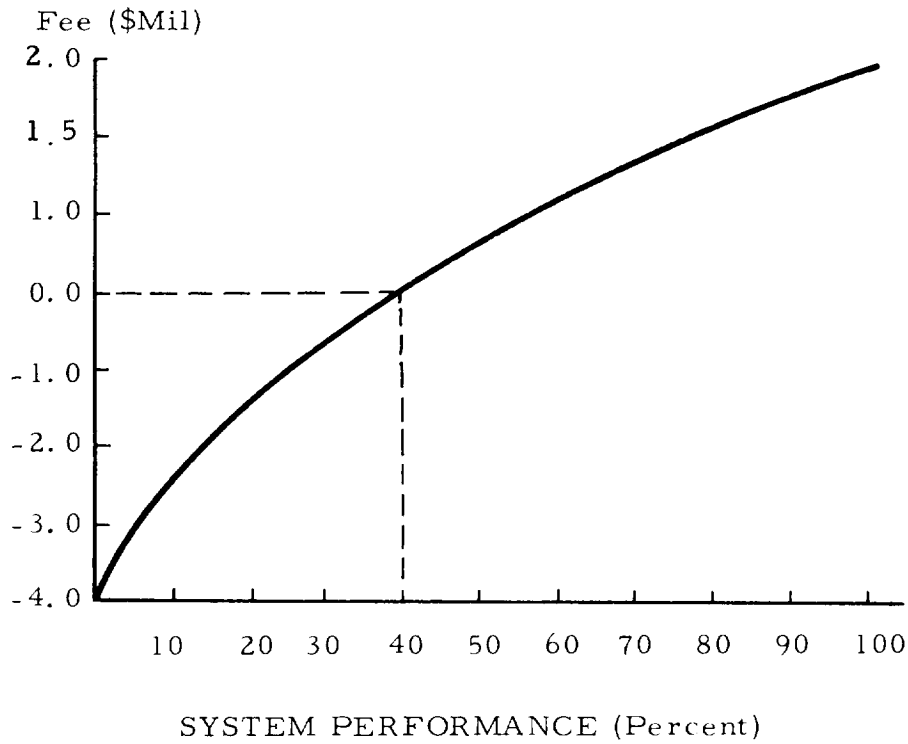

FIGURE 19A

Since there is a change in the performance incentive allocation and not a proportional change in the sharing rate, it is necessary to recalculate value. Using the same formula for value, the following results:

$$\text{Value from min to target performance} = \frac{\$4M}{.2} = \$20M;$$

$$\text{Value from target to max performance} = \frac{\$2M}{.2} = \$10M.$$

Note that it was possible to readjust the incentives within the performance parameter. Cases will occur in which this effort will not yield the desired result; then, it would be necessary to re-assess the relative importance of cost and performance.

It is interesting to note that so far in this structuring process, target fee (or profit) was not involved. It is used as part of the final evaluation step (step (h)) to calculate the maximum and minimum fees (which must be acceptable). In the example, assume a target fee of 8% ($8 million) was estimated. The maximum fee and minimum fees would be calculated as follows:

Maximum fee = Target Fee + (Max. Positive Cost Inc. Fee + Max. Positive Perf. Inc. Fee)
and Minimum fee = Target Fee + (Max. Neg. Cost Inc. Fee + Max. Neg. Perf. Inc. Fee)

or

Maximum fee = $8.0M + $3.0M + $4.2M = $15.2M (15.2%)[1/]
and Minimum fee = $8.0M - $4.0M - $2.8M = $1.2M (1.2%).[1/]

If these maximum and minimum fees are felt to be inappropriate, they would indicate areas where adjustments might be appropriate. To illustrate, if the +15.2% is felt to be too high, it probably implies that the total incentive fee pool should be reduced (to maintain the planned trade-off relationships), rather than reducing just the positive incentives on cost and performance. Thus, the minimum fee would be raised and the maximum fee lowered.

If an examination of the trade-off curves (see Figure 20 next page), the other visibility tools, the value statements, and the minimum and maximum fees indicate that the performance incentive in Figure 19A and the 80/20 cost incentive are appropriate, then no further iteration is required and the structuring process is complete.

Following is a general discussion of several incentive contracting visibility tools useful with the Cost-Performance Correlation Method or any similar method.

1/ It is important to understand that the level of target fee (or profit) does not affect the magnitude of the total incentive fee pool; e.g., $15.2M - $1.2M = $14.0M.

TRADEOFF CURVES

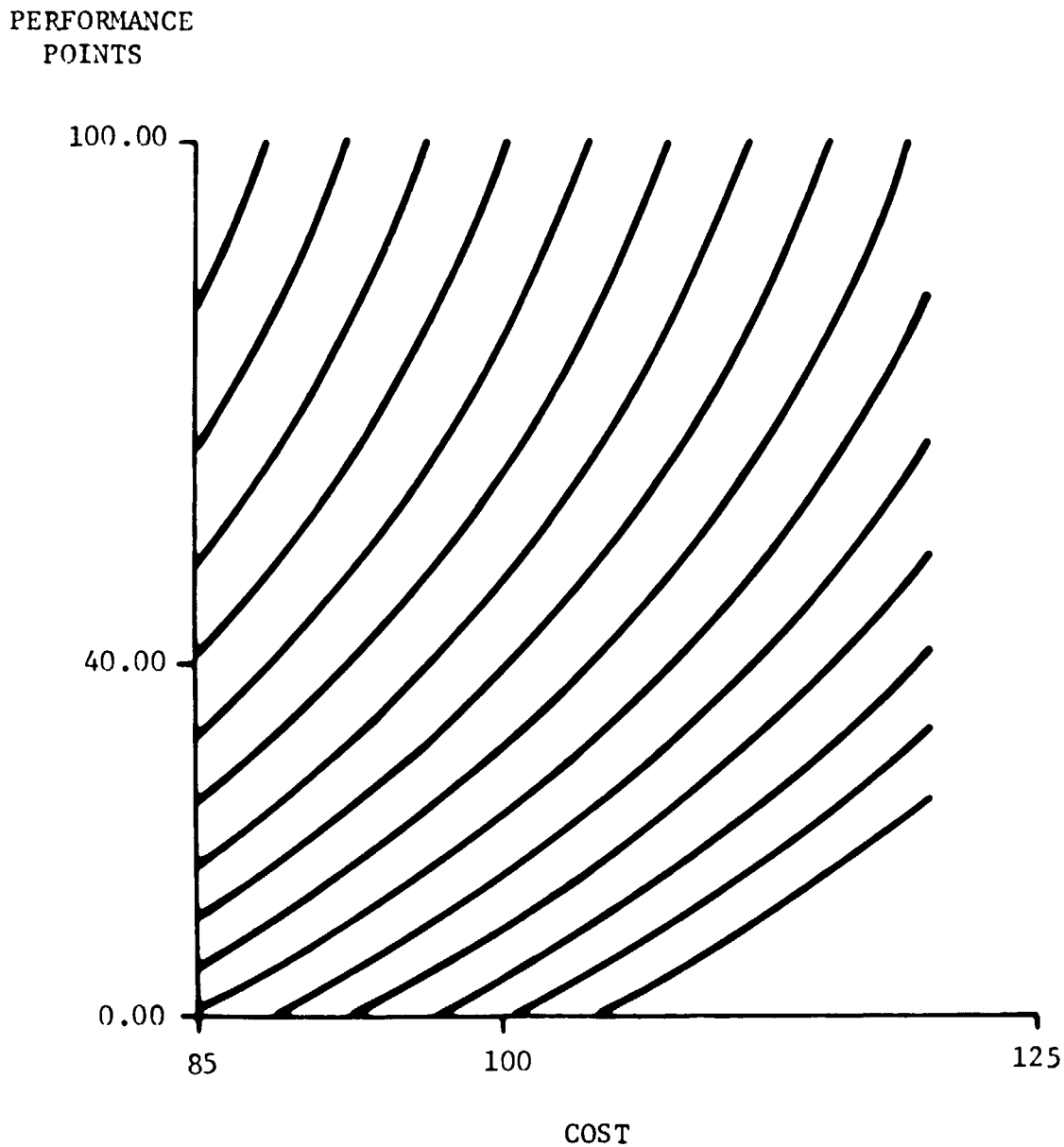

FIGURE 20

Trade-off Curves. Trade-off curves depict combinations of cost and performance achievement for which the contractor will be rewarded with the same fee.

They can be used as an effective tool by the cost, pricing, and technical team in evaluating incentive arrangements. They permit this team to determine if the incentive arrangement developed reflects the desired balance of emphasis among the incentive elements. For any given increase in cost, there is a specific improvement in performance which will leave the total fee unchanged. Also, for any cost reduction, there is a specific performance degradation which will balance the total fee.

The shape of trade-off curves is important. It communicates the Government's desires by showing the relative values of different combinations of cost and performance. Also, it indicates differences in contractor fee for different cost and performance combinations. If the contract is properly structured, the Government will be indifferent to different points on the same trade-off curve.

The cost axis in Figure 20 is measured in millions of dollars. The performance axis, in this illustration, is measured in points of system performance. Zero points represent minimum performance and one-hundred points represents maximum performance. The trade-off curves themselves are measured in millions of dollars of total fee (target fee + net incentive fee). The number of constant fee lines plotted and their particular values are arbitrary and can be generated by the computer according to the desires of the user.

The basic function of trade-off curves is to show how the contractor will be encouraged by the incentive arrangement to trade off or sacrifice achievement in one incentive element for achievement in another. The pricing-technical team should analyze all trade-offs to ensure that all combinations are satisfactory to the Government.

The slopes of the curves must reflect the Government's desires. The slope communicates to the contractor how much the Government is willing to pay for an increment of performance. For example, the curves in Figure 21 show that the contractor will earn $3.4 million for a 60-point system delivered at a cost of $45 million.

If the contractor is to spend $48 million and still earn a fee of $3.4 million, he must deliver an 80-point system. If he spends $48 million and delivers a 60-point system, his fee drops to $2.9 million.

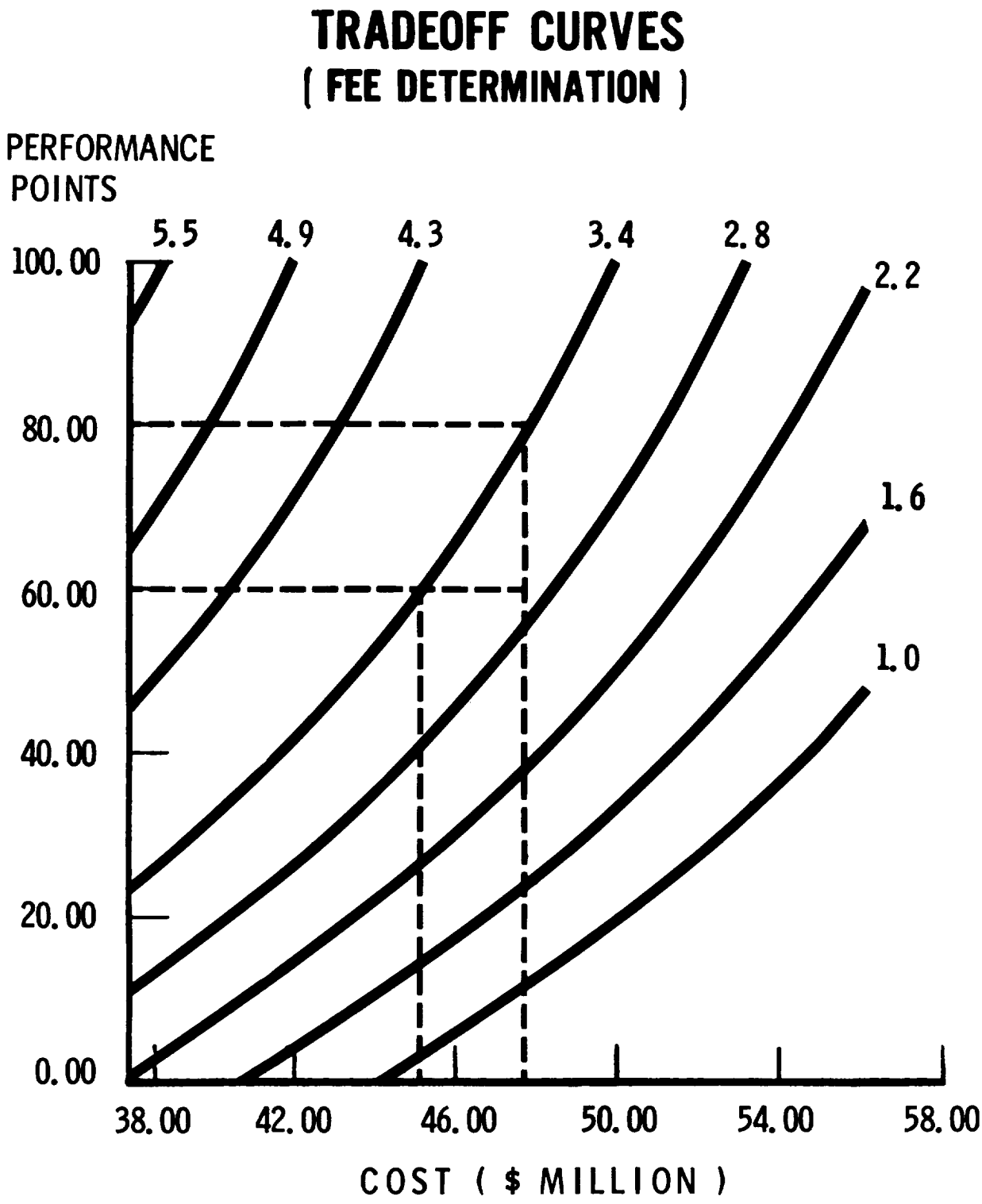
TRADEOFF CURVES
(FEE DETERMINATION)
PERFORMANCE POINTS
5.5
4.9
4.3
3.4
2.8
2.2
1.6
1.0
100.00
80.00
60.00
40.00
20.00
0.00
38.00
42.00
46.00
50.00
54.00
58.00
COST ($ MILLION)

FIGURE 21

Nomographs. Nomographs can be developed to portray the fee to be earned by the contractor for all combinations of contract cost and performance achievement.

The amount of incentive fee earned or lost by the contractor is dependent upon some combination of cost and performance. Therefore, the known quantities are cost and performance. The unknown quantity is the fee or profit.

The computer-developed total fee nomographs used here are constant in format, but variable in scale range. For instance, the left-most scale always depicts the cost range. The scale farthest to the right always depicts the performance range. The middle scale reflects the dependent variable fee. The user has the option of altering the range of each scale, such as the amount of fee swing, cost range, or par values as he deems desirable. As a result, a nomograph (Figure 22) can be generated for almost any particular contract structure. For an example which illustrates the use of a total fee nomograph, see page 132.

Cost-Performance-Schedule Ordering Tables.[1/] Cost-Performance-Schedule Ordering Tables identify the fee awarded for particular levels of cost and performance (and schedule, if appropriate) and illustrate the Government "value" associated with incremental changes of performance. The Table on page 160 is based upon Table I (Total Range) (page 128).

To show a more detailed example, consider a contract which contains incentives on weight, range-effectiveness and mean-time-between-failure (MTBF). The performance parameter weightings are 25 percent, 30 percent, and 45 percent, respectively. This data can be used to generate a Performance Ordering Table, as described earlier in this chapter.

Once the performance incentive fee swing has been determined, another column, relating fee to points, may be added, as shown in the Table on page 162.

The incentive fee is zero at the point which represents the par system. It will accumulate to maximum performance incentive fee at 100 points and minimum performance incentive fee at 0 points.

1/ In addition to the tables illustrated on the following pages, cost can also be made one of the parameter and varied (vis à vis holding it at target cost as in the examples).

TOTAL FEE

NOMOGRAPH

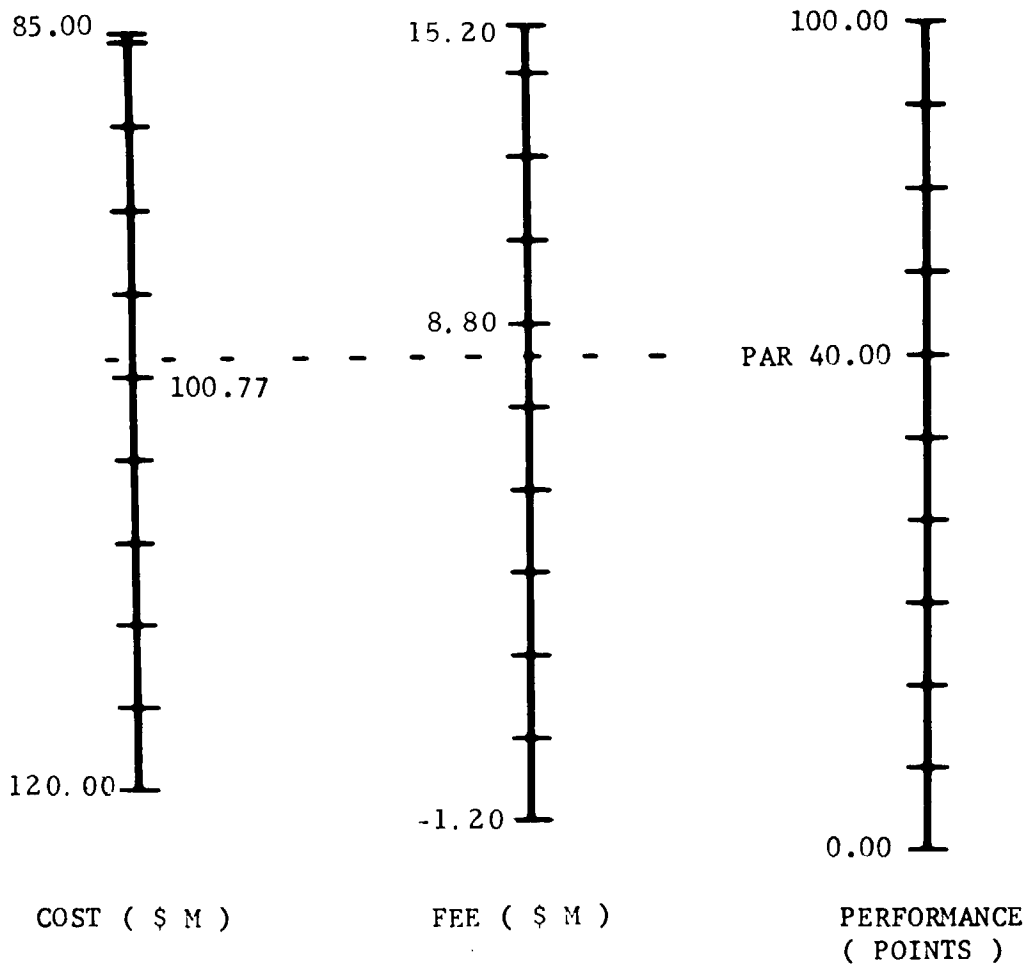

FIGURE 22

COST-PERFORMANCE ORDERING TABLE

(COMPUTED AT TARGET COST)

AIRSPEED	WEIGHT	ALTITUDE	POINTS	PERF. INCENT. FEE* ($ Million)	VALUE ** ($ Million)
1300.00	38000.00	50000.00	0.00	-6.00	
					16.16
1357.52	36892.60	50823.68	25.00	-1.80	
					3.46
1372.03	35769.61	50098.34	32.00	-0.90	
					3.46
1434.72	36528.05	50054.24	40.00	0.00	
					1.58
1401.69	35099.05	51182.59	44.00	+0.41	
					2.15
1338.11	35066.15	60833.26	50.00	+0.97	
					1.35
1450.41	37822.32	58228.93	54.00	+1.32	
					1.85
1394.16	30504.53	54144.25	60.00	+1.80	
					0.54
1502.83	32771.64	50514.12	62.00	+1.94	
					1.12
1417.01	35660.45	61527.78	66.00	+2.23	
					1.00
1497.43	36185.82	59597.95	70.00	+2.49	
					1.19
1387.30	32074.80	64329.26	75.00	+2.80	
					4.60
1550.00	30000.00	75000.00	100.00	+4.00	

* Target fee is not included.

** Represents dollars the contractor could expend in attaining the next specified level of performance and receive no increase in total earned fee.

Now it is possible not only to analyze the changes that occur in the performance level within each parameter as the system points change, but also to analyze the corresponding amount of performance incentive fee dollars which relate to that change. For example, consider the 52 point system versus the 58 point system. Range effectiveness decreases from 90 NM to 85 NM; MTBF increases from 700 hours to 896 hours; and weight remains essentially the same. The difference in performance incentive fee between the two systems is $250,000.

Those responsible for structuring and evaluating this contract must decide whether the increase in MTBF of 196 hours and the decrease in Range Effectiveness of 5 NM represents a trade-off which is worth $250,000 in fee to the Government. If not, restructuring is necessary to achieve the desired combination.

One of the inherent characteristics of a multiple incentive contract is in the trade-off options it provides the contractor. In the example above, a trade-off concerning performance incentive fee alone was discussed. The concern is whether or not the fee to be paid the contractor for delivering an improved system at the same cost is meaningful. The analysis should be carried a step further to recognize that the contractor may indeed not select the trade-off of increased performance at the same level of cost. Rather, he may increase performance at increased costs; thus, it is necessary to analyze the increase in cost which would offset the performance fee earned for increased performance.

The Performance Ordering Table - with Performance Incentive Fee, page 162, can now be augmented by adding a column of value dollars. Specifically, value is equal to the change in fee divided by the contractor's portion of the sharing ratio. Value as used here actually relates to the dollars the contractor may expend in improving system performance from one specified level to another, and retain the same total earned fee. The Table on page 163 has an added value column, and again, for illustration the 52 and 58 point systems are highlighted.

Delivery of a 52-point system results in a performance incentive fee of $0.55 million. The contractor could elect to deliver a 58-point system and neither earn nor lose in total fee by expending an additional $1 million. This is reflected by adding the figures .52 (going from a 52 to a 55 point system) and .48 (going from a 55 to a 58 point system) shown in the value column. The change in the performance incentive fee for the two systems is a plus $250,000, and since the total (net) incentive fee remains constant,

PERFORMANCE ORDERING TABLE

WITH PERFORMANCE INCENTIVE FEE

(COMPUTED AT TARGET COST)

Range Effectiveness	MTBF 1/	Weight	Points	Performance Incentive Fee ($ Million)
75.00	480.00	3600.00	0.00	-2.63
83.92	600.75	3591.68	20.00	-1.15
83.77	665.57	3514.70	30.00	-0.54
84.20	809.10	3499.20	40.00	0.00
92.86	634.79	3448.19	41.00	0.05
103.82	586.20	3475.96	43.00	0.14
86.37	600.19	3108.06	46.00	0.29
83.39	763.47	3317.64	49.00	0.42
90.06	700.30	3260.92	52.00	0.55
86.00	1036.60	3463.81	55.00	0.68
85.04	896.07	3259.87	58.00	0.80
79.12	1510.89	3438.41	61.00	0.91
78.91	1412.26	3374.68	63.00	0.99
101.99	1232.16	3522.10	70.00	1.23
96.43	1108.04	3149.19	80.00	1.55
101.84	1600.04	3266.08	90.00	1.82
120.00	1680.00	3000.00	100.00	2.07

* Target fee is not included.

1/ Mean-Time-Between-Failure

COST-PERFORMANCE ORDERING TABLE

(COMPUTED AT TARGET COST)

Range Effectiveness	MTBF 1/	Weight	Points	Fee * ($ Million)	Value** ($ Million)
75.00	480.00	3600.00	0.00	-2.63	
					5.96
83.92	600.75	3591.68	20.00	-1.15	
					2.44
83.77	665.57	3514.70	30.00	-0.54	
					2.14
84.20	809.10	3499.20	40.00	0.00	
					0.20
92.86	634.79	3448.19	41.00	0.05	
					0.39
103.82	586.20	3475.96	43.00	0.14	
					0.56
86.37	600.19	3108.06	46.00	0.29	
					0.54
85.39	763.47	3317.64	49.00	0.42	
					0.52
90.06	700.30	3260.92	52.00	0.55	
					0.52
86.00	1036.60	3463.81	55.00	0.68	
					0.48
85.04	896.07	3259.87	58.00	0.80	
					0.46
79.12	1510.89	3438.41	61.00	0.91	
					0.30
78.91	1412.26	3374.68	63.00	0.99	
					0.98
101.99	1232.16	3522.10	70.00	11.23	
					1.26
96.45	1108.04	3149.19	80.00	1.55	
					1.10
101.84	1600.04	3266.08	90.00	11.82	
					0.96
120.00	1680.00	3000.00	100.00	2.07	

1/ Mean-Time-Between-Failure

* Target fee is not included.

** Represents dollars the contractor could expend in attaining the next specified level of performance and receive no increase in total earned fee.

the additional cost expenditure of $1 million must result in an equivalent loss of $250,000 in the cost incentive fee (to offset the increased incentive fee for performance). Again, the appropriateness of the dollars associated with the trade-off must be determined. The intent is to arrive at a structure that clearly reflects the desires of the Government regardless of the trade-offs selected by the Contractor.

Finally, these trade-off curves, nomographs, and cost-performance ordering tables should be evaluated for the appropriateness of the value statements. If they are not as desired, adjustments should be made. These adjustments may include changing (i) the incentive fee split between the cost and performance incentive, (ii) the incentive fee range, or swing, for cost and performance, (iii) the range of cost from target cost (RIE), and (iv) the par value for performance.

4. Summary (Seven Steps - Multiple Incentive Structuring)

The development of a multiple incentive structure, as shown in this section, is composed of a logical sequence of steps which may be supplemented by the supporting services and visibility tools provided by DoD POESMIC. The logic of this seven-step structuring process should be used throughout the life of the contract to ensure that the incentive arrangement continually reflects the Government's objectives.

The visibility tools discussed can be used in evaluating contractors' proposals, in preparing the Government's pre-negotiation position, and to illustrate the final negotiated position -- thus, communicating a complete understanding by Government and contractor personnel of the contractual responsibilities conveyed by the negotiated incentive arrangement. Additionally, and very importantly, these tools can be helpful in monitoring the administration of the contract and in restructuring, if there are major changes or a program redirection.

The following checklist can be used as a guide to help ensure that all sequential steps are completed during the process of selecting, defining, weighting, and structuring performance parameters (Steps I-IV); see page 147 for the detailed steps of the Cost-Performance Correlation Method (Steps V-VII). Following this checklist are the data requirements needed by DoD POESMIC (see Section C, Multiple Incentive Contracting Services, page 114 of this chapter).

a. Checklist - Development of Performance Parameters

(1) Identify Key Performance Parameters

(a) Contribute to Product/System Effectiveness

(b) Measurable

(2) Formulate Performance Ranges

(a) Minimum Acceptable - Satisfactory

(b) Maximum Desirable - Realistic

(c) Target Performance - Goal

(3) Define Performance Rating Scale

(a) Assign Points to Minimum Acceptable (always zero)

(b) Assign Percentage Weight to Each Parameter (must sum to 100)

(c) Assign Target Points

(4) Evaluate Performance Arrangement

(a) Performance Ordering Tables

(i) Check Incremental Changes in Performance

(ii) Check Weighting

(iii) Check Minimum versus Maximum

(iv) Check Type of System versus Points

(b) Performance Nomograph - Check Trade-offs

b. POESMIC Data Requirements 1/

(1) Type of Contract (in use or contemplated)

(2) Cost Data

(a) Range of Incentive Effectiveness (RIE) 2/

(b) Minimum and maximum fees (state whether these fees are applicable to the cost incentive only or the whole contract) or ceiling price (state whether the performance and schedule incentives are or are not included in the ceiling price)

(c) Sharing ratio(s) (with their applicable cost ranges)

1/If pre-RFP, provide as much of the above data as is available. If dollar figures are not available, the incentive data may be expressed in percentages of an estimated target cost.

2/This range should be the "range of probable costs".

(d) Target Cost (or an estimate of target cost)

(e) Target Fee or Profit

(3) Performance Data

(a) Performance Parameters

(b) Performance Ranges (minimum, target, and maximum level) 1/

(c) Weightings 2/ or Government "Value" 2/ or the Performance Incentive Fee or Profit (rewards and penalties) of each parameter (If not linear, give the function or equation of each parameter.)

(4) Schedule Data

(a) Range (minimum, target, and maximum) 3/

(b) Increments or Steps (days, weeks, etc.)

(c) Government "Value" of late (minimum) and early (maximum delivery or Schedule Incentive Fee or Profit (rewards and penalties)

(5) Documents

A copy of the incentive portion of the RFP, the proposal(s), or the contract (If all the data in (1) through (4) is clearly outlined in this document, a separate compilation of this data is not necessary.)

(6) Special Provisions

Contract clauses applicable to the incentive arrangement, etc., that are not in the incentive portion of the RFP, the proposal(s), or the contract.

1/ The minimum should be the minimum acceptable performance level; the target (or par) should be the desired performance level; and the maximum should be the realistic maximum useful level.

2/ The parameters should be weighted according to their relative importance or Government "Value".

3/ Analogous to performance incentives, minimum is the minimum acceptable (worst) schedule, target is the realistic (most likely desired schedule and maximum is the maximum useful (best or early schedule).

(7) Incentive Rationale

Any additional existing information that would give POESMIC a clearer understanding of the rationale used for selection of the performance parameters, their ranges, the cost RIE, etc., as well as an understanding of the requirements and objectives of the contract or proposed procurement.

5. Fixed Price Multiple Incentives

The following statements made in Chapter III, under Fixed-Price Incentive-Cost-Only, attempt to establish the fact that while CPIF and FPI contracts are similar in many of their features they are also clearly different in others:

> "The Fixed Price Incentive (FPI) contract is preferred over the CPIF contract by both the Government and the contractor when all prerequisites for the selection of the contract type are met. FPI contracts will not be used when cost or pricing information and performance specifications adequate for the negotiation of firm targets and firm ceiling prices are not available at the time of initial contract negotiation.
>
> "The degree of technical uncertainties should be the primary criterion for the choice between selection of a CPIF or an FPI contract. An FPI contract should be selected when there is a reasonable expectation of technical success within stated, measurable limits.
>
> "In considering the extent of risk under an FPI contract, it should be remembered that an FPI contract assumes all of the risk equal to that of an FFP contract at a fixed point of cost incurrence prior to the time that the price ceiling is reached. At the point of total cost assumption, the contractor assumes full cost responsibility for continuing performance until completion."

Again, while the ingredients of the two contract forms are similar, the introduction of the ceiling price into the FPI structure has a significant impact upon the development of a multiple incentive structure. First, the maximum dollar amount for which the Government is liable is set. Further, the contractor must deliver a product meeting the contractual requirements on schedule. Also, the cost ceiling or PTA marks a clear trade-off point where the cost equivalent trade-off for performance is dollar for dollar.

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Previous Government incentive guides have recommended that performance incentive under FPI multiple incentive contracts should be rewards-only and outside the ceiling price limitations.

The performance rewards-only concept is preferred based upon the following rationale: (i) if a stated level of performance is required then it should be the basis for estimating the target cost, (ii) "target performance" implies that the Government would be satisfied with less than target performance at higher than target price, and (iii) "target profit" should reflect a fair reward for the performance level the contractor is required to achieve.

Because there is the element of a dollar for dollar trade-off involved, the rewards-only concept maintains the integrity of this concept. In other words, the contractor is assured of a given dollar performance reward that is consistent with the terms of his FPI cost-only arrangement. Where the performance incentive is rewards and penalties around target -- thus outside of the ceiling price -- the practical effect is to tell the contractor that he has a firm target cost and ceiling price with several "target profits". To illustrate, assume our previous example used in the FPI-cost-only section with the following features.

Target Cost : $10.0 million
Target Profit: $1,050,000 (10.5%)
Ceiling Price: $12.0 million (120% of Target Cost)
Share Ratio : 65/35

Let us now assume that the engineers subjectively decide that going from the minimum acceptable performance level to target performance is worth $1.0 million; going from target to maximum performance is worth $1.2 and since contractor's share should be the same as his cost sharing ratio of 65/35 or reward $1.2 million x .35 ($420,000) and penalty $1.0 million x .35 ($350,000). The structure would now be:

Target Cost : $10.0 million
Target Profit: $1,050,000 (10.5%)
Ceiling Price: $12.0 million (120% of Target Cost)
Share Ratio : 65/35
Performance Penalty $350,000 (3.5%)
Penalty Reward $420,000 (4.2%)

This, then, equates to a "target profit" range of from 7% to 14.7% based upon the performance levels achieved. If we analyze this profit range in terms of its effect on cost ceiling and ceiling price the following pertains:

Profit Percentage	Cost Ceiling (PTA)	Profit at Cost Ceiling	Ceiling Price
7.0	$11.461 M	$189,000	116.5 Percent
10.5	$11.461 M	$538,500	120.0 Percent
14.7	$10.815 M	$1,185,000	120.0 Percent

This relationship is graphically portrayed in Figure 23.

If on the other hand the decision is to establish target performance as the contractual requirement -- which seems to be implied -- then the result would be:

	Cost Ceiling (PTA)	Profit at Cost Ceiling	Effective Ceiling Price
Target Performance	$11.461 Million	$538,000	$12.0 Million
Maximum Performance	$11.461 Million	$559,000	$12.42 Million

This is graphically shown in Figure 24.

It follows, of course, that if the minimum system is indeed the acceptable level of performance desired then the rewards-only incentive would be $770,000 (7.7%) rather than the $420,000 given in the example. This would assume that the "target profit" for an acceptable system would still remain at $1,050,000 (10.5%). This approach would in effect be telling the contractor he could "trade off" approximately $286 for each $100 of cost fee (65/35) up to the effective cost ceiling of $11.461 million at which point the cost equivalence becomes 0/100.

Another way to express the agreement is to say that the Government is willing to pay $12.0 million (ceiling price) for a target system at maximum price or $11.82 million ($10.0 million target + $1,820,000 profit) for a system meeting maximum performance at target cost. If the value to the Government in this case is assumed to be reasonably valid ($2.4 million for the maximum system) then 18.2% fee for maximum performance at target cost is appropriate.

Again, it should be stressed that target cost must represent a reasonable cost for the required level of performance and that increased performance be of value to the Government.

It is essential that whenever performance rewards are "outside" of the ceiling price that a contractual provision be added to handle such an eventuality. This may take the form of a statement that the ceiling price may be adjusted upward to allow for payment of schedule and/or performance rewards.

While the Guide states that the rewards-only approach is preferred for FPI-multiple incentives, this statement should not be misconstrued to imply that the rewards-penalty approval is not perfectly acceptable.

FIXED PRICE INCENTIVE
(REWARDS - PENALTY)

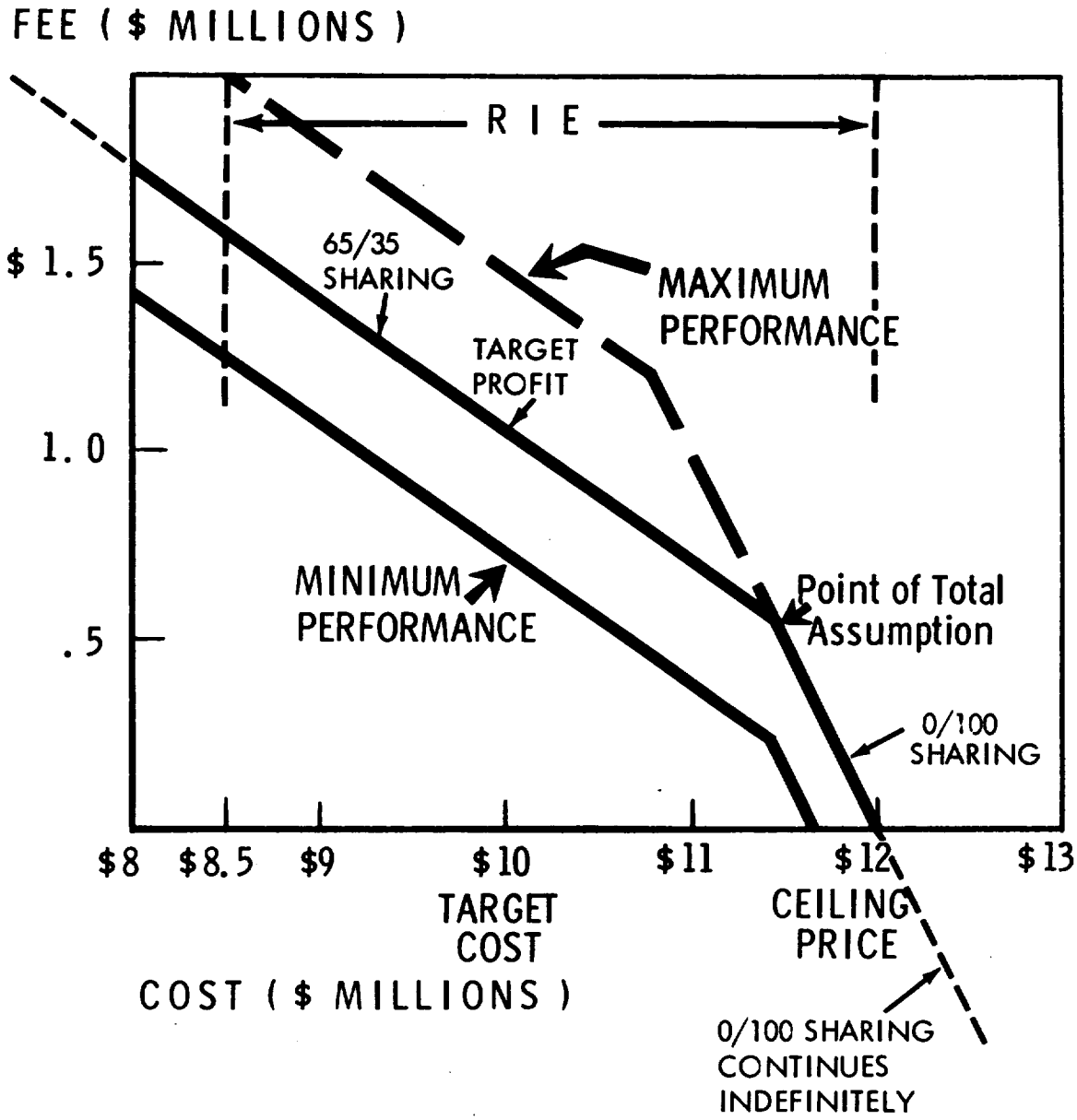

FIGURE 23

FIXED PRICE INCENTIVE
(REWARDS - ONLY - OUTSIDE CEILING)

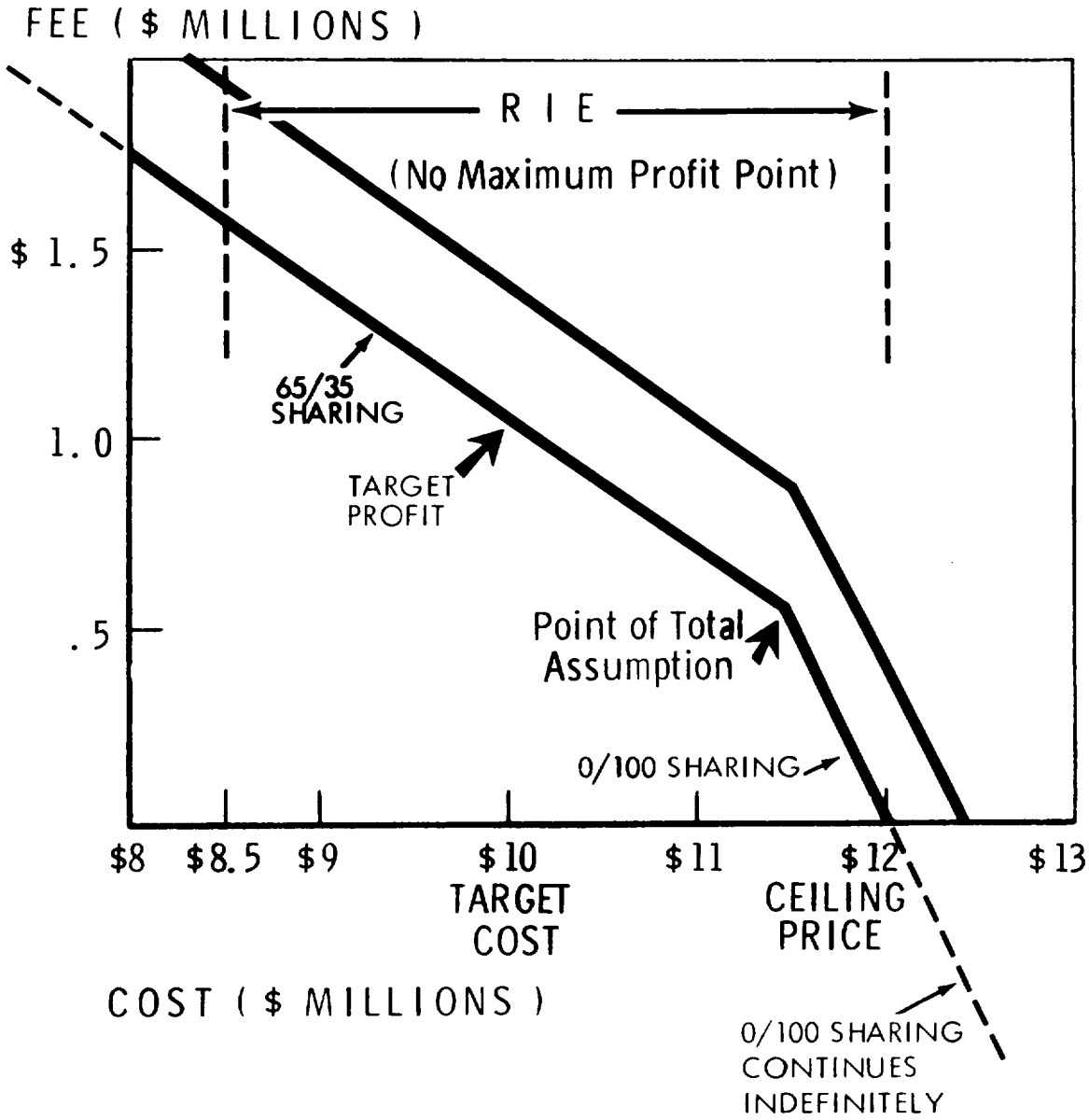

FIGURE 24

It has been, in fact, the traditional method used in the past. Any method is acceptable if it satisfies the objectives of both parties.

As has been stated, the rewards-only approach requires that all decisions be based upon improving minimum acceptable performance. Naturally, the principal change under the rewards-penalty concept is that a performance target--rather than minimum requirements--is selected.

Either approach is equally applicable to schedule incentives. However, as stated in Chapter V, Schedule Incentives, schedule incentives are often penalty-only and, therefore, would tend to reduce ceiling price.

E. INCENTIVE MEASUREMENTS AND PAYMENT

Performance incentive events must not only have reasonable goals and achievable maximum levels, but also must have measurable goals and levels. It may be debatable whether performance incentives are structured on minimum performance levels or structured around performance goals. In any event, the minimum performance level must be acceptable and should not be so flexible that it becomes meaningless as an incentive measurement line. If a point system is used to combine the incentive aspects of two or more performance features, the minimum acceptable rating in the point system should not permit average acceptable ratings which might include an individual measurement of performance below an acceptable threshold.

The methods and test procedures for measurement should be available and understood by both parties before contract performance. Where necessary, the procedures should indicate those conditions under which test results will be accepted for purposes of incentive determination and under what conditions they will be rejected, or subject to a decision by the contracting officer (and subject to appeal thru "Disputes" or other means of appeal). The measurement procedures and the agreement concerning the procedures also should provide for any exclusions covering failures attributable to associate contractors or GFP. The procedures should cover events under which the cause of failure cannot be determined. In most cases, undetermined causes of failure will be attributable to the contractors when the contractor has been fully responsible for design, development, and test or when the contractor has systems responsibility over associate contractors.

Certain incentive arrangements have provided that where performance failure occurs in the contractor's flight or test hardware and the cause cannot be attributable to any other unit, the performance incentive does not operate and cost incentives are limited to target profit.

The main criterion for performance is final mission or program success. Multiple incentive structures may provide that interim milestone earnings will be treated as conditional earnings. In this way, incentives for interim events may accrue for each particular event, but will not be available or fully earned until final mission or program success is demonstrated.

Major systems contracts may limit incentive earnings. When measurement of performance determines that a mission failure is due to causes within the contractor's control, the incentive arrangement may reduce the profit to the specified minimum fee

In the event that more than one contractor or cause is designated responsible for a performance failure involving crew safety, the incentives would be reduced to the minimum level if the contractor is determined to be a substantial contributor as specified in the contract. A substantial contributing cause does not need to be determined as the dominant cause.

When incentive events cannot be demonstrated due to causes completely beyond the contractor's control, the event may either be called "no contest" with profit payable at the target amount, or the incentive amount or points can be carried over and allocated to subsequent events or tests. Incentives for events which have not been demonstrated should not be reallocated to interim events which have already occurred; if this procedure is considered for a flight event that is preceded by pre-flight incentives, it appears equally reasonable that the entire incentive should be allocated to pre-flight test demonstrations.

The method for payment for earned incentives should be specified in the Schedule provisions of the contract. The "Allowable Cost, Incentive Fee, and Payment" clause (February 1968 ASPR; June 1967 NASA PR) deals only with the cost incentive--paragraphs (h) and (i)--but provides that the fee may also be adjusted by special clauses in the schedule provisions for delivery and performance incentives. The "Incentive Price Revision Clause" for both the FPIF and FPIS types of contract are essentially the same. It is important, then, that specific provision be made for payment to the contractor at the time a performance reward is earned.

It is generally assumed that final adjustment of target profit and target fee in accordance with the incentive provisions of the contracts will be accomplished and paid as soon as practicable after physical completion of the contract work.

F. PROTECTION AGAINST MASSIVE OVERRUNS

A major concern in the CPIF multiple-incentive contract is the very real possibility that operation of the incentive matrix will produce large overruns. In the contract shown in Figure 25 for instance, if the contractor delivered a 1,050 MPH aircraft three months after earliest date at a cost of $130 million, he would receive a $8 million fee, and if he delivered the same high performance aircraft six months late at a cost of $160 million, he would still earn $8 million. The fact that cost control and delivery were exceptionally poor in the second case would not affect the $8 million reward for highest equipment performance. Viewed another way, the same fee would be paid for very different levels of over-all contractual performance, and, even more important, once the contractor had expended $130 million, all incentive to control cost would end. In fact, at that point the contractor might be tempted to spend very large amounts to achieve improved equipment performance, and the greater the weight placed on the performance incentive, the greater will be his tendency to spend additional funds once the cost incentive has run out. There are several contractual provisions that may help to prevent this situation.

The simplest of these provisions is a clause that prohibits the payment of any reward under the performance incentive arrangement unless final costs are equal to or less than a stated amount.1/ This amount may be any cost from target to the upper limit of cost confidence depending on the particular circumstances. This, of course, prevents any trade-off decision by the contractor that commits more than the stated cost to the achievement of performance levels higher than target. The Government is saying, in essence, that it is willing to pay up to the stated level if such expenditures are necessary to reach target performance levels. If these are, in fact, the operative conditions of the procurement, then the provision will be an appropriate and effective means of preventing large intentional overruns. It does,

1/ This is called the contingency technique, since the contractor's reward in the incentive area is contingent upon his keeping withing a given cost range.

SAMPLE ASYMMETRICAL CPIF MULTIPLE INCENTIVE CONTRACT

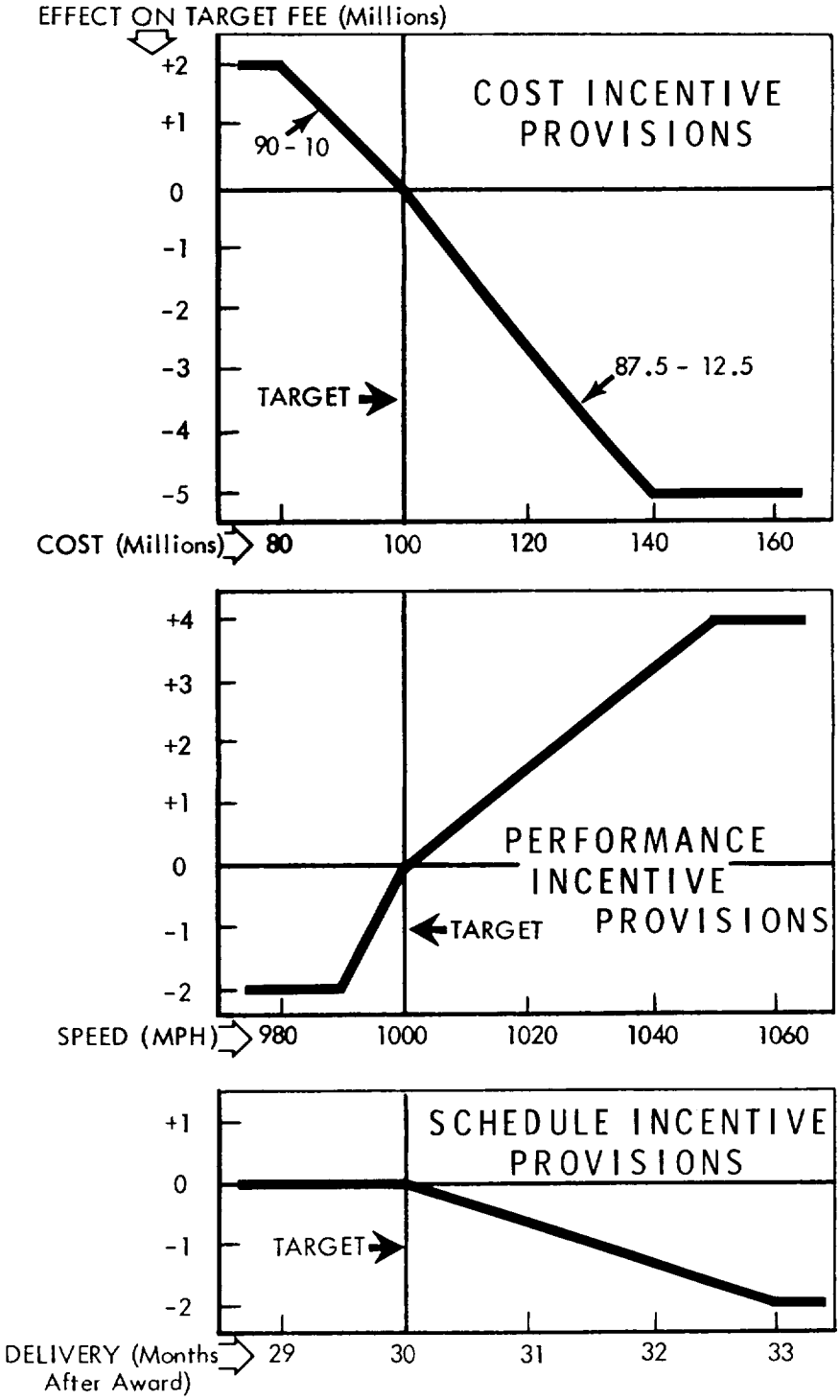

Figure 25

naturally, modify substantially the original trade-off matrix established in the multiple-incentive arrangement.

This provision is an acceptable solution to the problem of intentional overruns that increase performance levels and thereby gain a net increase in fee. It does not, however, prevent loss of the incentive to control costs when the contractor (i) has bought in or (ii) has reached the upper confidence limit of cost, but has not yet produced a product that meets even minimum acceptable performance levels. In these situations, he will exceed the upper limit of the cost incentive regardless of whether this produces a net increase in fee. And, once he is past this limit, the incentive to control costs will be gone. This condition may be prevented by allowing the cost incentive to continue operating at costs greater than the normal limit of the cost-incentive range. Assume, for example, that a contract showed the following fee swings around a target fee of $7 million:

	Incentive Swing	Fee Pool
Cost:	± $3.0 million	$6 million
Performance:	± $4.0 million	$8 million
Schedule:	± $1.0 million	$2 million
Total Fee Swing:	± $8.0 million	$16 million

This could be altered so that the cost fee swing would be plus $3.0 million, minus $8 million. The cost-incentive share line between $70 million and $130 million, however, would remain the same. We would simply extend that line past $130 million until it reached a penalty of minus $8 million.[1/]

Using the performance and schedule curves shown in Figure 25 and the cost curve of Figure 26 , we may examine the effect of the continuing cost incentive at several possible outcomes.

1/ The slope of this continuing cost incentive does not have to be coincident with the slope of the cost line below $130 million. It is, of course, subject to negotiation. Nor does it have to end at a penalty of $8 million. The contractual minimum fee could be removed altogether and a cost-sharing arrangement established.

CPIF CONTINUING COST INCENTIVE

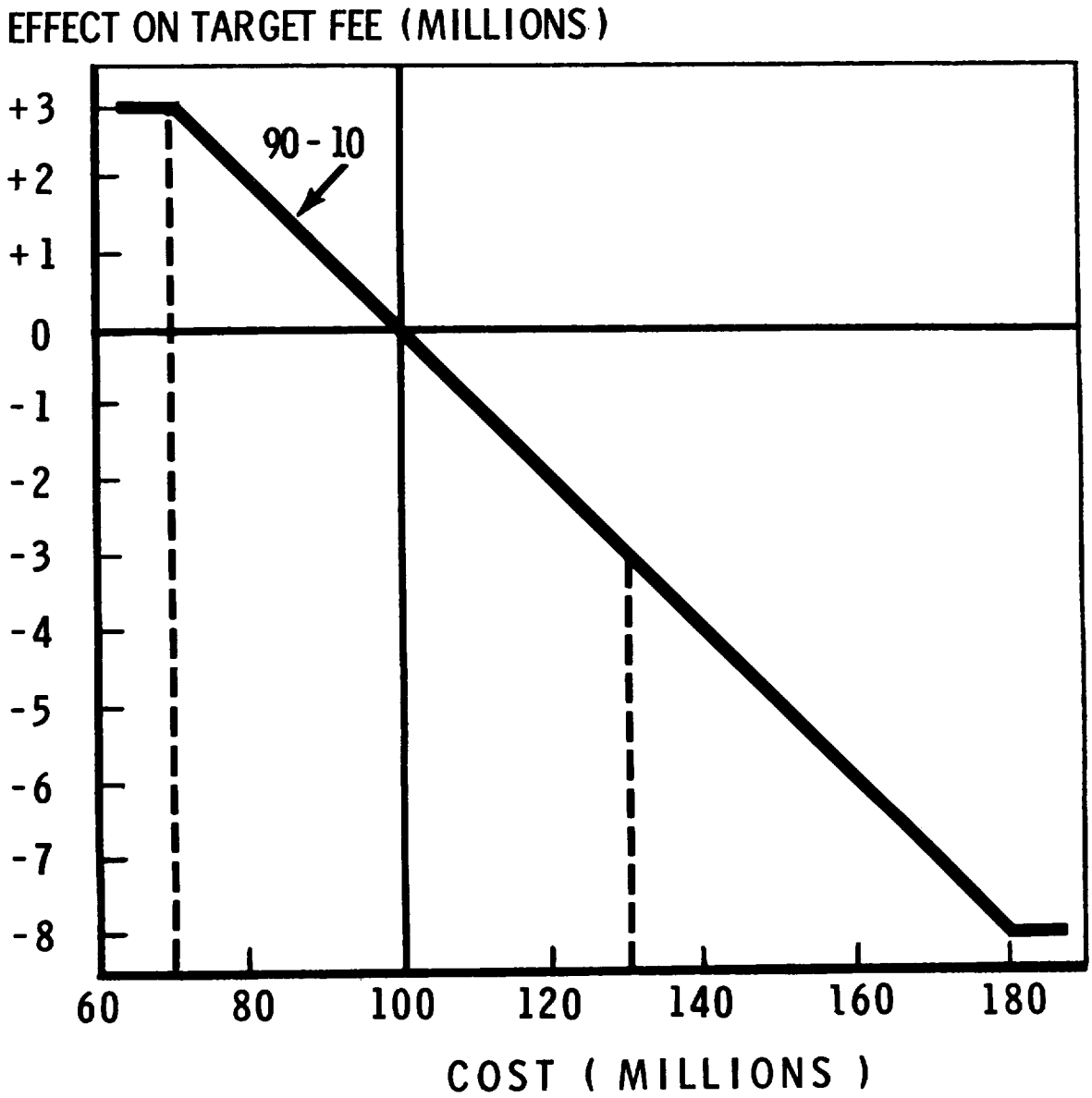

FIGURE 26

Example I:

Incentive Element	Outcome	Effect on Fee (Millions)
Performance	1,030 MPH (Maximum)	+ $4.0
Cost	$130 million	- 3.0
Schedule	30 months	+ 0
	Net Effect	+ $1.0
	Final Fee (Target $7 plus $1)	8.0

This, of course, is the same fee that would have been paid using the old cost incentive arrangement.

Example II:

Incentive Element	Outcome	Effect on Fee (Millions)
Performance	1,030 MPH	+ $4.0
Costs	$180 million	- 8.0
Schedule	On Target	0
	Net Effect	- $4.0
	Final Fee (Target $7 minus $4)	$3.0

In this case, because of very poor cost control, the contractor has been penalized not only the normal $3.0 million for cost, but an additional $5.0 million. The effect has been to erode his performance incentive earnings.

Example III:

Incentive Element	Outcome	Effect on Fee (Millions)
Performance	970 MPH (minimum)	- $4.0
Cost	$180 million	- $8.0
Schedule	3 months late	- $1.0
	Net Effect	- $13.0
	Final Fee	- $ 1.0

Despite the net effect of minus $13.0 million (which, when deducted from the $7 million target fee would result in a fee of minus $6.0 million) the final fee is -$1.0 million since the contractual minimum fee has not been changed. There is no requirement, of course, for a minimum fee and in exceptional cases minimum fee is not stated. If this had been the situation, in Example III, the net effect would have been a fee of minus $6.0 million.

G. THE EFFECT OF FIXED OVERHEAD ON INCENTIVE SHARING ARRANGEMENTS

1. The problem of fixed overhead and its impact on incentive sharing arrangements may best be demonstrated by an example. Suppose that a company's simplified forecast of profit and loss for calendar year 1969 is as follows:

Sales	$11,000,000
Direct Labor	5,000,000
Total Overhead (100%)	5,000,000
Profit	$ 1,000,000

Assume further that (i) firm fixed price contracts account for all sales; (ii) $1 million of the total overhead is fixed and $4 million is variable (in other words, even if the company did no business at all, it would have to pay $1 million to cover such costs as rent, depreciation, and property taxes); and (iii) the company is operating at less than full capacity and could perform $3 million of additional direct labor during the year without adding new facilities--that is, without increasing its fixed overhead.

2. Now suppose that the company has an opportunity to propose on a one-year CPFF contract. It estimates that the job will require $1.25 million of direct labor and $1 million of variable overhead. Thus, if it did the work, the total expenses for 1969 would be:

Direct Labor $5,000,000 + $1,250,000	=	$ 6,250,000
Variable Overhead ($4,000,000 + $1,000,000)	=	$ 5,000,000
Fixed Overhead	=	$ 1,000,000
Total		$12,250,000

The approved overhead rate for billing the CPFF contract would be 96 percent (total overhead/direct labor equals $6,000,000/ $6,250,000). On this basis, it submits the following proposal and is awarded the contract:

Direct Labor	$1,250,000
Overhead @ 96%	1,200,000
Total Estimated Cost	2,450,000
Fixed Fee @ 6%	147,000
Total	$2,597,000

The company's revised projected earnings for 1969 are as shown in Table I.

Table I

	FFP Business	CPFF Business	Total
Sales	$11,000,000	$2,597,000	$13,597,000
Direct Labor	5,000,000	1,250,000	6,250,000
Variable Overhead	4,000,000	1,000,000	5,000,000
Fixed Overhead	800,000	200,000	1,000,000
Profit	$ 1,200,000	$ 147,000	$ 1,347,000

The profit forecast has increased by $347,000 over the company's original projection of $1 million. This is $200,000 more than the $147,000 fee on the CPFF contract. The additional $200,000 "profit" is earned because the CPFF contract is now carrying part of the fixed overhead previously carried by the FFP business.

3. Now, suppose that the company overruns the CPFF contract by $450,000($250,000 in direct labor and $200,000 in variable overhead). Its expense base for the year would be:

Direct Labor ($6,250,000 + $250,000)	$ 6,500,000
Variable Overhead ($5,000,000 + $200,000)	$ 5,200,000
Fixed Overhead	$ 1,000,000
Total	$12,700,000

and the new approved overhead rate for billing the CPFF contract would be approximately 95.4 percent (total overhead/total direct labor or $6,200,000/$6,500,000). The revised profit and loss statement would be as set forth in Table II.

Table II

	FFP Business	CPFF Business	Total
Sales	$11,000,000	$3,077,000	$14,077,000
Direct Labor	5,000,000	1,500,000	6,500,000
Variable Overhead	4,000,000	1,200,000	5,200,000
Fixed Overhead 1/	770,000	230,000	1,000,000
Profit	$ 1,230,000	$ 147,000	$ 1,377,000

As a result of the overrun, company profit has increased. This is because the Government, under the CPFF contract, is paying an additional $30,000 (an increase from $200,000 to $230,000) of the contractor's fixed overhead--that is, the CPFF contract is making a greater "contribution to fixed overhead," thereby increasing profit on the fixed price business. Under these conditions, it was to the company's advantage to overrun the CPFF contract.

4. Suppose, now, that a CPIF contract with a target fee of $147,000 and a 95/5 sharing arrangement had been negotiated instead of a CPFF contract. If the CPIF contract is performed at target cost, company profits would be as shown in Table I--i.e., a total profit of $1,347,000 would be earned. If, however, a $450,000 overrun was incurred, profits would be as shown in Table III.

1/ The allocated share of fixed overhead for the FFP and CPFF contracts is determined as follows:

	FFP Business		CPFF Business	
Direct Labor	$5,000,000		$1,500,000	
Total Overhead (95.4% of direct labor)		$4,770,000		$1,430,000
Less: Variable Overhead		$4,000,000		$1,200,000
Equals: Fixed Overhead		$ 770,000		$ 230,000

Table III

	FFP Business	CPIF Business (95/5 Share)	Total
Sales	$11,000,000	$3,054,500	$14,054,500
Direct Labor	5,000,000	1,500,000	6,500,000
Variable Overhead	4,000,000	1,200,000	5,200,000
Fixed Overhead	770,000	230,000	1,000,000
Profit	$ 1,230,000	$ 124,500 1/	$ 1,354,500

Despite the overrun and the operation of the share line, total profit has increased to $1,354,500. In other words, the effect of the 95/5 sharing arrangement has not been great enough to offset the added contribution to fixed overhead resulting from the overrun. And it was to the company's benefit to overrun the CPIF arrangement, just as it was with the CPFF contract.

5. This "negative incentive" condition can be corrected only by ensuring a sufficiently steep sharing arrangement. If the Government had used an 80/20 sharing formula (instead of 95/5), company profits would have decreased as a result of the overrun as shown in Table IV.

Table IV

	FFP Business	CPIF Business (80/20 Share)	Total
Sales	$11,000,000	$2,987,000	$13,987,000
Direct Labor	5,000,000	1,500,000	6,500,000
Variable Overhead	4,000,000	1,200,000	5,200,000
Fixed Overhead	770,000	230,000	1,000,000
Profit	$ 1,230,000	$ 57,000 2/	$ 1,287,000

1/ Fee received on the CPIF contract with a 95/5 share plan is target fee less 5 percent of the cost overrun ($147,000 - ($50,000) (5%) = $124,500).

2/ Fee received on CPIF contract with an 80/20 share plan is target fee less 20 percent of the cost overrun ($147,000 - ($450,000) (20%) = $57,000).

The incentive formula has reduced fee by more than the additional contribution to fixed overhead. (It can be shown that under a 93/7 share line, total company profits would remain constant if an overrun of $450,000 was incurred.)

6. Normally, the proportion of a company's total overhead that is fixed will not be known with great accuracy. It will vary substantially -- by industry, by contractor within an industry, and by the period of time covered. In fact, company management may affect the amount of "fixed" expense by deliberately deciding that certain expenses will be retained despite fluctuations in volume. What is critically important for Government negotiators is not precision in estimating these fixed expenses, but strong efforts to incorporate a suitably steep share line in those situations where the contribution to fixed overhead is likely to be an important factor; namely, when the contractor is operating at less than full capacity (or will be at full capacity but have no backlog) and a significant part of his business is performed under firm fixed price contracts. 1/

1/ Contribution to fixed overhead is not a problem when the company's business is all (or nearly all) on a cost reimbursement basis. In this case, the overhead paid on all contracts will change whenever the volume of business changes.

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CHAPTER V

SCHEDULE INCENTIVES

A. COST-PLUS-INCENTIVE-FEE

The Guide has cautioned that schedule incentives are probably the most difficult to assign a Government value because the objectives may not remain constant, and the effect of the changes cannot be forecast with reasonable accuracy.

However, there are advantages and disadvantages associated with the application of rewards and penalties to motivate delivery or accomplishment on time. Generally, penalty-only incentives appear to be the most appropriate for schedule. The principal reason for this is that schedule is the most difficult to control and usually the least important element to major program success. Obviously there are many exceptions to this statement and the use of schedule incentives can be effective in achieving the Government's objectives. For example, where the Government is trying for a "window" on a space shot; or where the delay of a critical component will cause a major "re-direction" of a total program -- i. e. an air-to-air missile designed for a particular aircraft; or in those many instances where earlier delivery is important on standard or semi-standard items and the spector of Termination for Default or Liquidated Damages does not realistically apply then schedule incentives may be appropriate.

The principal problem with establishing a schedule incentive is the lack of control on the part of the Government to set a realistic delivery date and then to maintain it. Almost every contractual "equitable adjustment" involves schedule changes as well as cost (e.g. excusable delays, the changes clause, the Government furnished property clause, stop work orders, program redirection, etc).

Further, unlike trade-offs involving performance, trade-offs between cost and schedule are possible throughout the entire period of a contract. The contractor can, for example, accelerate his effort by using more overtime or employing redundant approaches to problems.

The relationship between cost and schedule is not necessarily, however, an inverse one. For instance, late accomplishment of a milestone may impose additional working capital requirements on a contractor and necessitate overtime on another contract by delaying the availability of facilities, equipment, or personnel. In general, delays are costly, and the contractor has a natural motivation to meet his schedule.

Schedule nevertheless is rarely as important to the contractor as performance. Performance has such great impact on company reputation and ability to obtain future business that it governs the contractor's trade-off decision making in the event of a conflict with schedule.

The importance to the Government of meeting schedule varies widely among contracts. In some instances, delays are of minor consequence. In others, they may jeopardize the success of vast programs. In the extreme case, a delay may impair the national security.

In contracts on which delays are not of serious concern, no incentive should be placed on schedule. If the contractor can benefit from extending his effort, such as by increasing the quality of his product or by continuing absorption of fixed costs on a cost reimbursable contract, schedule incentive of modest amount will not be sufficient to motivate him to sacrifice that advantage.

Even without incentive on schedule, some inducement for the contractor to fulfill his responsibilities on time is always present. The desire to avoid a record of lateness prompts contractors to meet deadlines. In addition, since delays usually result in extra cost, they reduce any incentive earned on the element of cost. A small incentive for timeliness of contract execution would provide negligible, if any, additional encouragement.

If achievement of contract goals would be seriously endangered by schedule slippage, then lateness should, if practical, be made a matter of contractor nonconformance. The Government then would be in a position to terminate for default and possibly collect damages if the schedule were not met, and the contractor, in addition to financial injury, would suffer degradation of reputation. Termination and collection of damages are, however, difficult and costly. Government and contractor efforts often are so interrelated that joint responsibility must be assumed for lateness. Except for the possibility of letting redundant contracts to increase the possibility of meeting deadlines, making on-time completion a firm requirement and including liquidated damage clauses is another course of action for the Government if lateness is likely to result in failure of the program.

When schedule slippage can be tolerated but would be of substantial consequence to the Government, a reward should be placed on schedule. The Government should estimate the value of delays and must recognize in negotiating these incentives represent the same cost equivalency as is employed in the cost incentive. Such a procedure would help motivate the contractor to make those cost versus schedule trade-offs that would best serve the Government interest. In those rare instances where more than one sharing ratio is used as the cost incentive, then the appropriate

share on schedule would be calculated as the average cost share over the range between actual cost and target cost -- or the total profit assigned to schedule can be divided by the average rate and the cost equivalent factor applied.

Another problem is that the value to the Government of delays can be extremely large -- so large that corresponding schedule incentives might be impossible for a contractor to accept. If such is the case, and yet it is recognized that delays will, if necessary, be tolerated, the Government should give serious consideration to letting redundant contracts. If that course of action is not acceptable, there is no alternative for the Government but to negotiate the largest incentive possible for delays.

This section has not addressed the subject of rewards for early completion of work. It has dealt only with schedule delays. Usually, early completion is not of value to the Government. Sometimes it can result in additional cost. Prototypes might, for example, be delivered at an inconvenient time and might require storage and care over an extended period. Rewards for schedule advances are, therefore, not generally advisable. In the event that early completion is of value, however, incentives can be established in a manner analogous to that recommended for delays.

Based upon past experience, schedule incentives probably should be used more in fixed priced procurements and less in cost-reimbursement buys.

If schedule incentives are used, the incentive feature should focus on the delivery of the product, however a certain degree of schedule flexibility for interim milestones may be necessary to avoid impact on performance. In nearly all CPIF situations, there will be many changes to interim schedule events which are beyond the control of the contractor. For this reason, it has been found practical to use "forgive" provisions when interim milestones are incentivized. Thus, a lost interim milestone is not always fully charged against the contractor if the end-product delivery schedule is met.

Whenever a specific or fixed date is critical -- as in the case of a space "window" shot -- a reward on schedule should reflect this fact. A go/no-go schedule incentive should be established for that fixed -- calendar -- date outside of the "contract date". In other words, the contractor meets that date in order to earn the incentive notwithstanding the effect of contract adjustment on schedule.

The standard schedule incentive on a "contract date" basis appears to be particularly inappropriate in those multiple CPIF situations where technical uncertainty is combined with cost uncertainty. If the uncertainties

of contract performance are such that performance cannot be estimated with sufficient reasonableness then it does not appear realistic to attempt to introduce fixed delivery schedules.

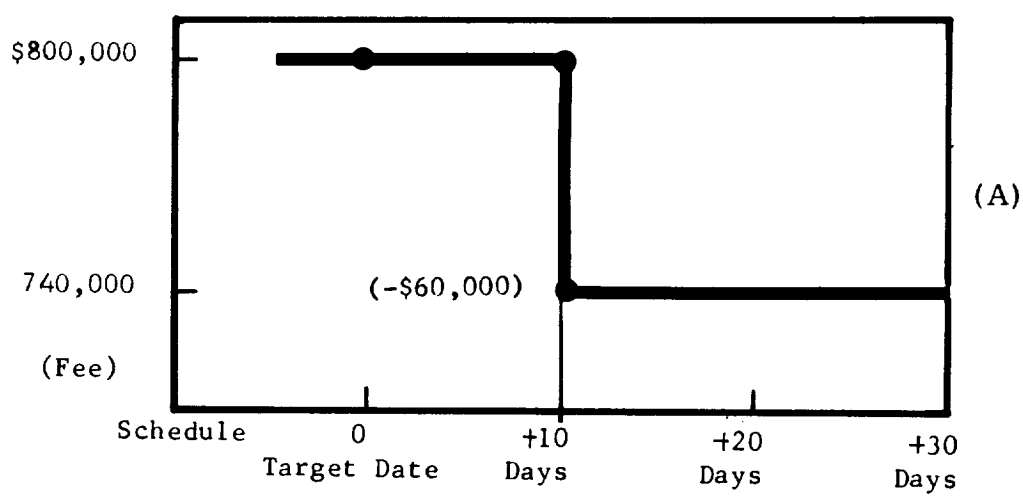
The two most commonly used methods for application of schedule incentives are the go/no go and the linear arrangement which imposes a fixed reduction in fee for each day of delinquency until the maximum deduction amount is reached.

In the go/no go schedule incentive, the full penalty is imposed for any delinquency. When the delivery date is targeted at a point two or three years after award, the go/no go date is usually modified by creating a plateau which may extend one week or even one month following the target date.

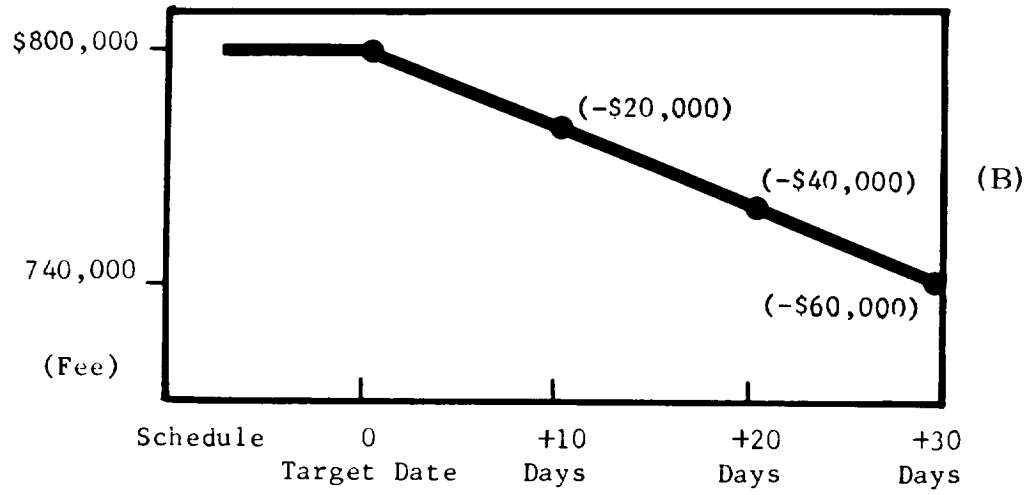
An example of the two types of schedule incentives might assume a $10 million contract with a delivery objective established at a date 18 months after award. The contract has a target cost of $10 million with a target fee of $800, 000 (8%), maximum fee of $1. 2 million (12%), and minimum fee of $240, 000 (2. 4%). The schedule penalty is $60, 000. In this example, the sharing rate applied to the cost incentive is 80/20.

The schedule example is graphically portrayed below and shows a go/no go incentive structure with the entire fee reduction applied at the end of a 10-day plateau.

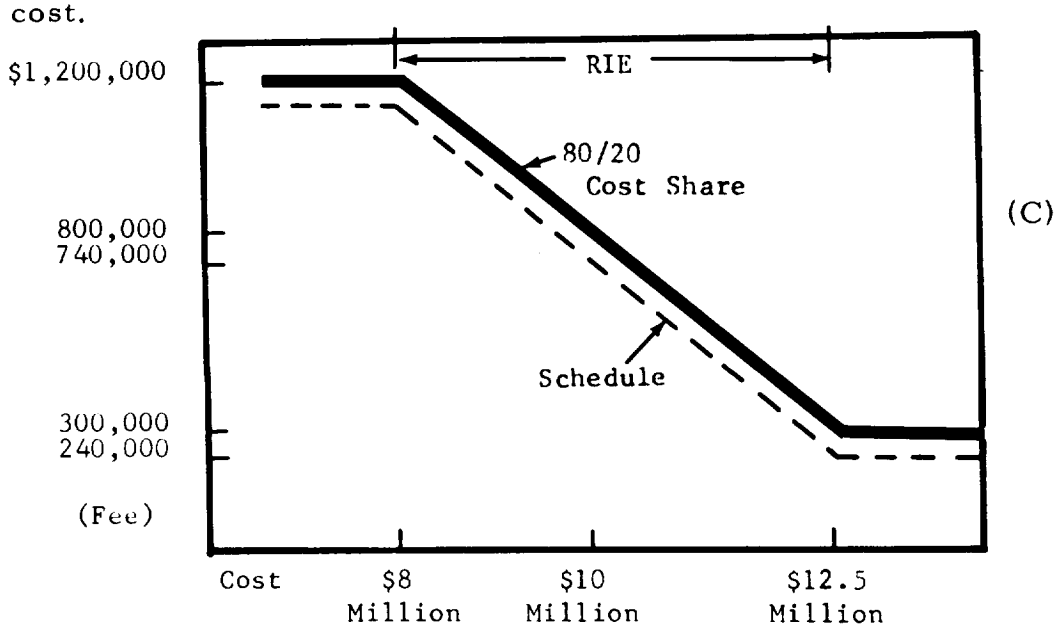
CPIF
SCHEDULE INCENTIVES



This figure shows the fee reduction applied at a rate of $2,000 per day over a 30-day period following the schedule date.



This figure shows the CPIF cost and schedule incentive structure. The two preceding figures illustrate the fee reduction effect at target cost.



There are several possible variations in either the go/no go schedule incentive or the linear reduction method. In the go/no go type, an incremental schedule incentive could be applied by reducing fee at the rate of $20,000 at the end of each 10-day period. Thus, there would actually be three go/no go dates instead of one date. In the linear example, the rate of fee reduction could be small at the beginning of the 30-day period and gradually increased throughout the 30-day range. In this case, the $60,000 fee reduction might be applied at the rate of $500 per day during the first 10 days, increased to $2,000 per day during the next 10 days, and finally increased to $3,500 per day during the remaining 10 days of the delinquency range.

If the incentive is large enough to attract attention at all levels below the project management level, the importance of the program and the fact that there is "some incentive" will serve to attract management's attention. The size of the schedule incentive must be determined on a case-by-case basis. Obviously, the size of the incentive may influence the decisions to make trade-offs, but trade-offs are encouraged when there is enough over-all program visibility to permit trade-offs, and when the trade-offs are in line with the contractual objectives.

In the examples shown above, the trade-off of cost (cost equivalency) for schedule is $300,000 ($60,000 x 5). In other words, with an 80/20 sharing rate, the contractor's share of a $300,000 extra expenditure to meet schedule would amount to $60,000. A trade-off to attempt a 10-day improvement in schedule might entail added expenditures up to $100,000. The 80/20 share line would charge $20,000 to the contractor, equal to the avoidance of the $20,000 schedule incentive penalty for 10 days. The net contract charge to the Government would be $80,000 for the maintenance of the contractual schedule.

The value statement developed by the program and contracting personnel prior to contract negotiation should have determined the "value" of the schedule at this point. The actual value of the schedule improvement may be many times greater than the net cost to the contract. It does not need to be expressed as anything but a reasonable ratio of this value as is done in cost incentive. The schedule incentive should focus on delivery of the final work in a schedule range which is compatible with the schedule of associate contractors engaged in the over-all program. The objective is to encourage the trade-off to achieve schedule when costs are below target cost; the value statement also should develop a rationale for the trade-off even when costs are above target.

Since the contractor is sharing in cost expenditures caused by performance continuing beyond the objective, and is also sharing through additional fee reductions from the schedule incentive, it appears that the continuing motivation over a range of time may, in many cases, have a stronger motivating effect than a go/no go incentive placed on one calendar date. In a go/no go situation, the motivating effect is operating from the first day of the contract until the "one" schedule incentive date in the contract. Then the effect is lost at one point in time. In a linear arrangement there is a continuing effect for a longer period of time. The cumulative effect over a longer period is considered to offset the smaller fee reduction which is applied on a daily or weekly basis. There are no simple, single set of guidelines to determine the appropriateness of a go/no go or a linear structure.

There also is no simple, single set of guidelines to determine the size of the incentive for schedule. The amount should not be any greater than the amount necessary to get attention at all appropriate levels. Extracontractual influences, the Contractor Performance Evaluation Program, and the influences of performance records in future source selections are all motivators for on-time schedule. The continuing cost sharing is another strong motivator for on-time schedule. Certainly, the schedule incentive should not be so large as to impact adversely on performance during a possible cost overrun.

B. FIXED-PRICE-INCENTIVE

The basic guidelines covering schedule incentives in CPIF situations also are appropriate guidelines in FPI contracts. The main difference is caused by the basic differences in the two types of contracts. The contractor may only be required to exert best efforts to make a certain delivery in a CPIF contract, subject to the Limitation of Cost Clause, while the contractor guarantees to meet a minimum acceptable delivery adjusted schedule in the FPI contract (subject to the contract clauses).

The Government's minimum requirement for schedule completion generally is not subject to negotiation; however, the analysis performed during the development of over-all prenegotiation objectives and the conclusions reached during the fact-finding may extend or decrease the schedule period which was originally contemplated. At any rate, these actions will have examined the realism of the minimum requirements for delivery and also should have examined the feasibility and desirability of earlier schedule goals.

If early completion is of substantial value to the Government, earlier completion dates can be negotiated as the minimum acceptable delivery schedule, and a go/no go schedule incentive established.

The same extracontractual influences which serve to motivate timely delivery in a CPIF contract are also operating in an FPI contract. Contractor Performance Evaluation Reports covering schedule are important motivators for timeliness because of the effect on future source selections. Before establishing schedule incentives the contracting officer should always review the Contractor Performance Evaluation data bank to determine the contractor's schedule performance in the past. If this record reveals that the contractor's performance in meeting delivery is unsatisfactory he can then decide to apply a heavier penalty schedule incentive or decide against the award of the contract to that contractor. Obviously the contracting officer must evaluate the reason for the delayed delivery. In many development programs delivery uncertainties may be considered as inherent to the uncertainties of technical performance and not necessarily the product of company management.

There are two FPI contractual factors working for timely delivery without the requirement for additional incentives. One direct factor is the requirement for conformance with the minimum acceptable schedule. Or liquidated damages may be assessed if there is nonconformance if the contract so provides. The second factor is the normal interrelationship of schedule with cost. If costs are increased because schedule is seriously delayed, all cost incurrence beyond the point of total assumption is the responsibility of the contractor.

It may be enough to say that in the past more contractors have missed schedule commitments than performance or even cost goals. One area where schedule incentives have proven effective, however, is in maintaining the original delivery objective following a major change. Whereas the change entitles the contractor to a delivery adjustment the Government may still be interested in holding to the previous schedule. A schedule incentive to achieve this objective can be negotiated into the contract at any time.

CHAPTER VI

CONTRACT CHANGES

A. INCENTIVE CONTRACT CHANGES

When administration of incentive contracts is mentioned, the first thought usually refers to contract changes. The major problems connected with incentive changes have been caused by the lack of timely definitization of changes; however, there have been major complex incentive contracts operating over a long period of time without any undefinitized contract changes in an overage status (undefinitized for more than 180 days). Late definitizations of contract changes can adversely affect the integrity of the incentive contract structure. Undefinitized changes, like letter contracts, are operating with reduced risk. In order to provide continuing motivation, agreements on the pricing and incentive aspects of contract change notices should be reached as soon as possible.

B. COST INCENTIVE CHANGES

When the work required by a contract is changed under the Changes clause of an incentive contract -- either increased or decreased -- or when an equitable adjustment is authorized under any other clause of the contract, adjustments may be made in the target cost, target fee, minimum fee, maximum fee, or any or all of them as appropriate. This also means that performance or schedule goals, the sharing rate or rates and the RIE may be adjusted appropriately.

Changes are troublesome enough under contracts that do not contain incentive provisions -- where only the price and delivery are at issue. The problem is compounded under the simplest type of cost-only incentive arrangement when it is necessary to determine the effects of the change not only on target cost and profit, but also on maximum and minimum fee or ceiling price. The introduction of performance incentive parameters and the change effect on "trade-off" ratio or Government value statements brings still greater complexity.

This discussion will begin by focusing on changes to contracts that contain cost-only incentive provisions. This will permit us to outline -- in the simplest possible framework -- several means of approaching the problem and thus, to judge their relative advantages and desirability.

There are many methods and approaches which can and are used in order to arrive at an equitable adjustment to a contract. While this Guide will discuss only four of these techniques, it is suggested that any method which fits the particular situation is appropriate. Further, while the

coverage will indicate that some of the methods have more advantages and fewer disadvantages than others, each has its particular application and, therefore, is the "most preferred method" in that instance.

The four methods of making equitable adjustments to incentive contracts to be explained in the Guide are:

(i) Individual Element Adjustment Method -- i.e., determining the effect of the change on each element such as target cost, target profit, and ceiling price individually. This method has also been referred to as the "equitable adjustment" method. However -- and hopefully -- the objective of any technique should be an equitable adjustment.

(ii) The Constant-Dollar Method -- where the same dollar adjustment is applied to target, maximum and minimum fee or profit and ceiling price.

(iii) The Constant-Percentage Method -- where the percentage of minimum and maximum fee or the percentage of ceiling price over target cost is held constant.

(iv) The Severable Change Method -- where the change is isolated from the incentive provisions. In effect, a separate agreement is reached on the change portion.

1. Individual Element Adjustment Method.

There are many circumstances where all of the elements of the incentive package should be negotiated separately on their respective merits in arriving at the equitable adjustment for the impact of the change in the procurement. This seems to apply especially where a high degree of technical and/or cost uncertainty exists, a major change is involved, or where the degree of uncertainty varies significantly from either the original contract or the changed portion. Even the timing of the definitization of the change can have a direct impact upon the amount of "risk" or uncertainty involved, which would suggest that the equitable adjustment for ceiling price be something other than the exact figure -- or percentages thereof -- negotiated at target cost or where the adjustment to maximum and minimum fee should always be to the same dollar or the same percentage adjustment. The effect of the change on ceiling price may be either greater or less than the predicted effect of the portion of the original contract deleted. To the degree to which this can be determined, it should be reflected in the equitable adjustment. The Individual Element Adjustment Method is appropriate for these circumstances. Its greatest advantage is in this flexibility to tailor the compensation to the effect of the change on each element of the arrangement. It does require, however, greater effort to evaluate the effect of the change on each element and may involve more negotiation time as a result.

2. The Constant-Dollar and Constant-Percentage Methods

These two methods will be discussed together in order to contrast the results achieved.

It is generally agreed that certain situations may be appropriate for the constant-dollar procedure and others more appropriate for the constant-percentage procedure. Depending on the method used, the structure, however, will be significantly different at the maximum points on the RIE for costs over or under target cost, and thus the two methods are not interchangeable.

As stated earlier, the constant-dollar adjustment holds constant the fee variation from target fee, as adjusted; and the fee pool is held constant; maximum and minimum fee are adjusted by the same dollar amount that was added to the target fee. The constant-percentage method holds the percentage relationship constant between the minimum fee and the maximum fee. When there are increases in target cost, the constant-percentage method extends the RIE on each side of the target, increases the dollar amount of increase in target fee, and adjusts the minimum fee by a dollar amount less than the increase in target fee. The constant-dollar method holds the dollar range of the RIE constant, the maximum fee is not increased by a dollar amount greater than the dollar increase in target fee, and the amount of the minimum fee is adjusted by a dollar amount equal to the increase in target fee. The share line usually remains the same under the two methods. The principle that should be pursued is the maintenance of the integrity of the incentive plan as it represents the intended goals. Thus, care should be exercised in the definitization of a change so as to not negate the value of trade-offs made prior to the issuance of the change.

Either of the two methods, in particular situations, may be equitable; however, the two methods do represent the extremes in approach.

The examples shown in Figure 27 portray a comparison of the applications of the constant-dollar method for changes and the constant-percentage method. The original procurement structure, before change, shows a CPIF incentive contract with a $10 million target cost, $800,000 (8%) target fee, a maximum fee of $1,070,000 (10.7%), a minimum fee of $175,000 (1.75%), and a sharing rate of 82/18 for costs under target and 75/25 for costs over target. The RIE extends from $8.5 million to $12.5 million (15% under target cost to 25% over target cost). In the graphics which portray the comparison, contract change "A" has a negotiated target cost which is $1 million and change "B" has an increased target cost of $2 million more than the cumulative target cost negotiated in change "A".

The following tabulation shows the dollar amount of various incentive features of the original structure and two changes:

	Original Negotiation	Negotiated Change "A"	Cumulative Structure "A" Constant Dollar	Cumulative Structure "A" Constant Percentage
Target Cost	$10 million	$1 million	$11 million	$11 million
Target Fee	$800,000 (8%)	$90,000 (9%)	$890,000 (8.09%)	$890,000 (8.09%)
Maximum Fee	$1,070,000 (10.7%)		$1,160,000 (10.5%)	$1,177,000 (10.7%)
Minimum Fee	$175,000 (1.75%)		$265,000 (2.4%)	$192,500 (1.75%)
RIE	$8.5-$12.5 million ($4 million range)		$9.5-$13.5 mil. ($4 mil. range)	$9.4-$13.79 mil. ($4.39 mil. range)
Sharing	+82/18 -75/25	+82/18 -75/25	+82/18 -75/25	+82/18 -75/25

	Original Plus "A" (%)	Negotiated Change "B"	Cumulative Structure "B" Constant Dollar	Cumulative Structure "B" Constant Percentage
Target Cost	$11 million	$2 million	$13 million	$13 million
Target Fee	$890,000 (8.09%)	$150,000 (7.5%)	$1,040,000 (8%)	$1,040,000 (8%)
Maximum Fee	$1,177,000 (10.7%)		$1,327,000 (10.08%)	$1,391,000 (10.7%)
Minimum Fee	$192,000 (1.75%)		$342,000 (3.15%)	$227,500 (1.75%)
RIE	$9.4-$13.79 mil. ($4.39 mil. range)		$11.5-$15.5 mil. ($4 mil. range)	$11.05-$16.25 ($5.20 mil. range)
Sharing	+82/18 -75/25	+82/18 -75/25	+82/18 -75/25	+82/18 -75/25

The graphics in Figure 27 show that there are no differences between the constant-percentage method and the constant-dollar method in the primary zone of motivation near the target cost. In fact, the constant-percentage share line each side of target cost is the same as the constant-dollar share line. If there was a 90/10 share line extending five or ten per cent of cost each side of target cost, there would be a very small difference in the various profit positions beyond the plateau or shallow sharing area. The significant difference between the two approaches is found in the comparison of the RIE for each approach. The differences are substantial at the extreme possible cost outcomes for cost over target or under target. The constant-percentage method opens up the RIE and automatically presumes there is uncertainty in every change. On the other hand, the constant-dollar method retains the original RIE, and presumes there is no additional uncertainty, or that the cumulative uncertainty is no greater than provided in the original structure. It should be noted in the example in Figure 27 that the first change, change "A", was negotiated with a 9% target fee, and change "B" was negotiated with a 7.5% target fee, as compared with the original contract fee of 8%.

Another significant difference between the two methods is found in the effect on minimum and maximum fee. The constant-percentage method increases the range between the maximum and minimum fees at a rate which is greater than the constant-dollar method. On the other hand, the constant-dollar method increases the amount (and the percentage rate) of the minimum fee and decreases the maximum fee (and percentage rate) at a rate which is greater than the constant-percentage method.

For small changes, or for a series of small changes which increase cost without a significant change in total program uncertainty, the constant-dollar method appears best. Also, for small changes the sharing structure can be moved to the right and the target fee can be moved upward at the same rate of fee as contained in the original structure with minimum and maximum fee amounts maintained. Naturally, this approach cannot be used if there are large changes or if the cumulative amount is large.

3. The Severable Change Method

This method is appropriate in those unusual situations where the changed effort can be separated from the incentive structure and treated as a separate arrangement. The primary prerequisite for the use of this method is the Government's ability to assure that the costs can be isolated from the incentive contract (e.g. through a subcontract or a separate cost or profit center).

The practical application of this technique is where the changed effort dictates a completely different pricing provision from the basic incentive contract. For example, where the basic contract is CPIF but

COMPARISON OF CONTRACT CHANGES
CONSTANT DOLLAR/CONSTANT PERCENTAGE

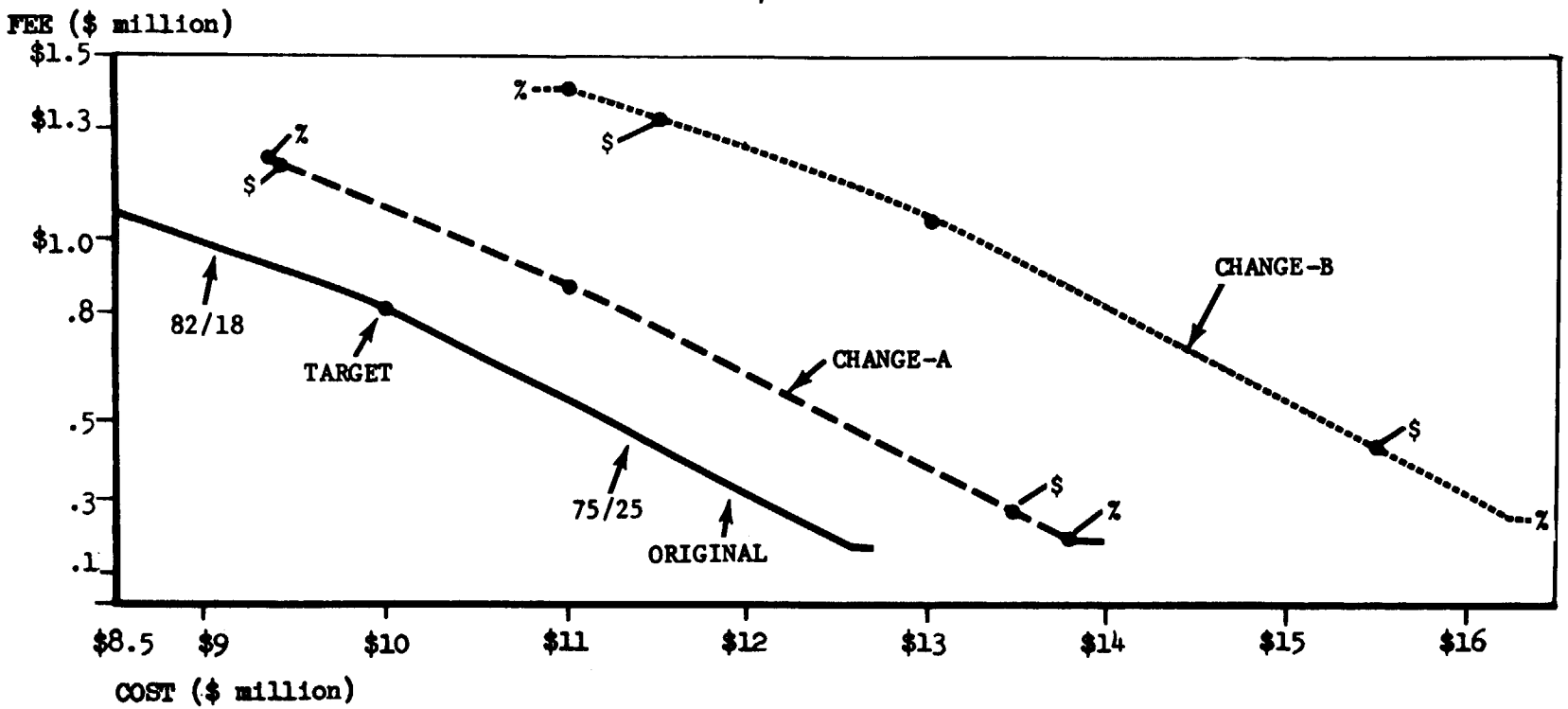


FIGURE 27

the change can be priced on an FFP basis. Or the basic contract is FPI and the uncertainties of the changed effort strongly suggest a CPFF arrangement. Under these circumstances, taking the change "outside" of the incentive structure can protect the integrity of the original agreement and facilitate the negotiation of a meaningful and equitable adjustment for the change.

It should be noted that, conceptually, the constant-dollar method of adjusting changes has the same effect as pricing the change on an FFP basis when the costs incurred for the change equal the negotiated target cost for the change. Thus the amount would be the same. However, where the change is "inside" the formula, if the cost incurred varies from the negotiated target cost, that variance would be subject to the sharing ratio; whereas if the FFP change is "outside" the formula, any variance is the contractor's "responsibility". Naturally, at ceiling cost under an FPI contract -- or minimum fee under CPIF -- the result would be the same under either method.

It appears that the severable change method is most appropriate where the uncertainties introduced by the change would substantially alter the original contract cost/performance (trade-off) ratio.

Again, it is vitally important that the cost incurred for the effort be traceable if the technique is to be used.

Administrative effort may be reduced and timeliness improved by negotiating an estimated amount for changes in low dollar categories prior to commencement of performance. In this way, changes below some fixed amount (the amount is generally limited to $10,000, but may be higher) are made effective without a change in target cost, target fee, or target profit for individual change actions. When there is a proper base for an estimate of a total amount for low dollar changes, formula pricing of change orders may employ advance agreements on several rates and burden factors. Naturally, a $10,000 change considered as a low dollar change in a major systems contract would be a major change in a $100,000 CPIF contract. The dollar limit in the smaller contracts would be closer to $500.

Negotiations of changed effort should reflect the relative risk position present at the date of authorization of the change. This concept is expressed by Method 1 in Chapter 16 of the ASPR Manual for Contract Pricing. ASPM-1, Method 1 (the preferred way) provides for an estimate of the current cost, the cost as of the time the change is made. Method 2 as described in ASPR-1 reconstructs the cost of the work as estimated at the time it was made a part of the contract.

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C. MULTIPLE INCENTIVE CHANGES

While changes in multiple incentive contracts have been called the largest single source of administrative problems, the contract administrator should discard all thinking that changes per se are the primary or even the secondary cause of problems. In many cases, changes are not understood and are misused, and certain problems have been caused because of lack of planning for changes. It is not enough to say, "changes should be held to an absolute minimum." Improved definition, operational performance requirements in lieu of detailed parts specifications, and better control of change generating sources will contribute to the solution to the change problem.

The Changes Clause permits unilateral change action, and it requires the contractor to commence performance of unpriced actions. While the action may be contractually unpriced for a period of time, all actions (except emergency changes) should have an estimate of the cost effect and an assessment of the effect on schedule and performance prior to the release of the change.

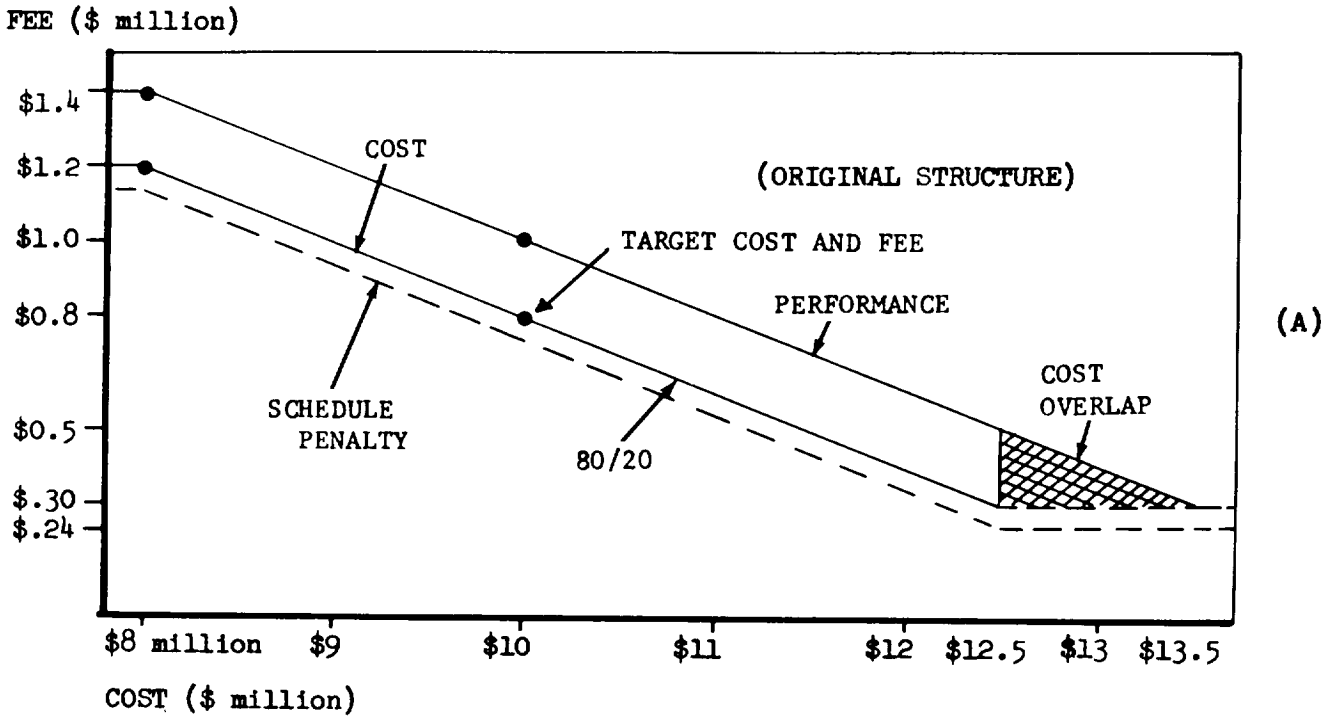
A contract change, pursuant to the Changes Clause, should not become the vehicle for reopening the original procurement negotiation. Only the change and the effects of the change are evaluated and priced.

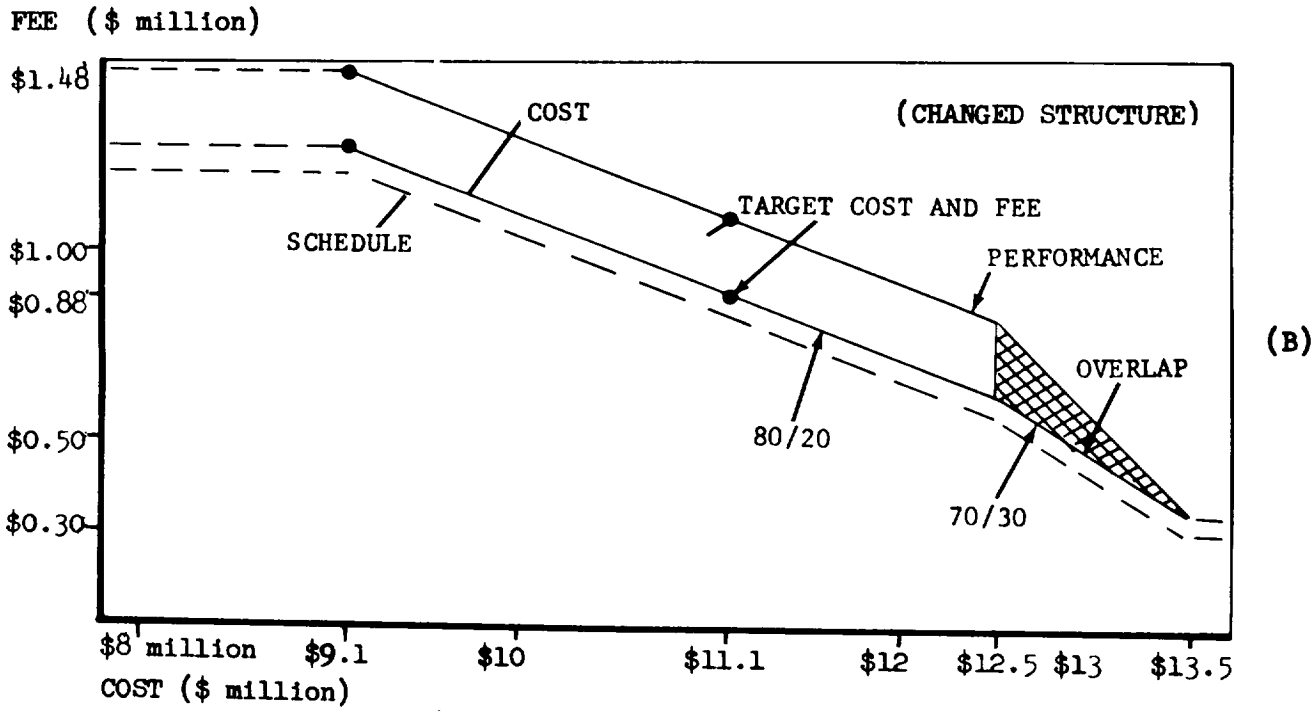
In practice, it will be found that the majority of change actions in multiple incentives will affect only the cost portion of the incentive, but a series of disruptive changes may also have an effect on delivery. If the multiple incentive contract has a performance penalty (or penalty and reward) and the contractor is in an unfavorable delivery position (indicated progress behind schedule), the contractor should not be able to use changes as a bail-out mechanism.

If performance and cost incentives have been originally negotiated in a compartmentalized structure, and if the change affects only cost, it is possible to isolate the change to the cost portion and maintain the dollar values allocated to performance and cost. Figure 28A shows the original structure,and Figure 28B shows a $1,100,000 change as negotiated and applied to the CPIF multiple incentive example (originally shown in Figure 14). The basic example covered the procurement of a piece of test equipment for simulating space environment. The original structure is shown below:

Target Cost	:	$10 million
Target Fee	:	$800,000 (8%)
Maximum Fee	:	$1,400,000 (14%)
Minimum Fee	:	$240,000 (2.4%)
Cost Range	:	$8 - $12.5 million
Share Ratio	:	80/20
Performance Incentive	:	+$200,000 (increase simulated altitude from 350 to 450 miles)
Schedule Incentive	:	-$60.000 ($2,000 per day penalty over 30-day range after 180-day delivery date)
Minimum Acceptable Performance	:	300 miles (no share in cost underruns unless a level of 320 miles is reached)

CPIF
MULTIPLE INCENTIVE CHANGE





(CHANGE HAS APPLIED ONLY TO COST)

FIGURE 28

The $1.1 million change covers the addition of instrumentation and data recording equipment. The change will not affect the schedule incentive or performance incentive because the effort involves the procurement, assembly, and installation of instrument modules and recording devices similar to the type used by the prime contractor in prior installations of smaller units. In this case, the Government has found that existing GFE is not suitable for use with the advanced sensors and the testing environment made available by the new equipment. Assembly and test of the added equipment will involve only six months of effort and will be finished prior to completion of the basic space chamber. The recording and instrumentation equipment is not a structural part of the space chamber, and the connections with the chamber will not affect performance.

The following pricing information describes the change and the cost effect of the change, and is graphically shown in Figure 28B.

	Change	Changed Structure
Target Cost	$1,100,000	$11,100,000
Target Fee	$84,700 (7.7%)	$884,700 (7.97%)
Maximum Fee		$1,484,700 (13.37%)
Minimum Fee		$240,000 (2.16%)
Cost Range		$9.1 - $13.5 million
Share Ratio		80/20

This change has been made by the individual element method. The target cost was increased by $1.1 million and the RIE on the underrun side was maintained at $2 million below target cost. The target fee was increased by $84,700 and the maximum fee was increased by $84,700. The original RIE for cost extended from $8 million to $12.5 million; however, a cost overlap feature extended the effective RIE to $13.5 million by eroding any earned performance at an 80/20 sharing rate for costs over $12.5 million.

In this change to the multiple incentive, the cost RIE has the same 80/20 share rate until $12.5 million is reached ($604,700 fee), at which point the share rate increases to 69.53/30.47 until the maximum RIE point of $13.5 million is reached with a minimum cost fee of $300,000. The $60,000 potential schedule penalty has been retained and the lowest fee which can be realized is $240,000 at the $13.5 million cost point. The minimum fee point, however, in the basic structure could be reached at $12.5 million.

A composite view of the original structure and the changed structure is shown in Figure 29.

MULTIPLE INCENTIVE CHANGE

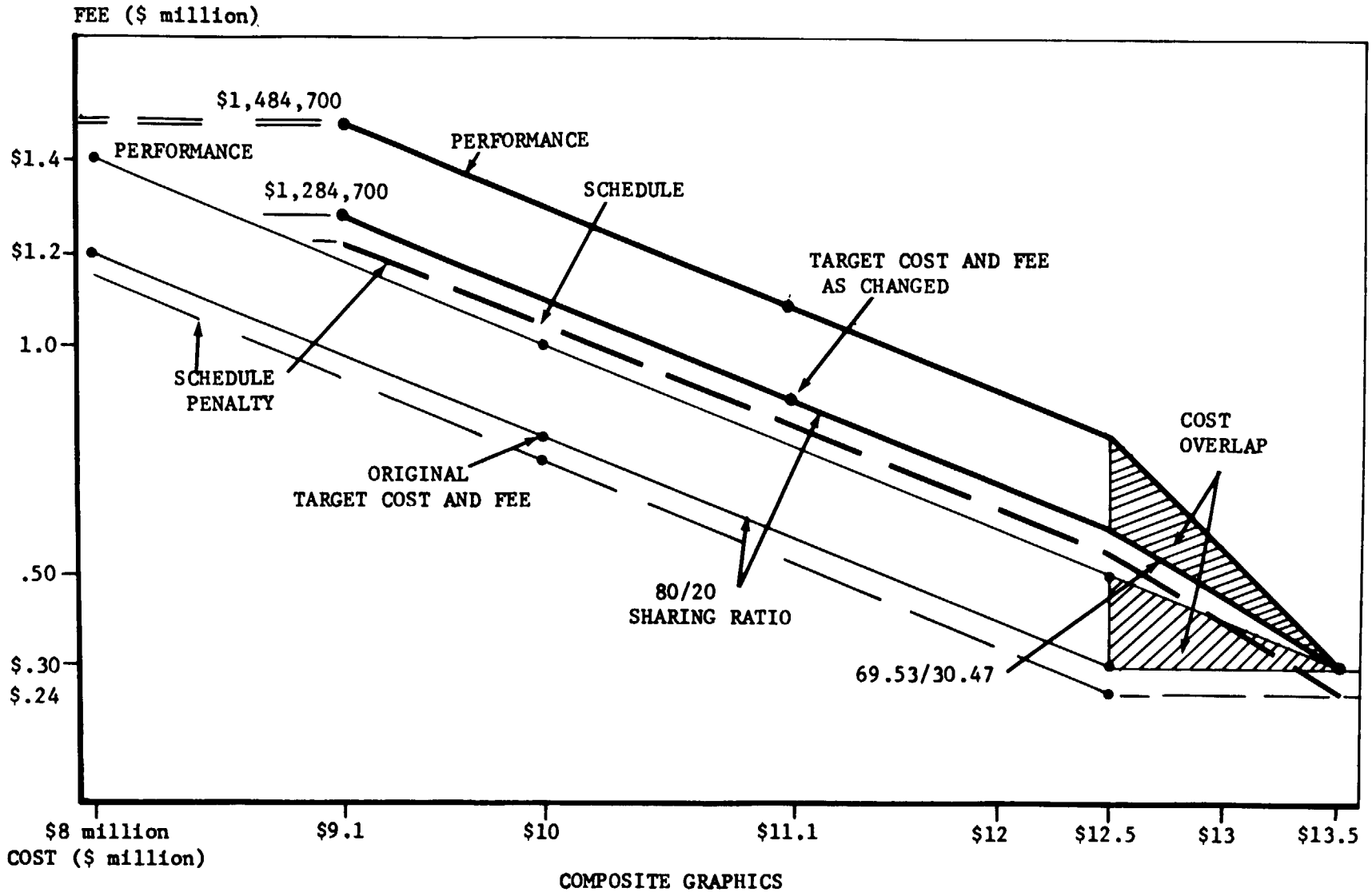
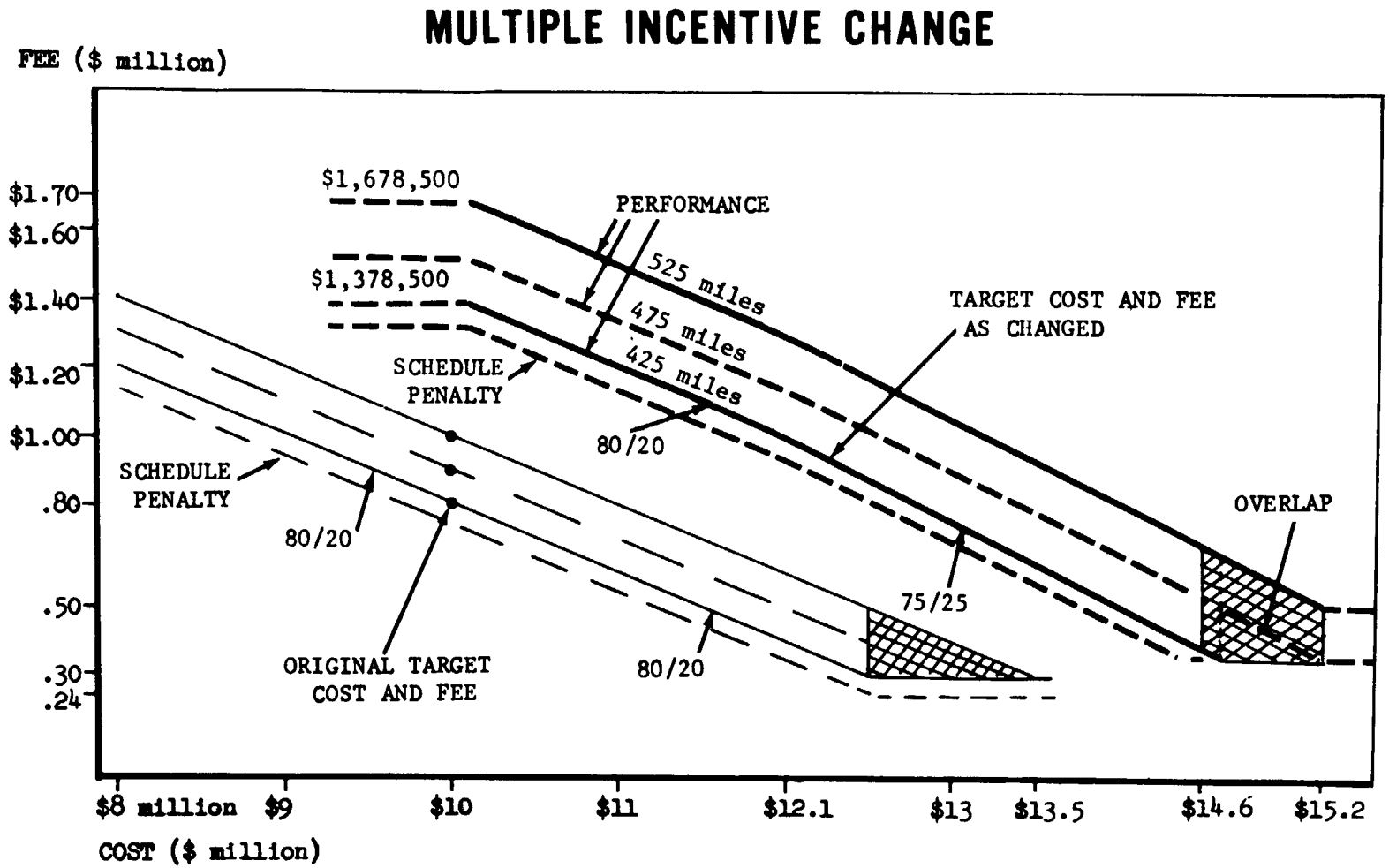


FIGURE 29

The forecasted cost performance at the time the change was made indicated that the basic contract would be completed on schedule with a cost under target of approximately $1 million (10% underrun). The cost incurred amounted to $6.5 million at the time of the change. Performance achievement could not be forecast until additional tests were completed; however, the design work and the completed subassemblies of the structure showed great promise for a good, high altitude system. In this change, the contractor's favorable position resulting from performance and indicated cost reduction achievements have been preserved, and the cost risk for new work is so small that there is no requirement to extend the RIE beyond $13.5 million (at that point, the contract would become a CPFF contract with a few fee of $240,000 if schedule was not met). Because of the contractor's indicated cost and performance position, both sides at the negotiation table considered the example to represent an equitable adjustment for the change. It preserved the indicated earned fee and raised the maximum potential fee from $1.4 million to $1,484,700.

The second CPIF multiple incentive change example as shown in Figure 30 uses the same basic structure from Figure 28A and Figure 28B.



COMPOSITE GRAPHICS: ORIGINAL CPIF MULTIPLE INCENTIVE STRUCTURE AND CONTRACT CHANGE TO COST, PERFORMANCE, SCHEDULE.

FIGURE 30

This example shows a change which affects all elements of cost, schedule and performance. In the example, it has been found in subsystems testing that the vacuum system can be improved to provide a higher simulated altitude than was originally forecast, and altitude can be reached faster. The basic multiple incentive contract was attempting to develop a system which would reach a simulated altitude between 350 and 450 miles. It is now considered feasible to use a new vacuum system, involving significant changes in the pumping system, which will reach and maintain a range between 425 miles and 525 miles. The minimum acceptable level will be raised from 300 miles in the basic contract to 375 miles of simulated altitude in the changed contract, and the contractor will not be able to share in underruns unless an altitude level of 400 miles is reached. The change also includes additional instrumentation and recording devices discussed in the previous example concerning changes.

The cost effect of the multiple change amounts to $2.1 million. The negotiated target fee for the change is $178,500 (8.5%) and the value of the performance incentive at a maximum altitude level of 525 miles is $300,000. The changed structure provides for a performance incentive of $3,000 for each mile of simulated altitude improvement above 425 miles while the basic contract had provided for a performance incentive of $2,000 for each mile above 350 miles.

The basic structure and the changes are as follows:

	Original Contract	Multiple Change	Changed Contract
Target Cost	$10,000,000	$2,100,000	$12,100,000
Target Fee	$ 800,000 (8%)	$ 178,500 (8.5%)	$ 978,500 (8.09%)
Fee at Target Cost and Max. Performance	$ 1,000,000 (10%)		$ 1,278,500 (10.57%)
Maximum Fee	$ 1,400,000 (14%)		$ 1,678,500 (13.87%)

	Original Contract	Changed Contract
Minimum Fee		
Cost	$300,000	$353,500
Schedule	$240,000	$353,500
	(2.4%)	(2.92%)
Cost Range	$8-$12.5 million (cost overlap to $13.5 mil.)	$10.1-$14.6 million (cost overlap to $15.2 mil.)
Share Ratio	80/20	80/20 under target 75/25 over target
Performance Reward	$200,000 ($2,000 per mile)	$300,000 ($3,000 per mile)
Schedule Penalty	$60,000 (delivery in 18 mos.) ($2,000 per day penalty)	$60,000 (delivery extended 4 mos) ($2,000 per day penalty)

The contract, as changed, also contains the following narrative constraints which are shown by the graphics in Figure 30. The schedule penalty of $60,000 operates only to the cost position of $14,360,000, at the minimum fee point of $353,500 (2.92%). The schedule penalty does not continue beyond the cost point of $14.36 million in order to avoid any possible adverse impact on performance if there are testing problems at that stage. The share ratio has been increased from 80/20 to 75/25 for costs over target, and this feature will equate with the schedule penalty. The cost overlap feature continues to erode earned performance rewards beyond the maximum cost RIE point of $14.6 million until the cost point of $15.2 million is reached. The performance achievement level of 475 miles meets the minimum fee line at the $15.2 million position, and the cost overlap feature does not apply to any performance earnings in the range of 475 miles to 525 miles if costs exceed $15.2 million. It was mentioned earlier that the minimum acceptable performance level is 375 miles, and the contractor cannot share in underruns unless 400 miles is reached.

The change in Figure 30 has been made by the individual element (equitable adjustment) approach during negotiation. There was an indicated underrun of approximately $1.0 million at the time that the change was negotiated, and $6.1 million of cost had been incurred. The original schedule projection was about one week early, and these favorable positions were retained in the changed structure. The 80/20 share ratio was retained on the underrun side. The share ratio was increased to 75/25

for costs over target because the target fee rate of the change was increased to 8.5% and the potential performance reward was increased from $2,000 per mile to $3,000 per mile. The Government's risk exposure presumably has been reduced by changing the share ratio to 75/25 because the maximum cost point on the RIE has been negotiated at $14.6 million -- an 80/20 share ratio would extend the RIE to $15 million.

The RIE on the underrun side in the example in Figure 30 extends only to $10.1 million with a maximum fee potential of $1,678,500 (13.87%) at that point. From a structuring viewpoint, there is no reason for not extending the RIE to $9,417,500. At that point, the maximum fee potential would be $1,815,000 (15%). The reason that the negotiated change did not reflect an RIE point of $9,417,500 under target was because it was clearly unattainable. Extending the RIE to permit the structure to show a 15% fee point would be meaningless. The action would not only be meaningless, but it would distort the incentive structure and make it difficult, if not impossible, to reflect the incentive profit value for any subsequent changes.

The reader has undoubtedly recognized many of the fallacies involved in the handling of this assumed change negotiation. First, the entire original contract has been altered. The share lines have been changed to accommodate an arbitrary minimum fee level. Performance value has been increased without a sound basis for the increase except increasing the maximum performance goal. The narrative constraints have added a greater motivation to spend money to achieve 75 more miles which are assumed to be reasonably achievable.

Further, the contractor can now "earn" the original target fee of $1 million at $12.3 million cost if he reaches the 450-mile level, whereas under the original contract his fee would have been approximately one-half that amount for reaching exactly the same results.

The original contract was based upon the value to the Government of going from 350 to 450 miles being worth the cost equivalent of $1 million (80/20 share or 5 x $200,000 = $1 million). Now 100 miles are worth $1.5 million under target cost (80/20, or $300,000 x 5) but only worth $1.2 million over target (75/25 or $300,000 x 4).

Note also that the change in performance for going from a maximum of 450 to 525 miles was negotiated at $2,100,000 plus $178,500 in fee (worth $892,500 cost equivalent dollars or nearly $3 million in "value" on an 80/20 basis) while the total value to the Government as expressed in the performance fee is only $1,125,000 (75 miles @ $3,000 x 5 on an 80/20 share). This is not to say that the Government has to relate fee to value directly, but it should not -- as it has done in this case -- tell the contractor that it is willing to spend over $3 million actual dollars to increase the minimum acceptable level on the system from 300 to 375 miles but is only willing to pay him $300,000 fee going from 300 to 525 miles.

If the value of gain from 350 to 450 miles was originally worth $1 million, then it still should be valid. If the value of going from 450 to 525 is worth more, then it should be related into the contract. For example, if the cost of the change was $2.1 million, this should be added to the contract, but the level of performance minima should be increased to at least the point where the contractor cannot earn more fee for less effort (e.g., the contractor can now "earn" $1.2 million in fee for producing a 425 mile system at $11 million cost where under the original contract he could only earn $1 million by delivering a 450 mile unit for $10 million).

Hopefully, the example will demonstrate the danger of reopening the original contract structure and not evaluating the effect of a change in terms of its expressed value. The use of more than one sharing ratio should be recognized as confusing the value statement. Further, attempting to hold any one element of the negotiation constant can create its own problems.

While the narrative constraint is useful in offsetting any possible motivation on the part of the contractor to deliver a minimum system at low cost, a more direct approach is possible by using a form of interdependence such as stating that performance below par at low cost will carry a 90/10 sharing ratio while performance above par at low cost will be rewarded under a 70/30 formula.

In this example a heavy penalty for performance below 425 miles and large rewards above 450 would appear appropriate as compared to the $3,000 per mile regardless of outcome.

The handling of FPI changes, cost-only and multiple incentive changes, will be similar to the procedures used in CPIF changes. A particular change in an FPI contract does not mean, however, that the change will automatically have less uncertainty or more risk than a CPIF change. In CPIF contracts, one of the major concerns with changes is to maintain the same over-all degree of risk negotiated in the original contract (including the relative position of the minimum fee) and maintaining the contractor's relative cost, schedule and performance position (gains or losses). In an FPI contract, the major concern also involves the development and negotiation of a cumulative structure which maintains the over-all degree of risk and reflects the contractor's progress. The "balance" of cost, schedule, and performance incentives cannot always be maintained, and it may be inappropriate to attempt to maintain the ratios which resulted from the original negotiation.

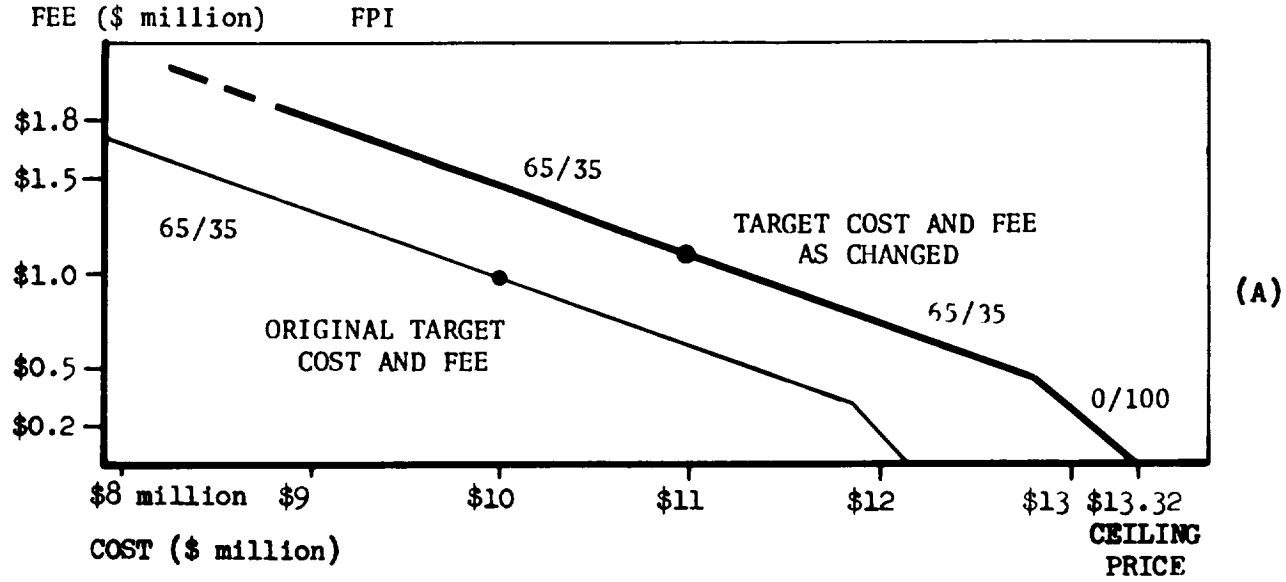
The following basic FPI provisions and the simple cost-only change using the constant dollar method are depicted in Figure 31A.

	Basic Contract	Change	Changed Contract
Target Cost	$10 million	$1 million	$11 million
Target Profit	$1 million (10%)	$120,000 (12%)	$1,120,000 (10.18%)
Ceiling Price	$12,200,000 (122%)		$13,320,000 (121.1%)
Share Ratio	65/35		63/35

Figure 31B shows a composite view of basic provisions and a change to a multiple FPI contract. The change affects only the cost, and the cost, and the equitable adjustment causes changes in the share ratio and ceiling price (percentage of target cost).

	Basic Contract	Change	Changed Contract
Target Cost	$10,000,000	$1,200,000	$11,200,000
Target Profit	$1,100,000 (11%)	$ 132,000	$ 1,232,000
@ Cost	$ 900,000	$ 132,000	$ 1,032,000
@ Performance (100 points)	$ 200,000		$ 200,000
Ceiling Price	$12,000,000 (120%)		$13,496,000 (120.5%)
@ Cost	$11,800,000 (118%)		$13,296,000 (118.72%)
Share Ratio	65/35		65/35 under target 60/40 over target

FIXED PRICE INCENTIVE CHANGES



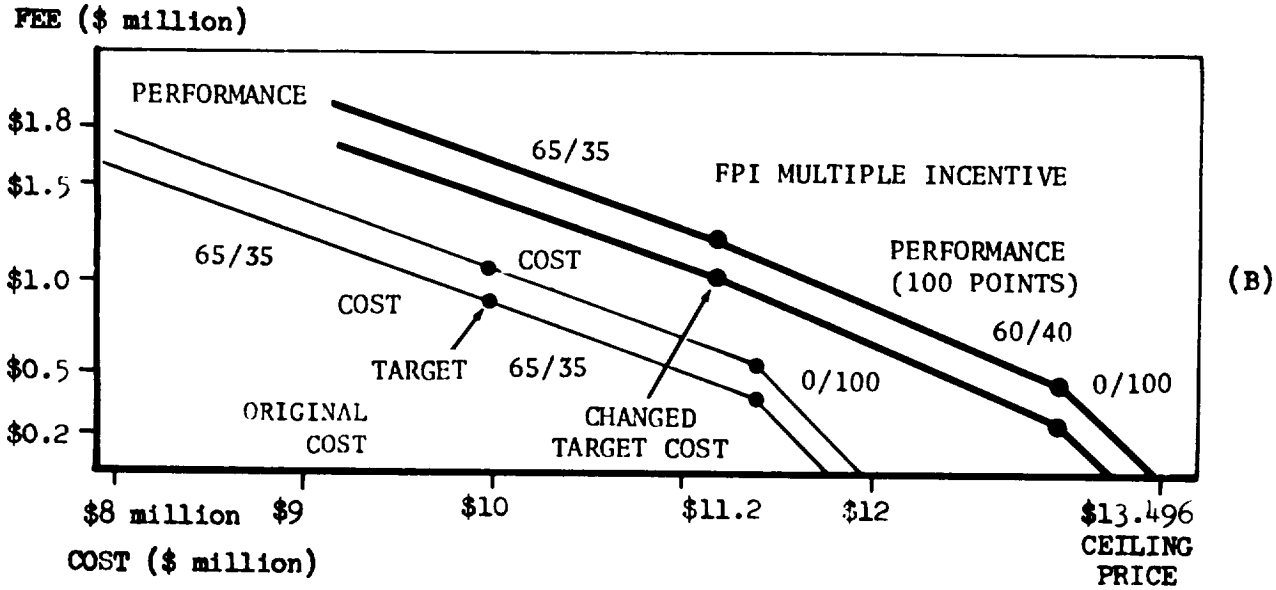


FIGURE 31

D. CHANGES IN RISK; CHANGES IN PROBABILITIES

The measurement or estimate of risk and probability is not as difficult today as it was ten years ago, and it will be less difficult ten years from now. The degree of difficulty in compiling cost and performance data varies greatly from program to program. The variance depends on the stage of development, its history, the age of the project, and the concentration of program responsibility within the Department or Agency, and within industry. Data collection, of course, must be a continuing effort throughout the life of a program. It is too late to start the collection of data necessary for analysis when a major change is issued. When the change is issued, the data should already be available from the program office, the prime contractor, testing sites, and the major subcontractors.

Parametric cost estimating applications (calculating gross costs from a few statistically correlated design/performance and program parameters) have been identified and used for more than five years. A relatively large number of tests have been tried in studies of the applications of advanced cost estimating relationships. Development and production costs for total programs covering space boosters and launchers have been developed by parametric techniques. The various phases of a program covering planning, design, prototype, and release have been estimated in pilot tests of certain development programs and the tests have been applied to major changes and program redirections. The usefulness of the techniques is limited by unique development characteristics and by the cost input from major subsystems. In many cases, the cost input from major subcontractors has contained a wide range of uncertainty because a backlog of smaller undefinitized changes already existed at the time of a major change.

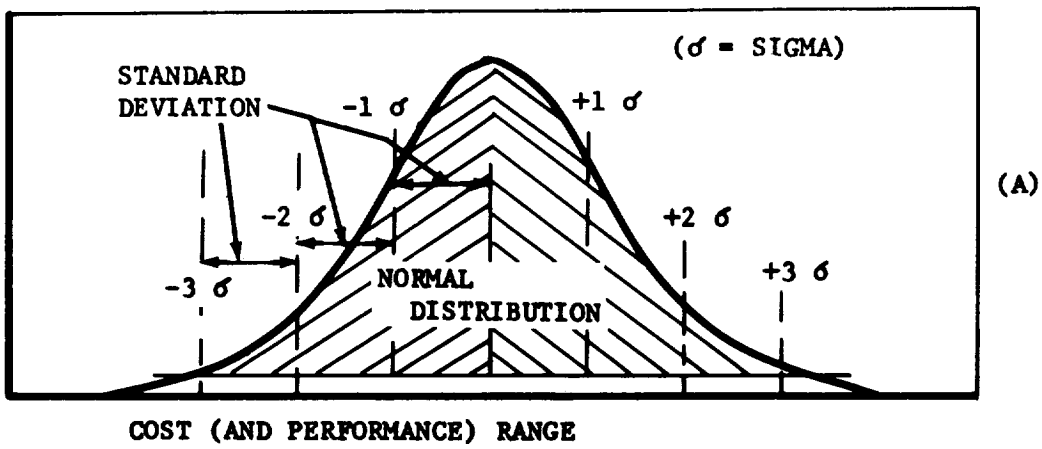
In order for the contractor to accept changes, the original incentive contracting model should be based on program goals and objectives (effectiveness), and the structure should reflect the risk inherent in the winning contractor's proposal. A later change should not reduce the contractor's original promise. Throughout the lifetime of a project, the quantitative measure of contract status (incurred, achieved, and expected levels of cost, performance, schedule, and profit) should be equally visible to the Government and the contractor. Without visibility, timely processing of a change cannot be accomplished, unless the change is estimated and definitized outside of the incentive structure. The relative risk of the original structure and the relationship of that risk to progress at the time of a major change cannot be maintained by estimating the total program to completion and quantifying risk to completion because the balance of the uncertainty of cost and the uncertainty of performance may change significantly.

If a contractual item is changed, it may change not only target cost and performance goals, but also the combined cost and performance confidence intervals. In certain contracts, the distribution of probabilities can be approximated by a normal distribution such as the example shown in Figure 32A. The distribution can be shown graphically as a triangle, or any number of ways. It is usually reasonable to assume that increasing deviations from target or from the most likely outcome become increasingly less probable, and the decrease in probabilities is approximately symmetrical as the intervals are extended each side of target.

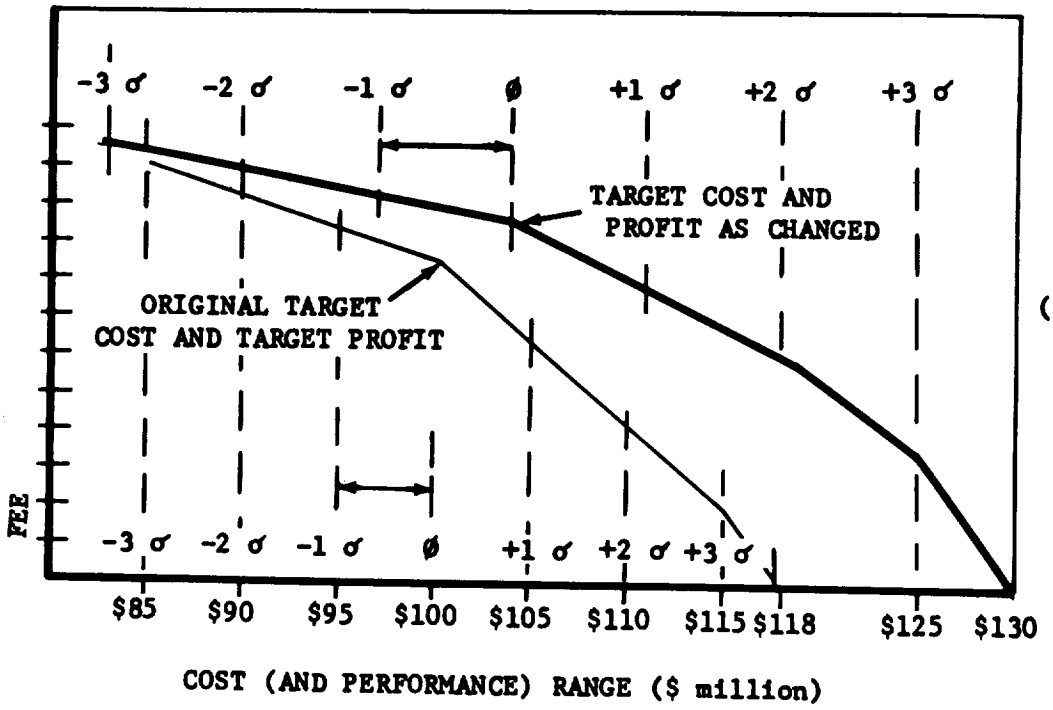
The measure of risk is the standard deviation of the distribution across the RIE, and the standard deviation is shown by Greek letter sigma, the symbol "σ". Figure 32B shows a composite view of a original incentive structure and a changed structure with the change based on the consideration of changes in probabilities of deviations from target cost and performance goals. The deviation range before the change is shown below the share line and the deviation range after the change is shown at the top of the graph, above the RIE and incentive share line. The confidence interval in this example has been extended in the changed structure which incorporates a performance change and increased costs amounting to $4 million. The confidence interval is between plus or minus 3 σ, and most of the increased uncertainty is found in performance. The basic change in target cost and target profit is graphically shown by a shift to the right and upward; however, the change has not been introduced at the target cost point of $100 million but was introduced into the structure at a cost point of $90 million to reflect the combination of confidence in the change and preserving the risk which was contained in the original structure. The final changed structure now has a wider confidence interval and the share lines are not as steep except at the extreme increment of costs near the ceiling price.

The example of a change in a multiple incentive as shown in Figure 32B graphically depicts an approach which maintains the risk position of the contractor at the time a change is introduced and marries that risk position with the performance and cost risk of the change. Of course, a mathematical formula and quantitative statistical concepts and procedures must be applied in order to accomplish this complex change structuring. At the time of this writing, only one in-depth study covering the application of risk and probabilities in changes has been performed. The approach which has been briefly depicted in this section is founded on mathematical theory and provides a basis for introducing changes with different degrees of risk and probabilities. The available body of knowledge concerning risk and probabilities should be studied and utilized to the maximum practical extent in order that the techniques can be refined and made workable for a wider range of applications in contracting.

CHANGES IN RISK AND PROBABILITIES



(A)



(B)

FIGURE 32

CHAPTER VII

EXCEPTIONAL METHODS OF STRUCTURING

A. INTRODUCTION

Chapter IV of the Guide has already mentioned the advantages of utilizing computer techniques to structure and evaluate the incentive models which may be considered during contract planning and negotiation.

Both Government and industry are now able to utilize the computer as a tool which conveniently and effectively generates the curves, tables, and formulas required to structure contracts for major, complex programs. A considerable body of knowledge has been developed proving the workability of computer programs for structuring; however, the computer programs are not a substitute for judgments of project teams involving technical, pricing, audit, administration, and contracting personnel.

Most of the incentive contracts can be graphically displayed and structured by using simple, mathematical calculations. A slide rule, calculator and adding machine, or conventional, manual arithmetical methods are often adequate tools for evaluation or structuring exercises. Simple arithmetic has been employed often to develop the incentive examples in this Guide. The sheer size of a program and the large number of cost and performance combinations, however, may require computer techniques to cope with what would otherwise be time-consuming problems. Value statements can be more precisely defined and made more meaningful when they have been exposed to the greater visability provided by the computer's range of examples.

The exceptional methods of structuring utilize the same general principles of standard incentive contracting methods, and actually deviate from the usual pattern only in the scope and depth of the structures.

Within the context of this Guide a clear understanding is necessary between the two terms interrelationship and interdependency. Unfortunately, these two words are being used to describe different relationships that are not apparent from a dictionary definition of the two terms.

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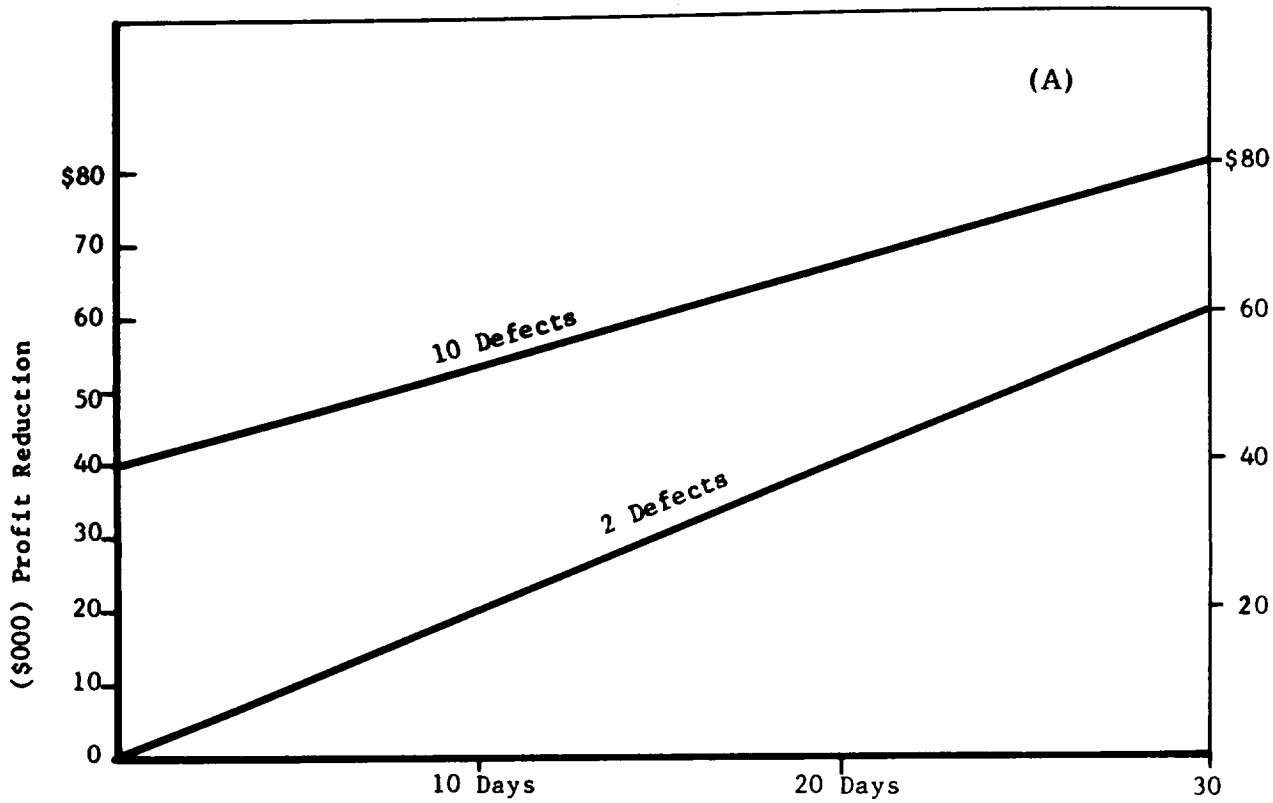
In previous portions of the Guide we have referred to the interrelationship between cost, performance, and schedule as expressed by the common denominator of fee.

Interdependency implies this same relationship, but, for some reason which is not apparent, has come to mean--in multiple incentive contracting--something additional. That is, a clear break or change in the concept of interrelationship at a given point in performance. This can be illustrated by an agreement which specifies that the contractor will share costs at 80/20 if cost and performance are under par, but will receive a 50/50 cost share if cost is under target and performance is over par. Or, he will share cost at 50/50 over target if performance is below par, but at only 80/20 if performance is over par.

While the normal incentive arrangement accepts changes in the sharing rate (e.g., 80/20 below target, 50/50 above target) and changes in performance fee (e.g., $100 for 0 to 50 points, $50 for 50 to 100 points) the contract with interdependency provides for an additional bonus or penalty when a given level--usually performance--is reached. However, cost, performance and schedule can be subject to interdependency. For example, schedule incentives may be made directly interdependent with cost by utilization of variable schedule incentive parameters. In this type of arrangement, the rate changes in accordance with the cost achievement. For example, a maximum adjustment of $2,000 per day imposed in the case shown (see Chapter V, page 189) could be changed to provide for an adjustment of $4,000 per day at the maximum underrun point on the RIE and a gradual reduction to the rate of $500 per day at the maximum overrun point on the RIE. Under this revised example, the maximum effective fee (with full schedule reduction) would amount to $1,080,000 in lieu of $1,140,000, and the effective minimum fee (with full schedule reduction) would amount to $285,000 in lieu of $240,000. This type of variable fee reduction applied to schedule would tend to offset any impact on performance that might be found where the contract had a significant overrun. An interdependent incentive penalty arrangement of this type actually states that the contractor does not share as much in underruns when an important item is not presented on schedule.

Figure 33A illustrates a simple interdependent delivery incentive arrangement applied to a "quality" performance incentive example (see Chapter IV, Section D, page 134) of a simulated altitude chamber which may be delivered and accepted with certain allowable deviations.

FPI
SCHEDULE INCENTIVES



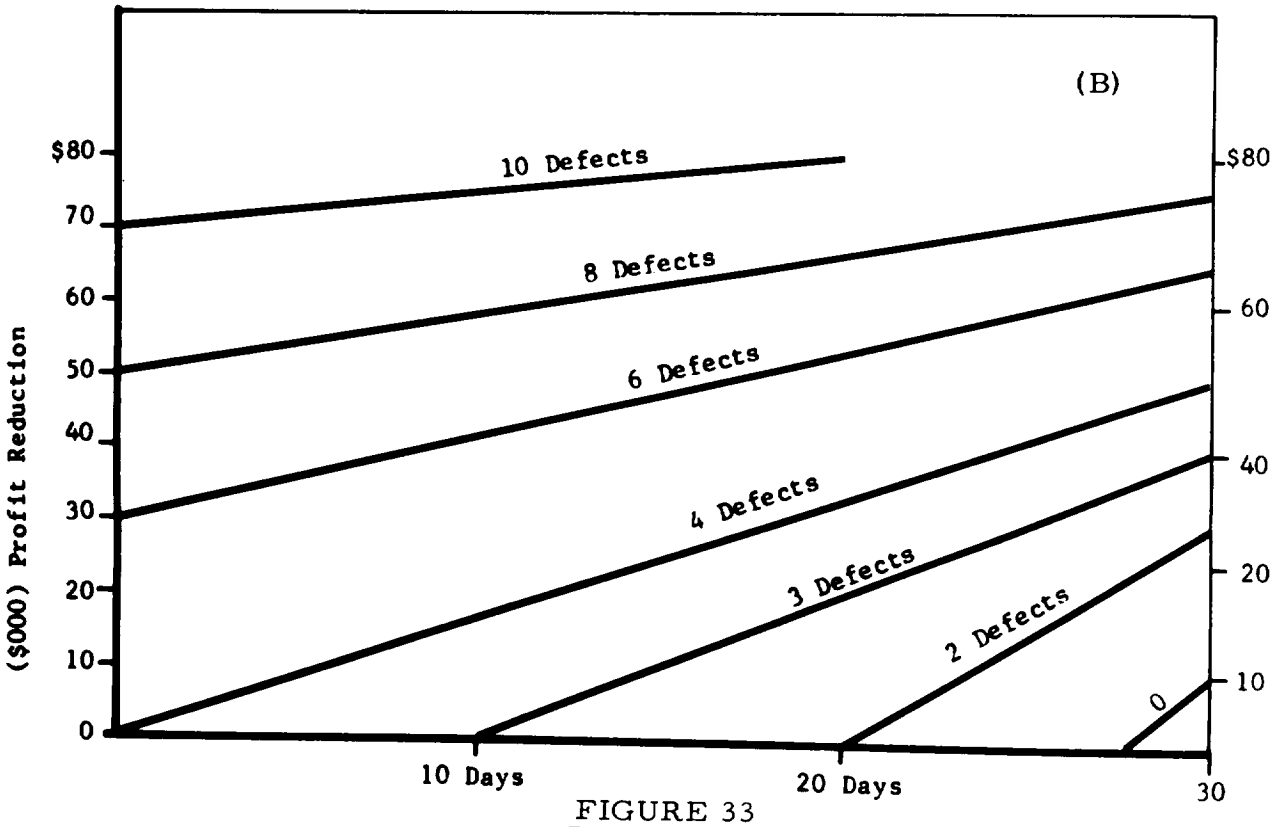


FIGURE 33

In the example in Figure 33B, ten defects present at the time the article is submitted for final acceptance result in a penalty of $40,000. The same ten defects, with delivery 10 days late, result in a penalty of $53,333; ten defects at 20 days late result in a penalty of $66,666; and ten defects at 30 days late result in a penalty of $80,000. There is no penalty for one or two defects; however, the straight schedule penalty amounts to $30,000 at 10 days, $40,000 at 20 days, and $60,000 at 30 days. Note that the additional penalty for more than two defects is twice as much as the on-time date as the penalty for defects at 30 days late. Both defect-free delivery and on-time delivery can be appropriately emphasized in this manner. The schedule penalty formula for two defects or less is the same as the example shown for a CPIF contract in Chapter V.

The example has been restructured in Figure 33B with heavier emphasis on the correction of deficiencies before delivery. In this variation of the example, ten defects result in a penalty of $70,000 at scheduled delivery time, and result in the same $80,000 penalty when delivered 30 days late. Heavier emphasis is placed on five or more defects at all points up to 20 days late, and there has been a relaxation on four or less defects, especially at the extreme late delivery stage.

Another example of interdependency is illustrated in Figure 34 which shows a simple interdependent structure that combines cost and performance in a manner which emphasizes cost effectiveness. In this variation of the example, the Government is not indifferent to the value of performance at any position on the cost range. Improved performance in Figure 34 is worth more in an underrun situation than improved performance in a cost position that is greater than target cost.

The performance values at target cost position in Figure 34 are in the same range as the values shown in Figure 14 and Figure 15 however, the value of performance which reaches simulated altitude of 450 miles at the $8 million cost position is more than the value of performance at the $12.5 million cost position. In fact, the value of the improvement between 350 miles and 400 miles, and the improvement between 400 miles and 450 miles, increases in relationship to the decrease in cost. In this example, the rate of cost sharing is dependent on the performance achievement, and the fee value for performance is dependent on the cost position. There is a mutual dependence of cost and performance if the buyer looks at price, as he should. The buyer is not procuring separate elements of cost, performance, and fee.

COST PLUS INCENTIVE FEE

INTERDEPENDENT STRUCTURE
(Emphasizing Cost Effectiveness)

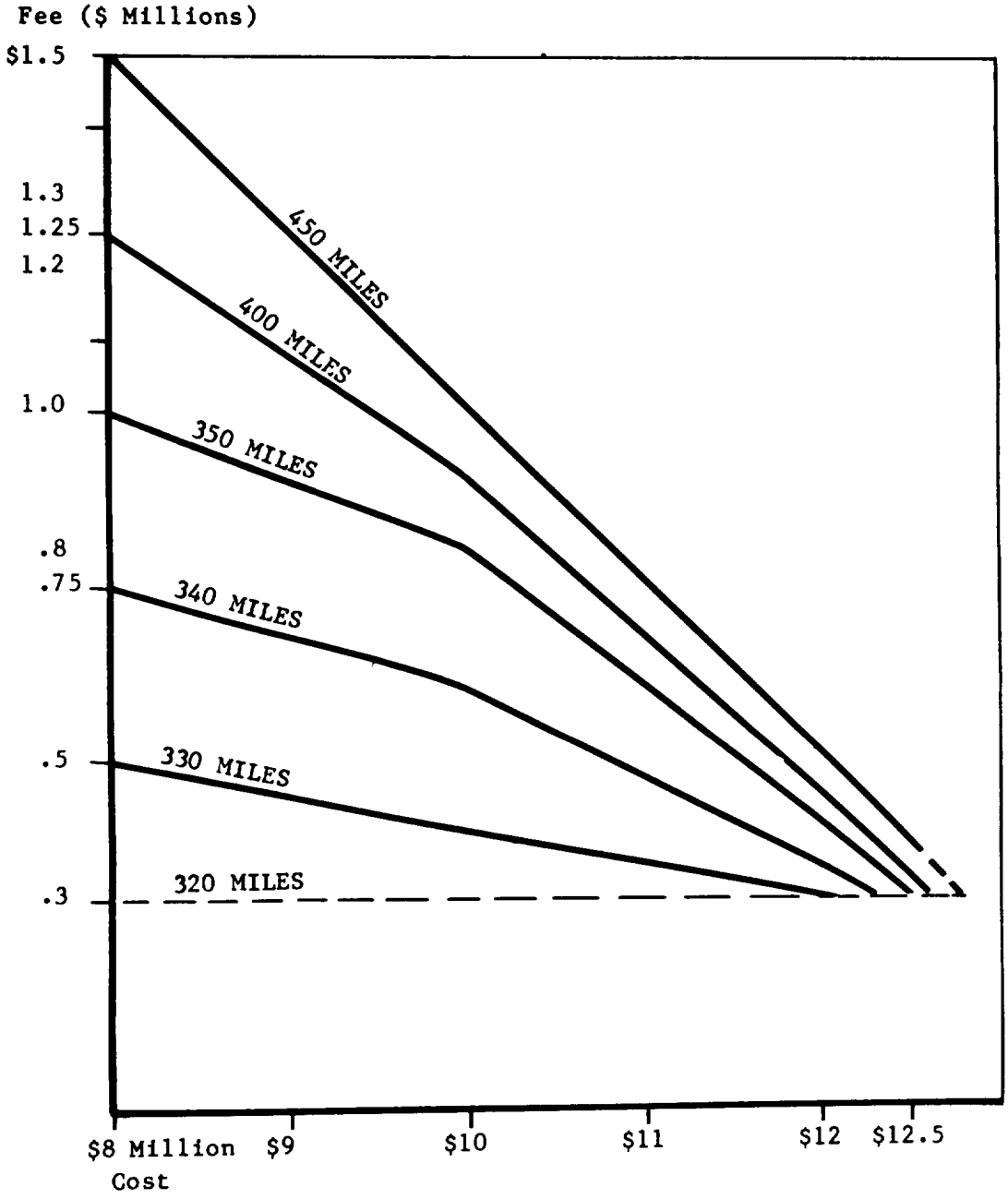


FIGURE 34

In the type of arrangement shown in Figure 34, the buyer is attempting to maximize the attainment of the objective within the limits of the given resources, or, economically speaking, he is attempting to minimize the price of achieving the given objective. Thus, interdependence in this case is cost (price) effectiveness. The interdependent arrangement must be carefully chosen, however, and the few cases where it is appropriate must be carefully selected.

B. PLANNED INTERDEPENDENT INCENTIVE MODEL (PIIM)

The PIIM program was first developed for the NASA Gemini spacecraft contract. The PIIM procedures were developed expressly for multiple incentive contracts in which it is not sufficient to treat the incentive elements independently. The concept brings together cost, performance, and schedule so that incentive fee is earned or lost on the basis of combined results in these parameters (if a point system is used, performance and schedule can be combined as one element). The range of incentive fee that can be earned for the almost infinite number of combinations of outcomes within the matrix is spread smoothly over a curved, three-dimensional surface so that there will tend to be no large fee gains or losses based on relatively small changes in the outcomes of any parameters.

Any type of incentive offers more fee for better performance and more fee for lower cost. The interdependent structure strives to maintain the best combination of high performance and low cost by paying incentive fee amounts which are not equal to the sum of individual fees for different parameters. Under a PIIM structure, incentive emphasis changes between the parameters for different program outcomes.

To describe the concept of PIIM, the following example is used:

RIE: Cost, $150 million-$250 million
Performance, 75 points-125 points

(i) at a low cost of $150 million and a high performance rating of 125 points, fee = $24 million

(ii) at a high cost of $250 million and a high performance rating of 125 points, fee = $10 million

(iii) at a low cost of $150 million and a low performance rating of 75 points, fee = $5 million

(iv) at a high cost of $250 million and a low performance rating of 75 points, fee = $0

Emphasis over the four boundaries of the interdependent incentive structure shown in Figure 35 is depicted in the smaller views of the sides of the structure in A, B, C, and D. The curves show incentive emphasis for individual parameters.

At low cost ($150 million), the incentive emphasis is highest at low performance and is lowest at high performance. The Government wants to encourage a contractor to improve performance at the low end of the performance range. At the high end of the range, the Government would not like to overreward performance increases and jeopardize a favorable cost outcome near $150 million. Thus, at the high end of the curve, performance is balanced against cost. The slope of the curve at this point is fairly shallow.

In the high cost region ($250 million), the incentive emphasis is relatively low at high performance, as shown by the gradual slope to the fee curve. Again, cost is balanced against performance, and the slope of the curve is fairly shallow.

The fee plan at performance of 125 shows relatively strong incentive at high cost levels, near $250 million. (The slope of the curve at this point is rather steep.) At lower cost levels near $150 million, the incentive emphasis is reduced. (The slope of the curve at this point is shallow.)

The curve for performance of 75 points across the cost range is very shallow and almost flat in the low part of the cost range.

The four curves represent the extremes, or boundaries, of the incentive plan. A three-dimensional surface can be drawn smoothly across these four boundaries, as shown in Figure 36. Fee can be calculated for any outcome of cost and performance that can be located on this surface, and is determined by the height of the surface at the point of the combined cost and performance values. Lines that connect all the points of equal height on the surface are called lines of constant, or equal, fee. These lines are shown for fee values of $2 million, $5 million, $7 million, $10 million, $18 million, and $20 million.

PIIM INCENTIVE FEE SURFACE

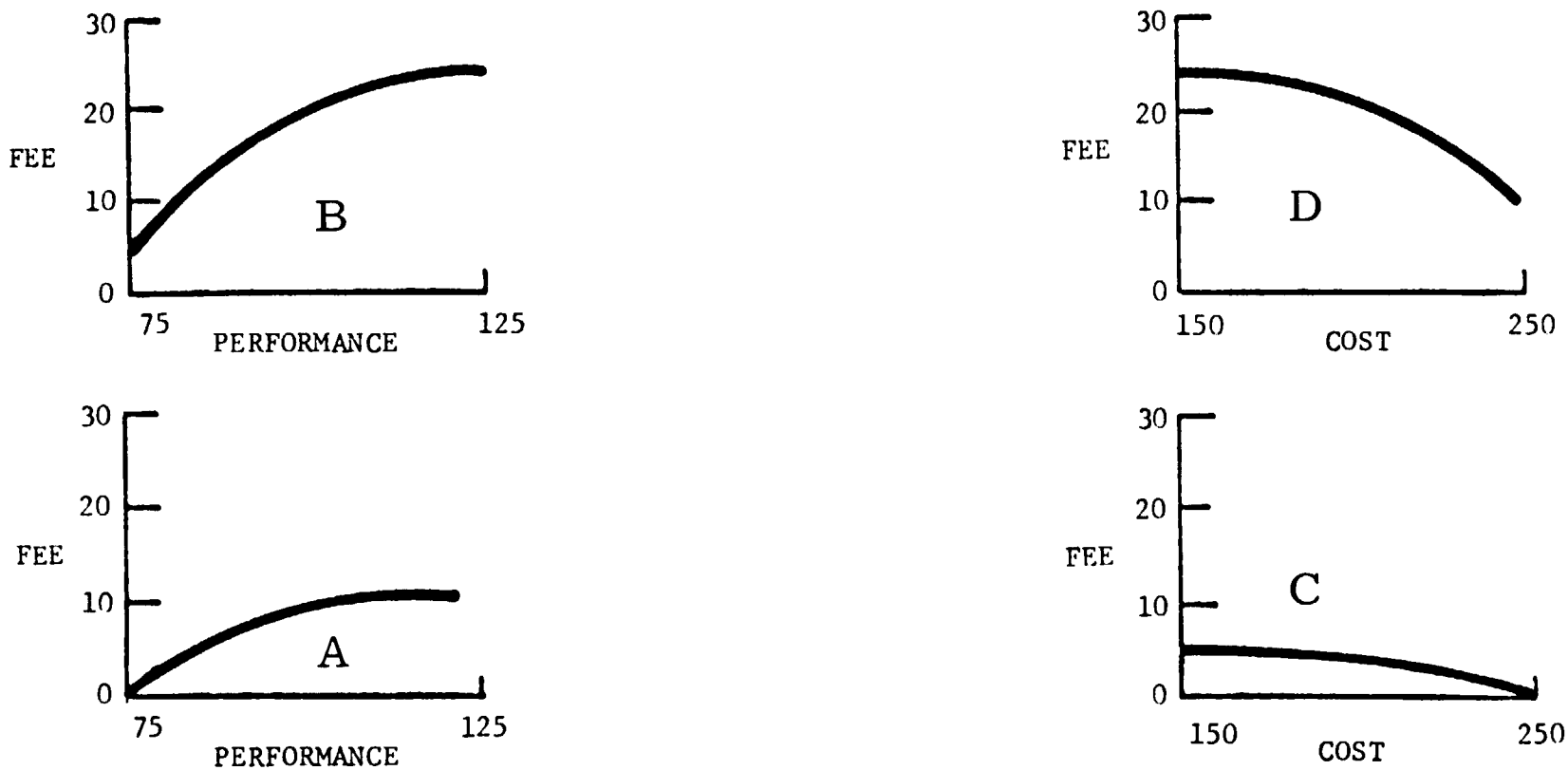


FIGURE 35

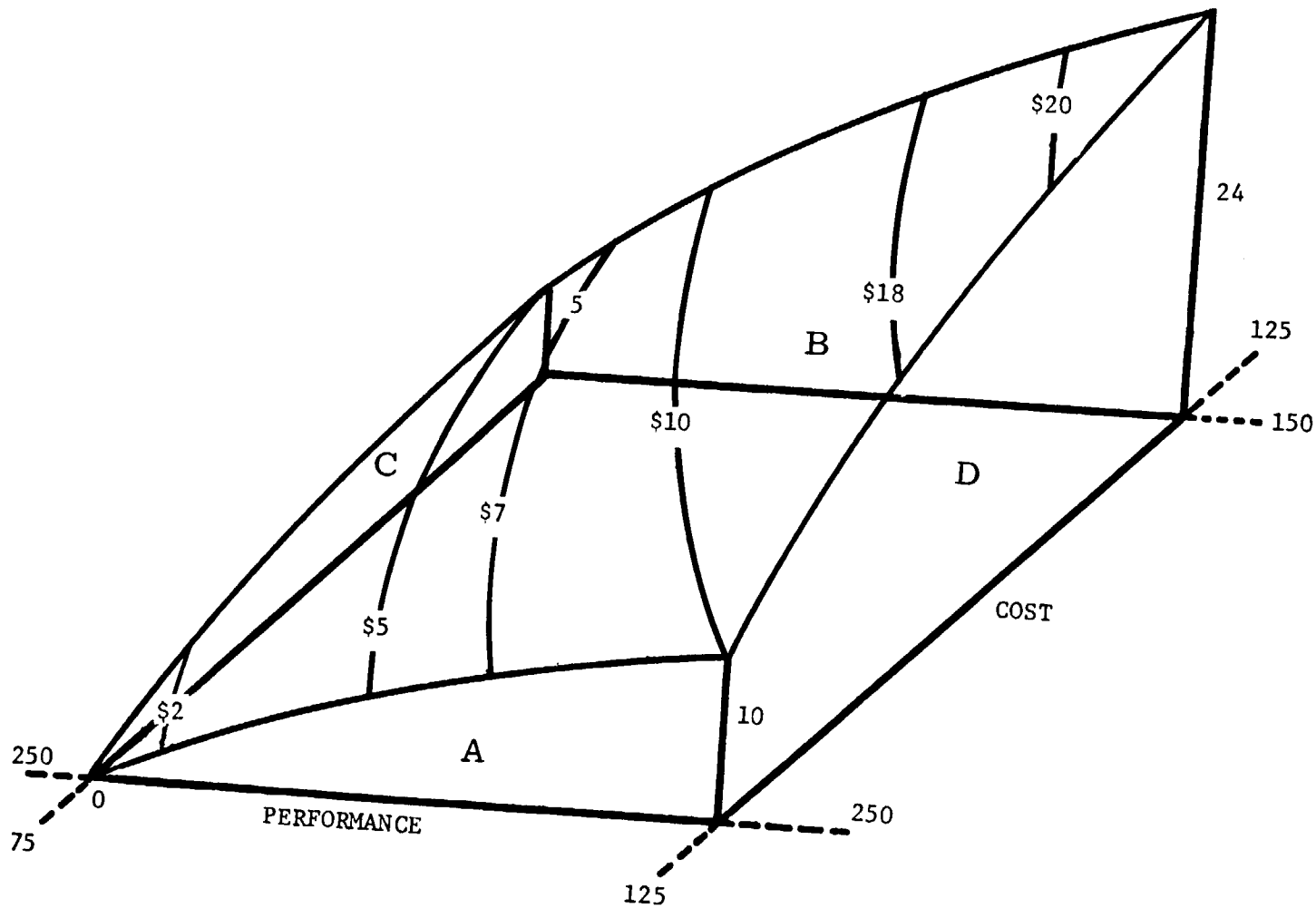

$20
24
$18
5
125
B
150
$10
C
D
$7
COST
$5
$2
10
250
A
0
PERFORMANCE
250
75
125

FIGURE 36

The PIIM surface can be adapted to suit the Government's value structure by varying the fee heights at the four corners of the surface. Also, the slopes at the extremes of the curves that bound the surface can be changed to reflect the desired relative emphasis of one parameter over the other. In this summary, these steps have been described separately for simplification. In the actual negotiation of an incentive plan, however, varying fee heights at the corners of the surface and varying slopes at the extremes of the curves bounding the surface are developed and negotiated simultaneously.

C. TABULAR MODEL

The purpose of the Tabular Model technique is to place extra constraints on certain incentive elements in the form of increased rewards or penalties, to assure that all trade-off decisions are made and continued within a defined range of predetermined effectiveness. The constraints and the rewards for accomplishing higher combinations of performance and cost achievements are obtained by adjusting profit with various multipliers. To provide for reward adjustments, a multiplier greater than one is established; for penalty adjustments, a multiplier less than one and greater than zero is assigned. If achievement of a specified level in a certain element (such as performance) is reached, an adjustment in profit is made by multiplying the profit earned in other incentive elements (such as cost) by a multiplier associated with performance.

For example, suppose costs were fifteen percent below target in a contract situation in which cost is highly important to the Government, but considered to be highly important only if performance were in the top half of its probable range. If the costs were low and performance achievements were also low, the cost saving would not be nearly as valuable to the Government.

By tailoring a tabular model to the various values of likely combinations of cost and performance for each individual contract, multipliers can be selected and applied in a manner which creates an interdependence among all of the incentivized elements.

Where the Tabular Model is to be used, the ranges of incentive effectiveness of the element(s) are subdivided into achievement grade

levels. These grade levels are numbered. It is not necessary that each element have the same number of grade levels, or that all elements be subdivided into achievement grade levels. A multiplier is assigned to each grade level. These multipliers are positive numbers and will be most likely to fall in the range of 0.5 to 1.5. It is possible that only one grade level and associated multiplier will adequately reflect the desired outcome.

Creation of interdependence among the incentive elements is achieved through use of the multipliers. In general, the principle involved is that the multiplier assigned to the achievement grade realized on one element is used to adjust (multiply) the basic (unadjusted) incentive fees earned on the other element(s). For example, suppose that the RIE for performance has been subdivided into grade levels one through eight. Further, suppose that the performance achieved under the contract falls into the grade five range, and that performance grade five has an assigned multiplier of 1.10. Then 1.10 is used to adjust (multiply) the basic (unadjusted) incentive fees earned on the cost and schedule elements (i.e., if both cost and schedule are "incentivized").

It is not necessary that multipliers be assigned for all incentive elements. The Tabular Model, in many instances, may serve its function well through assignment of multipliers to one or two elements. If an element does not have multipliers assigned, it does not require a breakdown of its RIE into grade levels.

If two elements have multipliers assigned, then two multipliers will be applied to the basic (unadjusted) incentive fee earned on the third element. If all three elements have multipliers assigned, the unadjusted incentive fee of each will have two multipliers applied to it. In such contracts, it is necessary to specify how two multipliers applied to a single element will be resolved into one. According to the incentive arrangement involved and the reasoning behind it, it may be appropriate to use the larger, the smaller, the product, the average, or to construct a table which specifies the multiplier to be used without following a rigid mathematical pattern. The choice will depend on the result desired in each individual case. The use of grade levels with assigned multipliers can result in large jumps (or drops) in profit or fee for a small change in contract outcome. This difficulty can be avoided by use of more grade levels of narrower ranges, so that differences between multipliers of adjacent grades of an element are not large. It can also be avoided by interpolation within grade levels.

While the structure of the basic (unadjusted) incentive arrangement is similar to contracts not employing the Tabular Model, the basic arrangement and the Tabular Model go "hand-in-hand" and must be developed with respect to each other. The multipliers have the effect of changing the weighting of the incentives for different outcomes. Therefore, the incentive rates or sharing formulas and the basic (unadjusted) profit will not be the same as if multipliers were not to be employed. The portion of fee assigned to the basic (unadjusted) incentive arrangement will normally be much less when the Tabular Model is used. For example, where the total fee pool is 15% (i.e., maximum fee 15%, minimum fee 0%) the total fee portion assigned to the basic arrangement should generally be less than half (e.g., 5% or 6%). The exception to this general rule is where only one element is to be emphasized and the use of the Tabular Model is to prevent complete loss of control of the other elements.

Consideration of any type of interdependent contract compels the Government and the contractor to analyze the objectives critically. This same discipline can be applied to any type of negotiation and is not a justification for complexity or for incentives. The purpose of interdependent incentives is to motivate efficient contractor management and the achievement of the most effective performance level in a way which would not occur without the incentive.

While technical decisions in the interest of the Government should be encouraged by the contract structure, it is recognized that these decisions also are generally in the best long-run interests of the contractor. Thus, the strength of the extracontractual motivating forces for performance should be examined carefully before an incentive value statement is placed on a performance event. In some cases, the extracontractual influence may be stronger than the contemplated incentive amount. In these cases, the limited motivational resources available in the incentive profit pool may be more appropriately assigned to cost control.

The questions of contract visibility during contract administration and the ability to introduce major changes are highlighted when interdependent structures are used. Interdependency may not be fully effective when major performance parameters are connected with several

subcontracted items. Also, major subcontracts and second-tier subcontracts for subsystems that significantly affect performance can create additional complexities which may impair contract visibility. When major changes or a large number of changes are introduced, contractual visibility is further reduced. Thus, when there is a high probability that measurements of individual subsystem performance will not be visible to program and contracting managers, fine gradations in prime contractor management actions will serve no purpose and should not be incentivized.

Earlier parts of the Guide have shown examples of simple interrelated structures using straight line surfaces. Any one of the cost performance, and schedule elements or the total structure may have curved or straight fee lines, depending on the circumstances. Simplicity and visibility, however, are key elements if the contract is to operate efficiently through the administration phase.

When technological uncertainty is high in several subsystems, the interdependent structure will not be able to accept a long series of changes. The structure itself can be changed by simply applying new probability factors and making statistical changes to the computer program; however, the practical considerations overrule the mere appearance of simplicity, because the same people that are required to make the technical changes and manage the changed conditions may not be available to make the judgments necessary to select a new computer program. This implies that interdependencies may be more appropriate in FPI than in CPIF contracts because of practical constraints during administration. Of course, the constraints of the ceiling price in an FPI contract, plus provisions for correction of deficiencies and other narrative constraints, serve as a cost balance for many of the performance incentives if minimum acceptable performance levels and performance goals have been correctly established.

CHAPTER VIII

INCENTIVE CONTRACT ADMINISTRATION

A. INTRODUCTION

Sound and timely contract administration is essential for incentive contracts to be effective. Poor administration -- too much or too little -- can negate the potential effect of incentives.

When the incentive concept was initially devised it was conceived that the contractor would have freedom to manage cost and performance variations. It was further intended that the incentive system should provide for anticipation of problems, and provide prompt cures which would neither materially affect the performance or delivery goal weightings, the cost incentive balance, nor the contractor's risk and contractual responsibility.

Experience with the administration of incentive contracts indicates that some administrative procedures and practices have increased unreasonably under certain incentive contracts, and there have been a few examples of inappropriate relaxation of administrative controls.

It is the policy of the Government, that where incentive contracts do provide maximum motivation for prudent cost management on the part of the contractors, administrative controls should be relaxed. When prudent cost management has been demonstrated by performance or by acceptance of a mix of contracts which reflect assumption of high cost risk, administrative controls which may hamper performance and are costly to the Government and the contractor should be eliminated or relaxed.

Problems involved in the administration of incentive contracts extend to several areas beyond the subject of contract changes; however, contract changes are probably considered first in any list of problems. It has been demonstrated clearly that the majority of problems associated with changes vanish when changes are proposed, negotiated, and definitized in a timely manner. This is not unique to incentive contracting, but timing is more important under incentives if the integrity of the original incentive structure is to be maintained.

In cases where numerous changes have been required, it has been considered that the more lengthy procedure involved in restructuring incentive contract features in order to make changes has tended to inhibit

the attainment of the finally desired objective. Thus, while such subjects as technical direction, partial terminations, financial and status reports, consent to subcontracts, prompt payment of earned incentives after demonstration, excusable delays, warranties, and management systems evaluations are administration areas affecting contractors' operations, the handling of contract changes can have the most tangible effect on the continuity of the incentive motivation.

B. RELAXATION OF ADMINISTRATIVE CONTROLS

Incentive contracting is intended to align the contractor's motivation with the Government's program objectives, and costly administrative controls considered necessary under a CPFF contracting environment should often be relaxed. Since the burden of risk has been substantially shifting to contractors in recent years, DoD has sought ways in which to eliminate certain administrative controls and reasonableness overhead audits in cases where the mix of contracts met a prescribed threshold of cost risk assumption. The program is known as Contractor's Weighted Average Share in Cost Risk (CWAS). 1/

The objectives of CWAS, as described in ASPR 3-1002, are to furnish a measure of the contractor's risk motivation, and where risk has in fact been assumed, minimize the extent of Government control.

Elimination of all unnecessary administrative controls, in contract management, especially under incentive contracts, is an objective of DoD and NASA. Of course, many controls cannot be considered unnecessary until contractor efficiencies have been demonstrated, or until there are indicators that the risk assumed in the contract mix will motivate efficiencies. The CWAS procedures provide a technique for developing the indicators of the degree of risk which has been assumed, however, even in the event of a low CWAS rating, when a contractor has assumed a high risk in an individual contract, consideration should be given to relaxing administrative controls for that contract.

It has been observed in various studies that the development of incentive arrangements has required better planning and better discipline on the part of the Government and the contractor. These fall-out benefits have not been exploited fully, however, in the administration phase of the contract, because better early planning should have permitted later controls to be relaxed.

Prudent relaxation of controls can be achieved on a case-by-case basis in such areas as administrative reviews or approval of overtime and travel, and subcontracts consent. These traditional CPFF controls can be relaxed even when CWAS is not applicable for all contracts on a corporate or profit center basis.

1/ See ASPR 3-1000 for detailed coverage on Contractor's Weighted Average Share in Cost Risk (CWAS)

Naturally, the responsibility for national defense or the responsibility for meeting the national space goals cannot be shifted. It must also be recognized that the most highly motivated contractor can fail in the performance of the most carefully structured contract. Thus, contractors' management reporting systems must be operating and capable to produce visibility of trends in operations.

Several of the measures prescribed for reduced administrative control are of more importance to technical managers than to contracting and finance managers. For example, the approvals for change to make or buy plans may be required by the technical (or quality) functions without consideration of other effects. 1/ This is also true in the requirements for approval of changes in key personnel. Each area, therefore, must be examined when direct monitoring actions may be necessary because of certain programmatic requirements. It is important to consider that this examination may disclose duplications of administrative controls through informal reporting actions. Certainly, all duplication should be eliminated, and only necessary administrative emphasis should be redirected to the most important functions.

C. PCO/ACO RESPONSIBILITIES FOR INCENTIVE CONTRACT ADMINISTRATION

It is essential that the Procuring Contracting Officer (PCO) and the Administrative Contracting Officer (ACO) clearly understand the assignment of responsibilities and the special requirements connected with the administration of an incentive contract. The PCO is responsible for establishing and maintaining effective communications with the ACO.

The policy of both the DoD and NASA is to make maximum use of the contract administration services and related field support capabilities of the Defense Contract Administration Services and Departments or NASA installations with plant cognizance. 2/ The Defense Supply Agency Manual 8105.1 (3-400) makes specific reference to administration of incentive contracts.

The written delegation of special responsibilities for administration should be unambiguous; however, it is incumbent upon the ACO to provide the PCO with assessments and recommendations concerning <u>any</u> potentially adverse situation which may be disclosed and which impacts on the contractual objectives.

1/ NASA PR 51-310.2, Functions Critical to a Project.

2/ See NASA PR Part 51, Contract Management Procedures; ASPR Section XX, Part 7; ASPR 1-406

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It is important for the ACO to maintain a continuous overview of the progress of major incentive parameters. Particular attention should be directed to the status of Government furnished equipment because of the effect of late delivery of GFE on contractual incentives.

There are no conflicts between the concept of program overview and the concept of relaxation of controls. Program surveillance and surveillance of contractors' functional systems reviews are parts of good contract administrative management.

When large complex incentive contracts are contemplated, the PCO should bring the ACO into the coordination cycle as early as possible. The degree of success of the administrative effort will be enhanced by the knowledge and experience of the administrative personnel gained during the development and negotiation of incentive objectives. In the majority of cases, of course, at the time the contract administrator enters the picture, the type of contract and the incentive structure have been selected and negotiated. The benefits from extensive preaward participation can more than offset the personnel expense in many contracts.

It is impossible to provide explicit guidelines that would cover every conceivable action which the ACO should perform for the PCO in the administration of an incentive contract. The delegation by the PCO will list the minimum necessary contractual and program coverage which is required. 1/ Over and above the delegation authority is the requirement for the ACO's effective communication with the PCO and the contractor. Timely communication is required if it is to be effective.

Progress reports and data transmitted to the PCO should be analyzed by the ACO and his supporting team to determine if the trends or indicated problem areas are reflected in the estimates for effort to be completed in prospective periods of performance.

Financial management reports, together with production reports, quality assurance reports, and reports of interim tests or milestone accomplishments should be compared with planned expenditure and manning levels. This comparison may provide a good factual basis for analysis of the status of certain incentive aspects. An assessment of the forward estimates will not be complete without a thorough analysis of the major subcontract areas and any pacing items.

1/ References: ASPR 1-201.3, 1-201.31, 1-406, 20-703
NASA PR - Part 51, Subpart 3

While prime contractors are responsible for selection of subcontractors and administration of subcontractors, the ACO is responsible for review of selected purchasing and subcontracting systems and for continuing surveillance of these systems. The ACO should be particularly cognizant of recommendations from audit, pricing, production and other specialized personnel when compliance with the recommendations is necessary for effective subcontract administration. Several incentive contract overruns have been identified too late for corrective action by the prime contractor because of ineffective subcontract administration systems. The primary ACO is responsible for coordination with secondary ACO's at major subcontractors' plants to assure that there is a mutual understanding of the requirements for the prime contractor to take prompt action where there is anticipated or actual delivery or performance delinquencies. Both the primary ACO and supporting ACO's also should give particular attention to the analysis of financial management reports when required from major subcontractors--the analysis should assess the relationship of costs incurred and those forecasted with progress in actual performance.

The monitoring of incentive contracts by the ACO's team is a continuing effort performed by various functional specialists to compare technical progress with planned progress and planned funding. The monitoring action is not an administrative control. The contractor must have relative freedom to manage costs and performance. Monitoring is simply a surveillance action to assure that the prime contractor's management of the incentive program continues to be effective, and to assure that the incentive structure continues to be effective without a requirement for significant redirection.

D. PROGRAM MANAGEMENT AND TECHNICAL DIRECTION

Program management of an incentive contract initially starts with the development of the performance, test, and evaluation specifications which are eventually incorporated into the contract. The Government's program manager, or project manager, normally through contract administration personnel, will monitor the progress of performance.

The contract administration duties of technical representatives of the project managers shall be determined in accordance with Departmental or NASA practices.

Government program managers are usually responsible for making all decisions which affect the total system performance and

cost for the lifetime of the system. The program management concept permits integrated decision-making, which evaluates the combined impact of all significant circumstances during the administration of the major incentive contracts. In many cases, the program manager's responsibility is not limited to the technical function, but considers all functional operations. When this approach is used, the contracting officer and his supporting team are sometimes assigned within the program manager's organization. The Government's organizational arrangement does not affect the incentive contractual relationship which is established between the Government and contractor. The organizational arrangement may only affect the manner in which administration procedures are implemented.

The contracting officer is the only agent with the authority to bind and obligate the Government in matters pertaining to contract administration. The ACO, however, cannot knowingly permit unauthorized acts by others and later approve them by ratification and still later attempt to deny the authority of such continuing unauthorized acts. Contract changes and increased work disguised as technical direction and a patter of "informal" changes which may require after-the-fact acceptance are examples which adversely affect the integrity of the incentive structure. In these cases, the incentive can be compromised by implied authority having been delegated by the continued acceptance of such undelegated actions.

The ACO will require the assistance of the technical team to monitor those parts of the contractor's management systems reports which pertain to identifiable areas of performance or specified goals of the contract.

Purchasing offices and system or project managers may assign technical representatives for liaison purposes. 1/

The technical representatives may assist in the administration phase by performing technical approval of (i) changes involving design consideration, (ii) costs as related to available program funds, and (iii) schedule impact, including consideration of trade-offs between cost, performance, and schedule. The technical program representatives should keep the ACO fully informed on matters discussed with contractors.

Technical direction can be an effective program management and administrative tool for both the Government and the contractor. On the other hand, if incorrectly used or misapplied, it also can be incompatible with incentive contracting.

1/ ASPR 20-705

Technical direction generally can be defined as:

(i) Filling in previously unspecified details or instructions concerning the technical requirement.

(ii) Shifting emphasis between tasks without affecting incentive or other parameters.

(iii) Providing guidance, advice, definitions, and other information which assist in interpretation of drawings and specifications and assist in interfacing with associate subsystems.

Technical direction is performed by technical representatives designated in writing by the contracting officer as authorized to issue technical directions which are not intended to impact on the cost or other incentive aspects of the contract. Of course, the extent and nature of technical direction contemplated should have been considered prior to the selection of contract type. Where significant technical direction is contemplated, a cost reimbursement contract may be appropriate.

When technical directives are used with incentives, operating procedures should include provision for serial numbered written directives, with copies issued to the contracting officer (and probably copies to Reliability and Quality Assurance and all other affected functions, or in accordance with Departmental or program management instructions).

E. FINANCIAL MANAGEMENT AND FUNDING.

In a CPIF contract, the Government is not obligated to reimburse the contractor for costs in excess of the target cost (as may be adjusted), and on the other hand, the contractor is not obligated to continue to work in excess of the estimated cost point unless the Government increases the estimated cost.

In a FPI contract, the Government is not obligated to reimburse the contractor for costs in excess of the ceiling price amount, but the contractor is obligated to continue to work to completion of performance.

In either type of contract, payment may not be authorized for more than the amount obligated on a contract.

The foregoing explains, in part, certain funding differences in incentive contracts. There also are certain financial reporting differences between CPIF and FPI contracts. The extent and depth of financial reporting for incentive administration purposes certainly should not result in reports which cost more than the benefits to be obtained.

Any contract involving a line item above $500,000 and with a performance period exceeding one year, whether FPI or CPIF, may have within the agreement specific details covering the requirement for the Contractor Financial Management Report (NASA Form 533) or the Contract Funds Status Report (DoD, DD 1586).

The primary financial management interest of the contracting officer generally is in the current funds status of the project plus the forecasted funding requirement or expenditure rate of the contract for which he has responsibility. Financial Management personnel, Comptroller representatives of the Departments and Systems Analysts will have several broad interests in data which portray details and cross-sections of cost, schedule, and technical performance. The Resource Management Systems of DoD [1/] will continue to develop additional guidance for assets management, acquisition management, and cost information reports; and expand beyond the present coverage of systems for major aircraft, missile, and space programs (the current applications are in programs with total obligational authority of $25 million for RDT&E or $100 million cumulative investment for production). The majority of the incentive contracts (not the majority of dollars obligated by incentives) may use financial management information developed by the Contract Funds Status Report (CFSR), DD Form 1586. The DoD quarterly report and the NASA 533 report were developed for line items funded in the amount of $500,000 or more but may be used for smaller CPIF incentive contracts of $100,000 or more. If there is a high confidence in the ability to predict costs and if periodic funding controls are easily manageable, the content of financial management reports should be held to the minimum requirements for progress information. Final judgment concerning the depth of reporting must be dependent on the specifics of a particular contracting situation.

Financial management evaluation for incentive administration purposes should be based on the work breakdown structure of the project. Reporting against the work breakdown structure will be in the best form for management of the Government program by project and technical personnel. In all cases, however, the reporting requirements should be compatible with the contractor's accounting system unless this is clearly impossible. The contractor should be allowed to

1/References: DoD Directive 7000.1, August 22, 1966; DoD Instructions 7041.2, June 13, 1966, 7800.7, December 23, 1966 and 7000.2, December 22, 1967.

use his own accounting and production reporting methods as long as the required data satisfy the Government's basic control systems criteria. The prime contractor is responsible to assure that major subcontractors' reports meet the same quality and timeliness standards.

The major differences between the FPI and CPIF reporting may be caused by the inability in CPIF to accurately define or specify progress milestones which relate time and cost with work performed. Reporting under either type of contract should reflect the estimate of all authorized changes which have not been definitized, and there should be identification of planned changes or contractor initiated changes which are in the proposal process. The report should be supplemented by Government project estimates of Government planned changes.

The Limitation of Cost clauses in the ASPR and NASA PR covering cost reimbursement type contracts provide for the contractor to notify the contracting officer when costs are expected to exceed 75% of the estimated cost (target cost) within the next 60 days (may be varied from 30 to 90 days and from 75% to 85%), or when the total costs will be substantially greater or less than the estimated costs. As previously stated, the Government is not obligated to reimburse the contractor for any costs beyond the estimated costs unless the estimated cost set forth in the Schedule is specifically increased by the contracting officer. The ASPR clause covering Limitation of Funds (October 1966) and the NASA PR clause covering Limitation of Government's Obligation (September 1962) are used when funding to complete the entire contract is not available. The contractor also is required to notify the contracting officer when costs for certain items or for a certain period of performance are expected to exceed the funds then allotted to the contract.

The size of the total contract and the length of the period of performance have a direct correlation with the type of funding plan. The contractor's funding plan should be matched with the cash flow requirements determined necessary at the time of negotiation. The cash flow plan related with the budgeted man-hour plan of the work breakdown structure should be reflected in the funding agreement of the schedule.

The concept of incremental budgeting and funding has certain advantages and disadvantages. The practice permits funding flexibility for the Department and within a major program. It also helps control Government expenditures in accordance with total Government budgeting practices. Two of the disadvantages often reported are the increased workload and the possible adverse effect on incentive planning or changes to incentive plans (trade-offs). The latter disadvantage

caused by incremental funding also can be related to the Limitation of Cost clause in CPIF contracts which is reported to discourage trade-offs above the target cost point even when revised estimated costs are within the RIE.

"Trade-offs" which may improve performance but increase costs above the target cost point or which may increase costs within a specified period with a funding limitation are not necessarily stopped because of the limitation of cost or because of incremental funding. The contractor is permitted and should be encouraged to notify the contracting officer that a significantly higher performance goal is contemplated to be reached by a revised plan for work specified in the Schedule. The contracting officer is permitted to consider the proposal for a revised estimated cost and a revised plan with higher performance goals. Where technical confidence is high in the revised plan and realistically and reasonably supported, the contracting officer may secure approval in accordance with Departmental or Agency practices for authority to increase the estimated cost of the contract without changing target cost, target fee, the RIE, or sharing arrangement. Funding levels for a specified period also may be increased when the revised plan reflects increases in over-all cost effectiveness.

The term "spoon feeding" has been applied to improper incremental funding practices. Incremental funding is quite often a necessity and in the long run may be beneficial for both the Government and contractor; however, its application as a program control device can be questioned. In many cases, the "spoon feeding" practice can increase costs rather than control costs. Many valid reasons can be cited for incremental funding; there are few valid reasons for "spoon feeding." It must be remembered that one incremental funding action between the contracting officer and the prime contractor may generate several incremental funding actions between the prime contractor and the subcontractors, and in some cases this extends on to certain second tier subcontractors.

In the event a significant change in the funding plan affects the contractor's ability to earn delivery incentives, the contract should provide for equitable adjustments in the incentive structure. The delivery incentive feature may be modified on the basis of an excusable delay; however, there are other contractual provisions which do not provide for equitable adjustment for schedule, therefore the parties should anticipate the effect of Government actions which can adversely effect schedule incentives and make proper provisions in the contract in the event of their occurrence. Changes to the allotment of funds for

one year in a three or four year contract may not always affect final delivery or total estimated cost. The extent of the variation from the original funding plan plus the contractor's ability to shift effort to other programs or elements of the same systems may form the basis for determining the effect of the funding variation. It would appear that the most workable plan for fixing "estimated" funding requirements for certain periods would involve a target amount for funding allotments with permissible variations of five or ten per cent without impact on the incentives. Funding periods should not be established for less than semi-annual periods.

F. DOCUMENTATION OF ADMINISTRATIVE ACTIONS

The importance of documentation cannot be over-emphasized, and there is no one particular standard of content for adequate documentation of all incentive contract actions. The requirement for documentation does not cease following the incentive contract negotiation -- it continues thru the analysis and negotiation of all incentive contract changes. The basic reason for documentation is to support the next contract administration action. Thus, the documentation package should also summarize or cross-reference a history of the cost, performance, and schedule achievements at various milestones during the lifetime of the contract. The documentation concerning the negotiation of a major change should show the basis for determining the percentage of completion of the contract or a particular element of the performance.

The PCO's files should be fully supported by the ACO's price analysis summaries. The scope and depth of audit evaluations and price analysis evaluations and the extent of their use should be clearly recorded in the final documentation of major change negotiation. Since both evaluations eventually become a part of contract records, reviewers of the documentation should be able to understand the negotiation positions taken on significant matters affecting any variances between data in the proposals and audit/pricing evaluations.

Since changes made during the contract administration phase will generally be based on the estimate of the cost at the time the change is made, it is also necessary in significant changes to multiple incentive contracts for the documentation to record the performance and schedule status at the time the change is introduced. The rationales supporting changes to the incentive-mix of cost, performance, and schedule values or sharing ratios should be supported in the documentation of change order negotiations. The contractor's probability of reaching a certain indicated profit position at contract completion should be discussed in the documentation of changes which cause significant redirection in a contract. This will highlight the fact that the contractor's relative position (increases or decreases) has been preserved in the changed incentive structure.

The accumulation and continuing review of historical information is not only necessary for program and contract management, but it also provides a basis for prompt, complete replies to the Renegotiation Board, General Accounting Office, and DCAA or departmental audit staffs.

It is highly important to remember that the annual reports to the Renegotiation Board are used not only as a basis for controlling excess profits, the reports may also be used as a basis to support the payment of earned profits above target profit. While the effect of all defense and space contracts on the contractor's total profit is based more on the total profit/volume/investment relationship than on the particular percentage of profit represented in a specific incentive contract, the size of a particular incentive contract and the success under that contract may cause one contract to be the dominant factor in an annual profit result.

Documentation supporting information to be reported to the Renegotiation Board, or in response to GAO inquiries concerning cost, performance, schedule relationships, should describe the efficiency shown and the risk assumed by the contractor in performance of a particular incentive contract. In short, the documentation should provide information concerning the extent to which the contractor met cost targets and performance goals under the incentive contract and the reasons therefor. Changes in cost and profit targets and cost sharing ratios should be described, with attention directed toward increased risk or reduced risk which might have been introduced by any significant changes. While many requests for information will require a current appraisal of performance under an incentive contract, it may be necessary to describe major milestones leading up to incentive events which were performed during a current period. An incentive for a flight milestone is not earned on the day of the flight. The incentive has been in process for many weeks, months, and possibly years prior to the flight date. The extent of the contractor's continuing stake in the objectives of the over-all program should be described when reports may cover only one year of a major program.

Reports for Renegotiation purposes covering research and development contracts with multiple incentives may require more background than would be necessary to describe annual performance under production contracts. The reports also must be careful to define levels of failure and success. An event which may have been identified by the public or the press as a mission failure, involving ten technological objectives, may actually represent the attainment of nine successful technological advances and failure in only one; even the contractor's

correct use of the lessons learned from one failure may contribute to the ultimate success of a program. Thus, the subjective weightings applied by program managers to incentive earnings and penalties on particular events should be explained.

The reporting of an incentive formula should describe any narrative constraints in the contract which may increase risk assumption; for example, cost overlap features or special provisions covering the requirement that specific performance levels be reached before cost sharing is permissible should be highlighted.

To ensure pertinent and accurate data for replies to the Renegotiation Board and audit offices, the documentation files should be maintained on a current basis. Reconstruction of actions becomes increasingly difficult at later dates and impacts on the accuracy and reliability of the data. The currency and completeness of the documentation will always affect the ability to perform pricing in the administration phase. Thus, the effort to document is equally beneficial for contracting and project personnel as well as renegotiation, audit, and other reviewers. In a final sense, good documentation also supports the contractors who must depend on the contract administration documentation to support any earned incentive profits that may be a determinant in higher than normal annual profits.

CHAPTER IX

COST-PLUS-AWARD-FEE CONTRACT

A. INTRODUCTION

The cost-plus-award-fee (CPAF) contract is a cost-reimbursement type of contract with special incentive fee provisions. It provides a means of applying incentives in contracts which are not susceptible to development of firm objectives for cost, technical, and management performance.

The CPAF contract fits in the spectrum of approved contract types between the CPFF contract and the CPIF contract. 1/ The NASA Cost Plus Award Fee Contracting Guide presents several examples of CPAF criteria, measurement, and rating plans. While early applications were usually limited to support services contracts, CPAF contracts may be appropriate for Engineering Development or Operational System Development contracts where the measurement of achievement does not lend itself to the objective measurements required by CPIF contracts. The CPAF contract should not be used as an administrative technique to avoid CPFF contracts when CPFF criteria apply, nor shall a CPAF contract be used to avoid the effort of establishing objective targets so as to make feasible the use of a CPIF type contract.

The CPAF contract provides that the contractor's earned fee will be determined subjectively by designated Government personnel on the basis of periodic, after-the-fact evaluations of the contractor's performance. The CPAF contract has a base fee, a maximum fee, and provision for a variable award fee to be adjusted upward. The award fee determination is subject to special checks and balances which provide procedural safeguards protecting both the Government and the contractor from arbitrary or capricious evaluations. These are a substitute for the conventional "Disputes" clause procedure, and the Disputes clause is made inapplicable to the award fee.

DoD and NASA have used CPAF contracts since 1962, and the majority of major aerospace and electronic industry contractors have some experience with award fee contracting at the prime contract level. Award fee procedures generally are not considered appropriate for subcontracting under Government prime contracts.

1/ ASPR 3-405.5, Cost Plus Award Fee Contracts
NASAPR 3.405-6, Cost Plus Award Fee Contracts
NASA Cost Plus Award Fee Contracting Guide,
NHB 5104.4, issued August 1, 1967, available
from the U.S. Government Printing Office

B. ELEMENTS OF CPAF CONTRACTS

The CPAF contract includes the following:

(i) an estimated cost,

(ii) a base fee (a fixed fee which does not vary with performance; base fee may be zero),

(iii) an award fee (to be determined subjectively following evaluation of performance as measured against the performance criteria set forth in the contract; award fee may be earned in whole or in part or may be zero),

(iv) a maximum fee (base fee plus award fee pool),

(v) performance criteria (evaluation criteria may include such elements as quality, timeliness, and cost effectiveness and sub-elements which define these criteria), and

(vi) fee payment plan (once each month or at more frequent intervals if approved by the Contracting Officer, the contractor may invoice for base fee and, in special circumstances, the Schedule may provide for a billing fee which is higher than base fee but lower than the amount available for maximum fee. When special billing fee provisions are included, the contract should provide that payment of fee can be made on the basis of a lesser fee when performance or cost effectiveness indicates that the billing fee rate will not be achieved, but the lesser fee will not be below base fee. Award fee will generally be determined and paid on a quarterly basis but in special circumstances can be determined and paid semi-annually).

Award fee evaluation plans and subjective measurement systems should be developed prior to commencement of performance. The techniques for assessing the contractor's performance and the evaluation plan should be fully understood by the contractor and Government personnel responsible for reporting performance progress and making final award fee determinations. While it is not necessary for the plans and procedures to be included in the contract, an outline of the evaluation system should be provided to the contractor.

C. DISPUTES CLAUSE

Various clauses in the contract describe a variety of conditions in which the "Disputes" clause may be applicable. The CPAF contract,

however, will include a specific provision that the determination of fee adjustment (the award fee) shall not be subject to the contract clause entitled "Disputes". The decision to pay an amount of variable incentive fee, all, part or none of the award fee pool above base fee, is a unilateral determination made by the Government. Matters affecting the base fee or other contractual conditions are subject to the conventional Disputes procedures as may be provided in the contract.

Summaries of evaluations are furnished to the contractor to afford him an opportunity to comment on the evaluation findings. In this manner, the contractor can appeal the award fee recommendations and attempt to qualify or justify actions taken during the course of the contract. The appeal can be made to the Evaluation Board or the Fee Determination Official. After consideration of an appeal, the Board or Fee Determination Official will make an award fee decision which is not subject to further appeal pursuant to the clause of the contract entitled "Disputes".

It is important that the contract should not describe the fee determination action as a "final" decision. The decision is not final and conclusive, and may be pursued through other established channels. No Government contract can contain a provision making final, on a question of law, the decision of any administrative official, representative, or board.

D. FEE

The maximum fee (base fee plus variable award fee) shall not exceed the limitations stated in ASPR 3-405.6(c)(2) or NASAPR 3.450(f).

The ASPR 3-405.5(d) also provides that the amount of the base fee shall not exceed 3 per cent of the estimated cost of the contract exclusive of the fee. While the NASAPR does not provide for a limitation on the maximum amount of the base fee, the majority of NASA contracts do have base fees that are below 3 per cent.

The award fee adjustments will be increases only, and the potential award fee should be in an amount which is sufficient to provide motivation for excellence in the areas described by the performance criteria.

With respect to the base fee level, the contractor's investment may be relatively small in certain support services contracts; however, this should not be the sole criterion to be considered in developing fee levels. The DoD Weighted Guidelines and the NASA standard profit criteria are not utilized to develop base fee or maximum fee, but the contractor's past performance, resources, complexity of task, and organization and plan for performance and cost effectiveness should be among the items considered in development of fee objectives. The contractor's use of his own resources involves the use of an organizational base and certain specialized

personnel skills which would be available for other traditional work. The CPAF contract may require higher level technical and management resources for improved levels of performance. The base fee can be used to provide compensation for this type of investment plus compensation for minimum acceptable levels of performance. When these conditions are present, a base fee objective of more than "zero" should be considered.

Full or partial payment of award fee corresponding with the periodic evaluations will make the incentive in the CPAF more effective, because the fee payment and evaluation conference directs timely attention to areas where good performance should be continued and where poor performance should be improved.

E. CPAF EVALUATION

The contract should provide for evaluation at stated intervals during contract performance. In most cases, the formal evaluation will be quarterly; however, monthly reports from performance monitors are suggested, with interim communication or conferences with the contractor when areas of performance require improvement.

The criteria and the evaluation/rating plan to be selected will differ widely from one contract to another and from one contractor to another. The ASPR and the NASA CPAF Contracting Guide present examples of criteria and evaluation plans, but these are not fully representative of the long listing of plans which have been considered appropriate for particular circumstances. The using activity should be flexible in selecting evaluation criteria and plans which will provide a good measurement of the contractor's performance and motivate the contractor in a continuing, positive way to improve performance. It is likely that follow-on procurements for the same services with the same contractor may require significant changes in evaluation and rating plans. (NOTE: Also consider changing criteria during a contract as work progresses and emphasis changes.)

Criteria for evaluation should represent work "output". The contracting officer and project manager are concerned with results rather than the "input" to a contract. The standards assigned to the outputs and the grading of the outputs are of extreme importance. There are many objective measurements or historical standards available to grade certain outputs and these can form the basis for the over-all subjective evaluation of efficiency. Virtually all desired results are reducible to some standard of acceptability and effectiveness. When a sound description of what constitutes acceptable work or improved levels of work cannot be outlined, there should be no effort to incentivize the performance, and it should be performed under a CPFF contract.

The Government project personnel responsible for the evaluation and the development of continuing work statements should devote greater attention to potential changes which are possible in the incentive structure for continuing or follow-on work. The evaluation framework should be as susceptible to adaptation and revision as the effort itself. In this way, many CPAF contracts may reach a point of definition or objectivity where the contract type can be changed to CPIF or even FPI in later procurements.

It is extremely important that the integrity of the evaluation system be maintained at all times. The monitoring, reporting, and evaluation procedures, together with the communications with the contractor, and the fee determination procedures are all part of a check and balance plan to protect the integrity of the CPAF system. Monitoring and reporting should be performed by personnel knowledgeable with respect to the contract requirements. This built-in capability for evaluation plus the contractor's opportunity to present matters to the Evaluation Board or Fee Determination Official on his behalf assures both the contractor and the Government that reasonable judgments have been used in decisions concerning earned fee. Summaries of the monitors' periodic reports, plus evaluation findings and the fee determination should be made a part of the official file documentation.

F. COMBINATION CPAF CONTRACTS

Where cost control is largely under the control of the contractor, the CPAF contract may provide for a combination incentive measurement plan and combination fee. This type of contract, if predominantly award fee and subjective, would be reported as a CPAF contract and could be identified as a CPAF/IF contract. If the cost-based incentive was predominant, the contract would be reported as a CPIF contract, and could be identified as a CPIF/AF contract. The NASA CPAF Contracting Guide shows examples of CPAF combination contracts which emphasize performance and costs in separate measurement plans; the cost incentive is a standard, objective CPIF, and it is combined with a CPAF which involves subjective evaluations of certain performance features.

The structuring methods and graphics for combination CPAF contracts are similar to conventional incentives. The award fee may be introduced into the structure in either a compartmentalized or interdependent way.

If basic performance specifications can be realistically estimated and accurately measured, an award fee feature can be added to an FPI contract. In particular circumstances, the award fee may be applied to (i) effectiveness of personnel policies, procedures, and practices (recruiting, personnel turnover, training); (ii) logistics (scheduling, spares control, transportation, standardization), and (iii) property control (internal audit, inventory documentation and data, effective utilization, maintenance, inspection, scheduling, equipment logs, calibration, corrective action, rework, and operational readiness), and the like.

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Combination CPAF or straight award fee evaluation procedures should reflect realistic standards for contractor grading so that several different evaluators can agree within a narrow range on the contractor's achievement levels. Evaluation plans which use a point system, specific adjective ratings, yes/no grading, or combination numerical/percentage ratings should direct attention only to the criteria which represent key performance elements. Reviews of the broad areas of operations and technical and business management can also look at the details of timeliness, quality of work, and effectiveness of cost management without complex, detailed reporting on numbers of tasks, work orders, or work packages. It will be found in most of the combination contracts that the cost incentive will provide motivation to adhere to schedules and reduce the amount of rework, overtime, and other areas directly affecting cost.

CHAPTER X

ADVANCED STUDIES OF INCENTIVE THEORY

A. EXTRACONTRACTUAL INFLUENCES IN GOVERNMENT CONTRACTING

Total, unquantified views of motivating forces have assumed traditionally that the contractor considered the following extracontractual reward factors as being equal or nearly equal to individual contract profit:

(i) Company growth

New fields of business

(ii) Prestige (reputation and influence)

Better public image
Social approval
National goals

(iii) Opportunity for follow-on business

Transformation to commercial business

(iv) Utilization of available skills and open capacity

If a contractual incentive is to affect behavior, the values of the prospective rewards or penalties must be greater than other rewards attainable by performance goals geared specifically to the extracontractual rewards.

The Government has been engaged in studies of extracontractual influences upon organizational performance since June 1, 1967.[1/] Very little has been known up to now about the behavior of contractors' organizations in relation to the contracting process.

Organizations are complex social systems, and contractors' organizations are composed of several smaller systems which in turn are influenced by environments of professional, functional, and individual systems. To predict the behavior of the larger system, the Government negotiator must consider two independent variables -- risk and information. Risk means contractual risk, and information means extracontractual influences. Information means that the Government negotiator

1/ NASA Grant No. NGR 33-015-061, issued by NASA on June 1, 1967, to the State University of New York at Buffalo.

is knowledgeable about the desires of the contractor. While risk and information are independent variables, the relationship of the variables will effect bargaining behavior on the part of the contractor and should effect the bargaining behavior on the part of the Government negotiator.

Risk involves the input of resources, the time involved, the competition, the cost experience, functional capability, the understanding of the commitment, and the premiums to offset risk aversion.

Information involves the amount of knowledge concerning the contractor's desires, the strength of desire for short-run profits, and the strength of the desires to survive, to grow, and perhaps to maximize long-run profits.

The role of information in the development of contract objectives and in negotiation is emerging as an interdependent role in incentive contracting. Incentives may be defined as promises of reward or punishment contingent upon specified performances, but any performance environment is a complex area of interacting forces, and any given input to motivate performance may have unintended as well as intended consequences. The contractor's expectancies, his desires, should be matched with the direct motivational effects of an incentive structure to avoid duplication and to avoid an unintended performance action because of conflicting preferences.

In the case of most contracts, no one can insist logically that profit (with dollars as the common denominator) is not the ultimate objective. Increased short-run profits assist in the attainment of the extracontractual profit factors, and in the long run, the extracontractual profit factors lead also to greater opportunities for future profits.

Many trade-offs are made in developing objectives for the profit and extracontractual profit operations. The top manager may want a new production facility or added production capacity more than a new warehouse when local warehouse space is available only under premium rental conditions. Thus, the manager's decision is to increase production capacity and immediate sales volume over a decision which would have increased the instant rate of profit on current production. The decision might have been made in order to increase prestige in the market by increased sales, or it might have been made in order to keep potential competitors out of the market. The decision also might have been made solely on the basis that the salaries of the manager and the marketing manager are based more on the volume of the company's sales than on the rate of profit.

In a particular contracting situation, the contractor may be motivated to secure a contract because the nature of the product produced or the national visibility of the effort under the contract will assist in recruiting scarce engineering or scientific skills, or may assist in the retention of key personnel. Increases in advanced technological resources are also strong extracontractual profit factors. The magnitudes of these extracontractual rewards may actualize profits in both current and long-run views.

The reviews of the psychologists in their studies of extracontractual influences cover the past performance of the contractor, as well as current performance in dealing with expected performance. The following language of the psychologists deal with past performance:

> "Past experience (reinforcement history) must include not only the direct experience of the performance but also vicarious experience. Response dispositions can be modified by the experience of others provided that the performer is aware of it and perceives it to be relevant to his own situation. The experiences of others may be instructive and may influence decisions."

In discussing current status, the following view is expressed:

> "The momentary state of the performer has importance. It will serve to define what will constitute a reward or penalty, and hence will define what may serve as an incentive for performance. By 'state of the performer', we refer to such matters as current needs, interests, self-concepts, i.e., to prevailing relations between current conditions and desired end results, both internal and external."

The psychologist, assisted by economists, business administrators, sociologists, and the scientists speaks about expected performance under incentives in the following manner:

> "Incentives can be defined as <u>promises</u> of reward or punishment (penalty) contingent upon specified performances by both parties. Thus, an incentive is a signal, evoking an anticipation of reinforcement, used for the purpose of manipulating performance. In usage, then, incentives refer to means-ends relationships, goals (anticipated reinforcements), and the means (correlated performances) for their attainment. We might speak of "incentives" when the anticipation is reward and "disincentives" when it is punishment; however, penalty is the obverse of reward.

When viewed as a signal or message, the content of a promise (incentive) is plainly germane to a consideration of its consequences. For one thing, considering the magnitudes of the reward and the performance event in the light of other parameters of a total performance environment may have the functional effect of converting it to a disincentive in some other area because of conflicts. Any given inputs are likely to have ramified consequences. The importance of matching the incentive both to the propensities of a supplier and to the consumption preferences of a user becomes obvious when the environment is to be manipulated by a contractual incentive."

In the language of the contracting world, the review team has said that it is also necessary to weigh a given contract incentive against others available (actually or potentially). The value of an incentive may vary as a function of its relations with others in the same setting and may even impact adversely on performance under certain conditions.

What is at issue is whether the performance will occur because of the incentive or whether it will occur anyway, under any type of contractual coverage with the same cost estimate.

In partial answer to the issue, incentives should not be misapplied. The limited motivational resources in the profit pool should be allocated to factors that can increase in value as a result of additional motivation. If a contractor has built a successful marketing history and corporate image around an "on time" theme by always meeting promised schedules, then it may be true that an additional incentive for schedule will be wasted. When a contractor has an overriding long-range interest in a follow-on program, then a strong performance incentive in a short-run development effort may not be necessary.

The benefits from some of the extracontractual influences accrue equally to the contractor and the Government, if the influences are identified and quantified. At the present time, we do not have the means to quantify the extracontractual influences, but the identification of some influences can certainly add such adjective weightings as "strong" or "weak". We can also review the performers when we consider corporate behavior and individual behavior. The expectations of the chief scientist and his desires for improved performance may override the expectations of the comptroller of the organization and his desires for cost reduction.

The recipient of incentives must have control over the performance which triggers the promised rewards or penalties. He must both be perceived to have such control and in fact have it. If technical direction

can override the contractual directions (even by strong influences on technical behavior) the performance incentive will not be fully effective. Countervailing motivations must still be considered, even in incentives which apply only to cost.

When performance is "intrinsically motivated, a contractual incentive message may be redundant (intrinsic motivation means the contractor or his technical personnel do something because they "want to do it", while intrinsic motivation refers to performance because they are "made to do it"). Thus, a contractor with actual or even mplied responsibility for performance (the public may assume the contractor has accepted responsibility) is intrinsically motivated. When risk is involved, this effect will be increased.

B. USING NON-PROFIT GOALS TO ADVANTAGE

Individuals or smaller organizational systems within a contractor's total organization may establish non-profit goals which are outside of the contractual parameters. The influences for these goals may be found in the contractor's overall extracontractual "policies." Some of these goals may be desirable, but only if they are identified and only if the program can afford them. When they also serve to increase contingencies, they place a barrier in front of any attempt to maximize profits.

The contractor will not (cannot) maximize profits in all parameters of a compartmentalized multiple incentive contract. The contractor will not attempt to "maximize" profits in an FPI contract. There is no profit limit in the FPI, and to maximize profit would assume an attempt to reach a profit rate of 25 percent or 40 percent based on the cost of sales. Public opinion admittedly and consciously plays a part in the social control of contract profits. Thus, maximizing profits in FPI contracts would always mean maximizing within certain limits. In the long run, this impacts on the ability to reduce prices on follow-on contracts.

The contractor may attempt to maximize contract profits at the negotiation table to offset uncertainties, or even deficiencies in capabilities. At other times, the attempt to maximize profits at the negotiation table may be a technique to start with a higher bargaining position when the Government negotiator has not previously valued profit parameters in accordance with the DoD Weighted Guidelines or NASA profit factors. The profit budget, however, will rarely reflect the maximized profit which may be obtained at the negotiation table.

The Government negotiator can make effective use of the non-profit goals, the extracontractual influences, however, deep-seated inefficiencies and unnecessary technical contingency factors must also be identified along with the extracontractual influences. If all factors, pro and con, are identified, stronger cost incentives can be used to correct the deep-seated inefficiencies. In this way, benefits will continue to accrue to both the Government and industry. Technically competent "price analysts" must perform this type of evaluation when significantly stronger cost incentives are to be employed in the elimination of the deep-seated inefficiencies.

Automatic contractual incentives may be mathematically perfect, but will be imperfect in operation if the extracontractual influences are not weighted in some manner and used in the selection of cost ranges and performance factors. Multidimensional profit factors should be allocated on the basis of the weights of the extracontractual influences on performance, schedule, and cost. This does not mean a reduced profit pool -- the largest possible range of potential realized profit variation should be continued as a negotiation objective.

A final comment concerning the use of non-profit goals may also provide benefits for both Government and industry. Extracontractual influences controlled by individuals (technical specialists) may adversely affect the operations of otherwise efficient make-or-buy policies and staffing plans. An in-house technical hierarchy can influence a contractor to aggrandize capabilities to "gold-plate" performance, or capabilities for future performance, at the expense of effectiveness on the instant contract. The costs for this are paid in the long run by both the Government and industry. Thus, some extracontractual influences may motivate direct inefficiencies. Since redundant incentives will perpetuate the inefficiencies, it seems extremely logical in these situations that performance effectiveness should be manipulated by the largest possible range of potential profit through cost incentives.

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