

1966

Total package procurement concept; Basis for analysis of the total package procurement concept

United States. Air Force

Follow this and additional works at: https://egrove.olemiss.edu/acct_fed

Part of the [Accounting Commons](#), and the [Taxation Commons](#)

Recommended Citation

United States. Air Force, "Total package procurement concept; Basis for analysis of the total package procurement concept" (1966). *Federal Publications*. 55.

https://egrove.olemiss.edu/acct_fed/55

This Article is brought to you for free and open access by the Accounting Archive at eGrove. It has been accepted for inclusion in Federal Publications by an authorized administrator of eGrove. For more information, please contact egrove@olemiss.edu.



AMERICAN INSTITUTE OF
CERTIFIED PUBLIC ACCOUNTANTS

LIBRARY

666 FIFTH AVENUE
NEW YORK 19, N. Y.



TOTAL

PACKAGE

PROCUREMENT

CONCEPT

DEPARTMENT OF THE AIR FORCE

10 MAY 1966



LOCAL REPRODUCTION AUTHORIZED

A limited number of copies are available in the Office, Assistant Secretary of the Air Force (Installations and Logistics). Contact the Executive Officer (Telephone: OXford 7-8147) SAF-IL, Room 4E 856, The Pentagon, Washington, D. C. 20330.

DEPARTMENT OF THE AIR FORCE
WASHINGTON

OFFICE OF THE ASSISTANT SECRETARY

May 10, 1966

TOTAL PACKAGE PROCUREMENT CONCEPT

Since the award of the contract for the C-5A aircraft, there have been numerous inquiries with respect to the methodology employed in the request for proposal, the source selection process, and the contractual arrangements. These techniques have since become known formally as the Total Package Procurement Concept. The Air Force is applying the Concept in the procurement of the SRAM and other weapon systems; and, with Secretary McNamara's endorsement, it is being applied to the Navy Fast Deployment Logistic Ship Program. In view of this interest, the attached paper was prepared at my request by Robert H. Turtle, and is based on his active participation in the C-5A procurement.

The purpose of this paper is to explain the philosophy and basic tenets of the Concept and the rationale of decisions made in applying it to the C-5A, in order to provide, from our limited practical experience to date, a basis for continued analysis and imaginative adaptation.

The factual material is officially documented. While many of the conclusions and recommendations are the result of a consensus, this paper should not be construed as presenting an official Air Force position nor the position of any one of the many offices that participated in the development and application of the Concept. Comprehensive internal and external studies are underway to identify the lessons learned in the C-5A procurement and to apply that experience in future procurements.

The Concept came to fruition on the C-5A through the team effort of many individuals throughout the Air Force, and to all who participated in this massive undertaking, I say, "Well done!" The constructive attitude and helpful response shown by personnel of all five competing contractors - Boeing, Douglas, General Electric, Lockheed, and Pratt & Whitney - afforded the necessary environment for an objective test of the Concept.

The Total Package Procurement Concept will not by itself do anything for either the Government or industry, but will be given purpose only through the ingenuity and sustained efforts of dedicated and properly motivated people interested in providing for National Defense within the structure of a free competitive society.



ROBERT H. CHARLES
Assistant Secretary of the Air Force
(Installations & Logistics)

A BASIS FOR ANALYSIS
OF THE
TOTAL PACKAGE PROCUREMENT CONCEPT

	<u>Page</u>
I. INTRODUCTION	1
II. THE CONCEPT DEFINED	1
III. THE PURPOSE	1
IV. EFFECT ON STANDARD PROCUREMENT PRACTICES	5
A. <u>Precontract</u>	5
B. <u>Source Selection</u>	7
C. <u>Contract</u>	8
1. Work Statement	9
2. Special Provisions	10
a. Maintaining Commitments	11
i. Price Commitments	11
ii. Performance Commitments	13
iii. Schedule Commitments	15
b. Protection Against Unreasonable Risk	15
i. Contract Types	16
ii. Escalation	16
c. Motivation to Exceed Commitments	17
i. Cost Incentive (including Flexible Cost Incentive)	17
ii. Performance Incentives	21
D. <u>Administration</u>	22
V. THE AIR FORCE EXPERIENCE	23
VI. THE FUTURE OF THE TOTAL PACKAGE CONCEPT	28
FOOTNOTES	34

I. INTRODUCTION

The recent announcement of the award of contracts for the acquisition of a two billion dollar weapon system program by the Department of Defense¹ resulted in little of the hue and cry over source selection techniques that had accompanied such announcements on programs of similar magnitude in the near past. Instead, public interest was focused on the system itself² and the novel procurement technique applied to the program. This procurement technique, colorfully characterized as "womb to tomb" contracting, has, for want of a similar ingenious title, been officially termed the Total Package Procurement Concept (TPPC)³ by the Air Force. The primary purpose of this article is to define the Concept and explain its purposes and effects in order to provide from certain limited practical experience a basis for continued analysis and further refinement of the TPPC.

II. THE CONCEPT DEFINED

Most simply stated, the TPPC as conceived by the Air Force envisions that all anticipated development, production, and as much support as is feasible of a system throughout its anticipated life is to be procured as one total package and incorporated into one contract containing price and performance commitments at the outset of the acquisition phase of a system procurement.

III. THE PURPOSE

As is often the case in this complex world, simple statements of any kind are in themselves novelties. In order to perceive the true novelty of the Concept, it is necessary to understand the sophisticated weapon system acquisition process as practiced in DOD and codified in the Armed Services Procurement Regulation (ASPR) and related DOD Directives, and as implemented by myriad Service and Command regulations. Congratulations are proffered to those who have been initiated into this mystic order; and the following capsule summary is offered to the uninitiated.

Acquisition and operation of a typical major new weapon system normally involves the separate negotiation of a development contract, a separate initial production contract, separate follow-on production contracts, and contracts for training, spares, support systems and other operational requirements. The development

contract is usually negotiated in a competitive atmosphere, with emphasis on promises of technical excellence. (Rarely were such promises reinforced by binding performance commitments and, if so, even more rarely were they tied to meaningful and enforceable cost commitments.) Then, because of the additional time and expense that would be required if another contractor were chosen for the subsequent contracts, noncompetitive negotiation with the development contractor is almost inevitable if the system is to be introduced into the defense inventory on a timely basis and without duplicating much of the development effort. The Government was thus engaged in "iceberg procurement;" it became wedded to a program and to a particular contractor without performance and price commitments, and without competition, with respect to the operational units in which it was really interested. And this was done with little visibility of the underwater portion of the iceberg, including operating costs.

In this environment competition in any form whatsoever is nonexistent, except on the initial development contract the cost of which often comprises about 20 per cent of the total cost of contracts let to acquire and support a major weapon system. Clearly, the competition for the initial development contract is intense, enhanced as it is by all that promises to flow to the victor in the ensuing years of production and operation of the system. Often this intense competition, itself, results directly in the generation of misleading cost, performance and schedule estimates which are provided to the DOD as back-up for the decision to embark upon Operational Systems Development⁴ programs.

Thus, the history of defense procurement is replete with cost overruns and less-than-promised performance which were, at least in part, the results of intentional "buy-in" bidding (where costs estimates are understated and performance and schedule estimates overstated) on the initial contract. And this has been the case even in situations where there has been no substantial increase in the then state of the art.

The Government itself must bear much of the blame for the results of "iceberg procurement." By requiring only an estimate of performance and cost, the Government forced competitors for new business to overstate performance and to understate cost. Who is not going to try to "buy in" when he knows that his competitor can do so without substantial penalty; and assumes that he will?

Another recurring theme has been the relatively uniform rate of profit earned despite extremes in technical performance and resources management by defense contractors. This is a product of Cost-Plus Fixed Fee (CPFF) contracting and of Firm Fixed Price (FFP) or Fixed Price Incentive (FPI) contracts^{5/} negotiated in a noncompetitive atmosphere after development. In short, the principal villains of the piece have been lack of competition and lack of contractual arrangements which create a climate in which the efficient are rewarded and the inefficient are not. Massive corrective efforts during the last five years have failed to exorcise these demons. Price competition in the Air Force, the major purchaser of complex weapon systems, increased from 14.9% in Fiscal Year 1961 to only 25.1% in Fiscal Year 1965. And while CPFF contracts were reduced during this period from 50.6% to 10.4%, the target prices for 74.9% of the work in Fiscal Year 1965 were set in a noncompetitive environment. Targets so established simply incorporate, in many cases, the then existing efficiencies -- and inefficiencies -- of the contractor and the lack of attention given to production methods during the development phase. In fact, under the general approach to price negotiation on production contracts of establishing a target profit percentage to be applied to the Target Cost, the contractor has a negative incentive to design and manage during the development phase for the lowest production and operating costs.^{6/}

Five principal benefits are anticipated under a concept which permits contracts to be awarded competitively under conditions where performance is related to price on substantially all of a given program:

1. It requires a tightening of design and configuration discipline, both in the specifications on which the competitors submit proposals and in the work under contract. On its part, the Government must be more specific in telling industry what is wanted. Thus, the system will be better defined before substantial resources are allocated to it.

2. It inhibits the unrealistic "salesmanship," or "buy-in" bidding, including overestimates of performance as well as underestimates of cost, which is encouraged when commitments are required on only a small part of the program, and which in the past has led to performance disappointments, budget disruptions, funding reallocations, and program stretchouts or cancellations.

3. Being committed to cost and performance figures for production units before detail design begins, the contractor has a strong motive to design initially for economical production, and

for the reliability and simplicity of maintenance of operational hardware to which he is committed; all of which are strongly influenced by actions taken during the detail design period, and for which there is little inducement in the absence of a production commitment. This should, among other things, minimize production redesign, reduce the need for subsequent value engineering redesign, and anticipate and capitalize on new cost reducing machine tool and other fabrication techniques. It should produce not only lower costs on the first production units, but, in turn, a lower take-off point on the production learning curve, thus benefiting every unit in the production run. And inasmuch as ground equipment, which can represent a large portion of a system, is included in the price of the total package, the contractor has a positive inducement not only to design and build such equipment economically, but to design the system itself so as to require less, or at least less expensive, ground equipment.

4. For the same reason, the contractor is motivated to obtain supplies and services from the most efficient source, whether in-house or by outside contract. If the prime contractor has committed himself to deliver an article with a specified performance for a certain price -- rather than at whatever the cost may turn out to be -- and especially if that price has been set competitively, you can be sure that, with respect to the approximately 50% of the work which he obtains from others, he will use the most effective ways to obtain the necessary quality at the lowest price -- and how can he do this other than by bringing into play those very forces which compel efficiency, namely competition and incentives?

5. Competition is increased at the beginning, thereby decreasing the need for subsequent competitive reprocurment of components, with all the drawbacks that this entails. When a component has been originally built by or under the direction of a prime contractor and is then put out for competitive bidding and is built by another company, a risk concerning the integrity of the system as a whole is created, complete interchangeability of the component is threatened, and a difficult-enough logistics problem is further complicated by a new part and part number.

6. When commitments are established in competition, the winner is forced to be efficient. There is a natural desire to excel. Competition transforms this desire into necessity. And the resulting efficiency benefits not only the buyer, but the seller. He is then in a better position to compete for the next round of business, and in other markets.

7. It permits the Department to make a choice between competing contractors based, not on mere estimates, but on binding commitments concerning the performance and price of what is really required -- operational equipment.

Inasmuch as application of the TPPC to a program is not feasible until the technological building blocks are in hand and the operational hardware requirement, both qualitative and quantitative, can be specified with reasonable precision and with reasonable expectation that it can be achieved, the advent of this procurement technique has had to await the growth of complementary planning and scientific management techniques. Presently, Weapon Systems Analysis and Director of Defense Research and Engineering (DDR&E) reviews are directed toward insuring that these conditions are met prior to the initiation of Operational Systems Development. Concept Formulation and Contract Definition required by DDR&E as a prerequisite to full-scale development^{7/} provides the building blocks for the TPPC. Thus, today, given Systems Analysis to establish our hardware requirements and Concept Formulation and Contract Definition to provide a reasonable expectation that they can be achieved, we no longer need to separate development from production for contractual purposes. We can lump the two together. In fact, we can go further and add much of the support, including spares, training and support systems and contractor technical services.

IV. EFFECT ON STANDARD PROCUREMENT PRACTICES.

Application of the Concept has an impact on all phases of standard Government procurement practices beginning with the Request for Proposals (RFP) issued for Contract Definition (CD) and including the selection of CD contractors, the Work Statement of the CD contract, the proposals submitted for the development and production contract, the selection of the winning competitor, the type of contract awarded, and the management of the program.

A. Precontract.

It is impractical and probably unnecessary to treat the changes in all of these steps in detail in an article of this kind. It should be realized, however, that planning for a Total Package buy must begin prior to and be incorporated into the initial RFP for CD. In order to obtain maximum benefit from the Concept,

competition must be maintained during the entire period in which the contractor prepares his cost and technical proposals for a Total Package contract, and this requires efforts of at least two contractors during this period and the ensuing selection period. Moreover, preparation for a Total Package proposal will usually require the application of greater resources and time than that required for preparation of a "development only" proposal.

Preparation of an RFP for the CD phase of a Total Package procurement may also require the allocation of greater DOD resources, since the desired response will cover production and support as well as development. In order to assure the maximum degree of comparability between competitive proposals, the RFP package should contain a model of the Total Package contract. While the terms of this proposed contract can be revised during and after CD, it is always helpful in source selection to be able to compare the contractors' responses in a common frame of reference.

Application of the Concept precludes the selection of a CD contractor who lacks production capability. Such a contractor would not normally participate in CD even if a Total Package procurement were not intended; but production capability is a mandatory requirement for the accomplishment of a Total Package CD as will become evident from the Work Statement of a Total Package CD contract. Whereas the Work Statement of a CD contract preceding a development contract only requires the preparation of firm prices or targets on the development phase of the contract with estimates for production and operational support, the Work Statement of a Total Package CD contract requires the preparation of firm prices or targets on development, production, operational support, and may require guarantees of operating costs as well.

In addition to the additional data that must be submitted to the Government in support of a Total Package proposal, the contractor must engage in in-depth analysis and projection of cost figures, and in all probability, initiate some preliminary design efforts in order to provide himself with the required degree of confidence inherent in a Total Package commitment. Inasmuch as this commitment extends to operational performance and schedule as well, the contractor must likewise have a high degree of confidence in his preliminary plans with a consequent shift of a substantial portion of his workload to the CD period. The advantages and disadvantages of this early emphasis will be considered later in this article.

In short, the proposal submitted during CD must, in order to be responsive, contain firm commitments to operational performance, to development, production, and support costs, and to the operational hardware delivery schedule.

B. Source Selection.

A principal purpose of the TPPC is to engender the highest degree of competition on as much of a program as is possible. The degree of competition achieved is a function of the extent, form and intensity of the competition. These factors are, in turn, a direct result of the stated basis of source selection and award⁸⁷.

As discussed earlier the extent of competition in an Operational System Development Program seldom exceeds 20% of the total program eventually put on contract. The most prevalent forms of competition in Government procurement practice are price competition and technical competition.

Price competition and technical competition in the framework of prior Government procurements have been inverse variables. That is, where technical competition is primary, prices both on development and production could be expected to rise. Conversely, where the acquisition cost was the primary consideration, technology in terms of operational performance could be expected to suffer.

The principle of price competition was adhered to in formally advertised procurements where the Government could state with detailed specificity the exact item that it wished to procure after experience had shown that an optimum cost/performance mix could be obtained at that performance level. Where, because of lack of prior acquisition and operating experience, the Government could not specify with the requisite detail the exact nature of the hardware it wished to acquire, prime emphasis was placed on technical excellence and cost remained to be negotiated with the winning competitor.

The Concept allows a unique opportunity to expand the extent, form and intensity of the competition for selection as the program contractor. This is accomplished by basing the source selection on the cost effectiveness of the anticipated operational quantity in an operational environment over a period of time equal

to the anticipated first-line utilization of the system. This approach has previously been utilized by DOD to select systems for acquisition from the myriad systems proposed by the Services, and is a concise summary of the Government's ultimate goal in weapon systems evolution.

It is only logical then that this method for comparison of items with dissimilar cost and performance attributes be used to select a source for the chosen system in order to optimize the most performance/least cost equation. The Cost side of a cost effectiveness formula considers development, production, support, maintenance, construction, and operating costs of an operational system over a period of useful life. The Productivity side of the formula considers the useful output of that number of systems over an equal period of time. This type of evaluation is never easy, but the detailed planning prior to initiation of CD and the firm commitments to development, production, and support costs, as well as operational performance and delivery schedule obtained from the contractor's Total Package proposal make it possible.

Both price and technical competition are engendered on the development, production, and support of the system since the all-inclusive Contract Price will comprise a substantial part of the cost side of the formula, while the concurrent technological considerations as they pertain to operational capability will be reflected in the productivity figures and in maintenance, investment and operating cost figures.

Total Package contracting does not require awards to be made to the low bidder. It does require performance and price commitments by competitors, and the award can then be made after considering all factors in an integrated, meaningful manner. In this connection, it should be borne in mind that in most technologically advanced weapon systems, performance standing by itself is more important than price standing by itself, but that the two factors should and usually can be related.

C. Contract.

Assuming that the competitive atmosphere engendered in a Total Package CD results in desirable commitments to Cost, Performance and Schedule, a final contractual document embodying all of these commitments must be structured. In order to facilitate the

incorporation of these commitments into a definitive document, it is desirable to have the proposed contract executed by each competitor in definitive form prior to the announcement of the selected source. In order to assure the attainment of the proposed Cost, Performance and Schedule commitments made by the contractor in CD, the contract should establish these characteristics as firm obligations rather than as goals. Thus, a cost-type contract would be inappropriate in a Total Package procurement.

Similarly, a Work Statement and specifications establishing certain performance and schedule levels as goals, rather than firm requirements, would likewise fail to retain the advantages of a competitive CD. Whether the contract should be FFP or FPI (and if FPI, the ceiling and sharing arrangement) should be determined on a case-by-case basis after consideration of the degree of risk inherent in the program and with the realization that the contractor is being asked to make production and operating cost as well as performance commitments prior to full-scale development of the system.

This uncertainty may result in all competitors allowing large reserves for purposes of meeting contingencies under an FFP contract. Thus, in most cases a FPI contract is best suited to Total Package procurements. The contract will cover the development, test and production of the operational hardware required, including support and training equipment, together with prices or pricing formulae for spares and support or training services required of the contractor in the operational phase.

Conceivably, each of these categories could be priced or targeted separately, but a single price in the case of an FFP, or target price and ceiling in the case of an FPI contract, is preferable, inasmuch as it allows a contractor the greatest latitude in meeting the operational requirement, guards against trade-offs that may be inimical to the Government's best interest and is administratively easier than computation of separate incentive fees and ceilings. In addition to progress payments, presumably billing prices would be used on long-term contracts to allow for a recoupment of unrecovered costs as certain work is performed or hardware is delivered.

1. Work Statement. Development, test, production, support and training equipment and services to cover the operational hardware throughout its planned useful life may be stated as a firm contract requirement, or may be stated in part as priced options. Use of an option technique is especially desirable where quantitative requirements may be revised during the course of a program.

Obtaining a target price proposal for option increments does not do violence to the theory of Total Package procurement, since the contractor, by virtue of his commitment contingent only upon the Government's decision, must prepare his proposal and plan for the development and production of the hardware as if the requirement were firm.

Utilization of several alternate option arrangements in the RFP provides the Government with flexibility in structuring the definitive Total Package contract work statement. Desirable options may be carried over into the Definitive Contract to allow the Government flexibility even after award of a Total Package contract. It should be realized, however, that requesting proposals on alternate bases may raise the cost of CD. Further, incorporating options in the work statement of the Definitive Contract may result in paying a higher price for the combined contract requirement and option increments than could be obtained by including the option increments in the original contract requirement. This can be minimized by including enough production units in the contract requirement so that the contractor will have the facilities with which to produce the option increments on hand and by establishing the number of units in each increment and the lead time for exercise of the option so as to provide for economical materials purchasing and handling and continuous production.

Where it appears reasonable to expect that the total number of production units ultimately required will equal or exceed the contract requirement and priced option increments, consideration should be given to establishing the entire combined amount as the contract requirement. In that case, the savings to the Government, if any, to be earned by placing all production units on contract must be weighed against the possibility of termination costs should the Government's quantitative requirement be decreased. In this connection, the limitation of the Government's obligation clause² which provides a ceiling on total cost to the Government should the program be terminated provides a tool for ready comparisons.

2. Special Provisions. Once having established the type of contract, i.e., FFP or FPI, and the Contract Requirements, i.e., development, production quantities, including training and support equipment and services, spares and contract options on the above, it remains to establish certain contractual procedures to (1) maintain the validity of the established target prices during the course of the program (2) provide reasonable protection for the contractor against cost increases that are beyond his control, and (3) encourage the contractor to exceed, where economically possible, the price, performance and schedule commitments contained in the Total Package contract.

To these ends, Total Package procurement has engendered or utilized certain new contract clauses designed to

accomplish the above requirements. While many of these clauses have potential application beyond the TPPC, they are especially useful in, and in fact were created to deal with, problems arising out of such procurements.

a. Maintaining commitments. The problem of maintaining throughout the life of the program the price, performance and schedule commitments so carefully established in competition is first in order of time, and possibly importance.

The weakest points in the chain leading from competitively established initial contract commitments to final contract realizations are those situations in which the contract is reopened for negotiation during the course of the program and therefore on a sole source basis. These situations, because of the changing nature of defense requirements, are not rare or unusual occurrences and must be provided for under the contract. Usually they are a consequence of a Government directed or approved variation from the contract work statement in the areas of (1) drawings, designs, or specifications (2) delivery schedules, or (3) quantities. Pursuant to the "Changes" and "Termination for Convenience" clauses of the contract, equitable adjustments to the contract must be negotiated for such deviations.

By far the most frequent opportunity for negotiation occurs in the area of changes to the drawings, designs, or specifications. These changes cannot be avoided entirely since often they incorporate some technical advance or result from a change in requirements arising from a change in defense strategy. There is no doubt, however, that historically many specification changes have been unnecessary and have increased program costs by a greater margin than the benefits derived therefrom.

The problem has been to devise techniques that would discourage both Contractor and Government program managers from making unwarranted changes in the system being acquired, while not discouraging valid technical improvements. Government representatives can be directed not to make unnecessary changes, but the Contractor cannot be prohibited from initiating them and attempting to gain Government approval. By far the most effective technique for dealing with this problem is to reduce the problem itself. This can be done by expressing what the Government wants, not in terms of detail or parts specifications, but in terms of operational performance. In such case, there is no need to make a change in the contract itself if a drawing or a detail specification is changed.

i. Price Commitments. While the Department has experimented with various changes in pricing arrangements, the

general practice has been to negotiate the same profit percentage on changes as was negotiated on the basic contract. In order to provide the Contractor with a reduced incentive to initiate changes, a new pricing structure has been proposed. This initial attempt at limiting changes has taken the form of eliminating the contractor's target profit on changes over a certain base percentage amount pursuant to a contractually established specification change pricing clause.

Acceleration and deceleration in rate of hardware delivery and related services is not unusual in Defense programs. These variations, dictated by changes in the world situation, are often beyond the predictive capability of the planners. The use of a single long-term contract rather than annual negotiation increases the potential for variations from the contract delivery schedule. This potential may be decreased by initially establishing a reasonable and economical delivery schedule.

Initially, delivery rate is a function of the resources and facilities allocated to production. Thus, the contractor initially tools and arranges facilities for a certain delivery rate dictated by the Government after an assessment of the quantities and time period in which the hardware must be introduced into the Defense inventory. Historically, and in the absence of changed requirements, the rate so established has been constant throughout the majority of the contract period with deviations occurring only in the build-up and tapering off time phases. This constant rate approach is usually not the most efficient over the entire contract period, since learning benefits derived during a production program often allow for an increase in rate at little or no increase in facilities and tooling, and thus, a consequent decrease in fixed costs per production unit.

This loss of economy becomes a problem of even greater magnitude as the contract period is expanded from annual production increments to a Total Package buy. It is therefore imperative that in a Total Package buy serious consideration and analysis be devoted to the initial establishment of a delivery schedule which, within the limitations of military necessity, allows for most economical production.

Moreover, past experiences indicate that despite the aforementioned potential for greater economy by increases in delivery rates as the production program progresses, schedule changes, whether compressions or stretchouts, have resulted in the negotiation of price increases. On the assumption that a

substantial portion of such increases can be related to negotiations in a sole source environment, it is essential that such negotiations be eliminated to the greatest extent possible. Therefore, a Total Package contract should, if possible, initially establish definite alternate target prices for variations from the initial delivery schedule. In such a case the Department will retain both the flexibility necessary to protect the Nation's military posture and the ability to exercise this flexibility without losing the advantages of target prices established in competition. Further, the ability to establish in advance the additional costs or savings resulting from a contemplated change in delivery schedule is an important tool in deciding whether a change should be made.

In a contract which calls for development, production, and services in finite amounts over a substantial period of time, attention must be given to the possibility of a change in quantitative requirements resulting in a termination of the program short of delivery of the original contract quantities. Generally, such terminations for the convenience of the Government are accomplished under a specific contract clause which allows for an agreement between the contractor and the contracting officer on the amount to be paid the contractor by reason of a total or partial termination. This amount may include a reasonable profit on work already accomplished. The major limitation on this amount is that it may not exceed the contract price (the ceiling price in incentive contracts) less any sums already paid and less the contract price (ceiling price) of any work remaining on the contract.

In a Total Package situation, given the length of the contract and the myriad tasks to be accomplished thereunder, application of this principle would leave an enormous area for negotiation, especially if termination occurred in the early years of a program. In order to limit this enlarged area of negotiation, a limitation, similar to the contract (ceiling) price limitation imposed on annual contracts, should be established at the outset of the program for each year of the anticipated program. Such a limitation of the Government's obligation would be based on the anticipated annual production costs, plus advanced buy requirements for long lead time items, plus an amount for contingent termination liability should the program be terminated during a particular program year.

ii. Performance Commitments. In the past, the Department has relied on an Inspection Clause to assure that

items delivered and accepted met the contract requirements. Pursuant to this clause, acceptance becomes conclusive on the matter of meeting contract requirements except as regards latent defects, fraud, or other such gross mistakes as amount to fraud. Utilization of this clause has engendered many problems, since it is often difficult to determine whether a sophisticated item of equipment meets contract requirements until it is placed in an operational environment. Recognition of this problem had led to the creation of the Correction of Deficiencies Clause to be found in recent Air Force major weapon system acquisition contracts. This clause created a type of warranty of useability in an attempt to assure compliance with certain contract requirements relating to operational performance.

Difficulties experienced with both the Inspection and the existing Correction of Deficiencies Clauses, even in situations where a complete development test program had been accomplished prior to establishing operational performance requirements for individual items of hardware, led inevitably to the conclusion that such difficulties would be intensified in a program which establishes operational performance requirements prior to the development effort. Realizing that commitments to operational performance of hardware are of little value in the absence of adequate testing and corrective procedures requires that attention be directed to a revised contractual provision allowing for such procedures.

A primary purpose of such a clause should be to extend, where necessary, the period of time within which actionable defects may be discovered so that the Department is afforded an opportunity to test and inspect each item of hardware in an operational environment. Usually this can be accomplished by adding a reasonable period to the date of final acceptance of an item of hardware to allow for operating experience.

However, in a Total Package procurement, some operational hardware will usually be delivered before all development testing has been completed and, therefore, allowance must be made for a reasonable period of time after acceptance and after completion of development testing to allow for operational experience. Further, the clause should provide a definite procedure for the timely execution of decisions after a defect is discovered. Thus, discovery of a defect should trigger a timely notification of the defect by one party to the other, a timely request for a proposal for corrective actions, containing estimates of correction costs, and a direction by the Department of Defense that the defect be corrected in whole or in part, or not at all.

Moreover, the Department should retain the ability to direct, with regard to each item of hardware, either that the defect be fully corrected, partially corrected, or not corrected, and in the case of less than complete correction there should be an equitable reduction in Target Cost, Target Price and Ceiling Price. In the case of corrections to be made in whole or in part, the time and place of corrective action should likewise remain a prerogative of the Government. Decisions to correct in whole or in part and the amount of an equitable adjustment should be based upon a comparison of the portion of correction costs to be borne by the Government with productivity differentials over the anticipated useful life of the system.

iii. Schedule Commitments. The third major area in which the Contractor has made commitments is that of delivery schedules. The value and cost effectiveness of a weapon system are often substantially influenced by the timing of its introduction into the operational inventory. Extra-contractual program elements must be planned for and timed to coincide with the delivery schedule contained in the contract. Thus, time is of the essence in these contracts. However, establishing actual damages for failure of timely delivery is a difficult task because of the necessary flexibility of the military establishment and the limitations imposed on the dissemination of information regarding military posture and alternatives. Consequently, the DOD has historically endured untimely delivery and the resulting expenses rather than take legal action to establish and recover damages.

Recently, a liquidated damages approach has been taken wherein the value of use of a system is determined by considering the costs of obtaining comparable performance from existing systems over the period of delinquent delivery. In this manner reasonable assessments of potential damage can be derived at the outset of the program and can be included in the contract as liquidated damages for late delivery.

b. Protection Against Unreasonable Risk. Commitments to performance, price, and delivery of operational hardware (made prior to full-scale development of the hardware) impose a higher degree of risk upon the defense contractor than he has been required to assume in the past. In order to assure that this degree of risk is not so high as to be unreasonable and consequently necessitate the inclusion of unreasonably high contingency factors in proposals, the contract should be structured so as to

reflect that risk and to exclude, insofar as is possible, responsibility for contingencies beyond the contractor's control.

i. Contract Types. Certain development and production contingencies may be covered by the type of contract awarded. Thus, as previously observed, an FFP Contract is not usually appropriate in a Total Package procurement. Instead, an FPI Contract seems to have a better chance of balancing the objectives of firm commitments against the potential for unreasonable risk. The balance that is struck is usually a function of the relationship of Target Cost to Ceiling Price and the Incentive Sharing Arrangement which governs the costs to be borne by the parties within that area. Thus, when a contractor proposes a Target Cost, he will not automatically incur an out-of-pocket loss if actual costs exceed the Target Cost and Target Profit. To be sure, a diminution in anticipated profit will result, but this is a more reasonable risk to assume. Development and production risk is within the contractor's control to some extent and is increased or decreased by the conservatism or optimism expressed in his cost proposal.

Many studies have been undertaken on the optimum relationship between risk assumed and Ceiling Price and Incentive Share. Suffice it to say that the Ceiling Price should be high enough above Target Price to allow for some consideration of development and production contingencies without invalidating the price commitments, and the Incentive Share should be high enough to encourage efficiency without imposing unreasonable risk.

ii. Escalation. In addition to the risks inherent in performing development and production work arising from the potential for deviations from the development and production work plans, there are always risks inherent in estimating the costs of the anticipated work required. These risks are minimized by annual contract negotiations, and conversely are magnified by extension of a contract over longer periods of time. Requiring price commitments for an entire program at the outset increases this risk in proportion to the length of the contract period.

Thus, consideration should be given to affording the contractor a reasonable degree of protection from unforeseeable changes in the national economy as reflected in appropriate Bureau of Labor Standards Indices. Further, where labor represents a substantial portion of prime contract and material costs, consideration should likewise be given to protecting the contractor from labor-associated cost changes that are beyond his

control, particularly those which are within the control of the Government. Thus, substantial cost deviations arising from changes in Federal Statutes governing work conditions and fringe benefits should be the responsibility of the Government.

c. Motivation to Exceed Commitments. While competition and hard-nosed negotiation can be expected to obtain for the Government the most desirable cost and performance commitments reasonably available at the outset of a program, the potential longevity of a Total Package contract adds emphasis to the need for encouraging the contractor to meet or better his commitments during the course of the program.

Similarly, the length of a Total Package program affords the contractor more opportunity to improve upon his commitments, either by taking advantage of new technological developments occurring during the program period or by management action leading to greater cost efficiencies. Given these opportunities, it remains to provide suitable incentives to assure that they will be seized upon by the contractor.

i. Cost Incentive (including Flexible Cost Incentive). Total Package contracting poses a dilemma: Is there too much risk?; and if the risk is contained, how can the contractor be motivated to produce high quality at low cost? A fixed incentive formula with steep cost sharing may force competitors to include, in their target cost bids, contingency factors which later prove to be unnecessary. On the other hand, a fixed incentive formula with a mild incentive will not adequately motivate, during development, economy of production design, product reliability, and simplicity of maintenance, and will not adequately discourage the performance of work in-house that could more efficiently be performed by outside contract. What is needed is a contractual arrangement which, without exposing the winning competitor to too much risk, will nevertheless motivate him as if he had that risk.

In recognition of the dual desire to temper the risk of a life-cycle Total Package program entered into competitively, and simultaneously to provide a sufficiently strong incentive to motivate high quality at low cost, a cost incentive formula has been developed that provides that the contractor's share in cost overruns and underruns, which may start out at a relatively mild figure, may be adjusted voluntarily and unilaterally by the contractor during the performance of the contract, so that if

he can reduce his costs, he will be able to generate higher incentive profits by increasing his share in cost underruns. Such adjustments will, for all practical purposes, operate prospectively only and may be made only within clearly defined limitations.

As in the case of the usual incentive contract, this flexible incentive will require the establishment of a target cost, a target profit, a ceiling price, and an initial cost-sharing arrangement for deviations from the target cost, for example 15%. The key difference is that as the work progresses, the contractor will be permitted, from time to time, to change his share in cost overruns and underruns by electing a higher or lower "incremental" share on the work then remaining to be performed. The various incremental shares, thus weighted to reflect the percentage of work performed while each incremental share is in effect, will be combined to produce a "composite" share which will ultimately be used to determine the contractor's cost reward or penalty.

The following limitations on this unilateral right on the part of the contractor have been used:

- (1) The contractor's ~~maximum~~ incremental share will be 50%.
- (2) The contractor may not change his share before 25% or after 75% of the target cost has been incurred, nor more frequently than once a year.
- (3) An incremental share may not be lower than half of the immediately preceding incremental share, and in no case lower than the share initially established in competition.

Thus, an initial share of 15%, a 50% restriction on incremental shares and a prohibition against increasing the share before 25% of the work has been performed, limits the maximum composite cost share to 41 1/4% computed as follows:

$$\begin{array}{rcl} .15 \text{ incremental share} \times .25 \text{ expended} & = & .0375 \\ .50 \text{ incremental share} \times .75 \text{ unexpended} & = & \underline{.3750} \\ & & .4125 \end{array}$$

In order to encourage the contractor voluntarily to steepen his cost share (which would represent greater risk), and to do so as soon as possible, thus increasing the

motivation desired, the formula provides an increase in the target profit in the amount of 15% of any increase in the contractor's composite share, multiplied by the amount of work remaining on the date of election. This automatically places a premium on increasing the share as soon as possible.

For example, if the maximum incremental share of 50% is elected when only 25% of the work has been performed, the contractor's actual profit will be greater until his actual cost exceeds the target cost by 11 1/4%, than if he had made no election. If the maximum share is elected when 50% of the work has been performed, this break-even point is reached when actual costs exceed the target by 7 1/2%; and if such election occurs when 75% of the work has been performed, the break-even point is at 3 3/4% of the target cost. There is also a reduction in the target profit, similarly calculated, whenever the contractor elects to decrease his cost share.

To illustrate, if the contractor elects a 40% incremental share after 25% of the target cost has been expended, and subsequently elects a 20% incremental share after 50% of the target cost has been expended, his target profit will first be increased by 2.109375%, and then reduced by 0.75%, for a net increase of 1.35975%, computed as follows:

	<u>Change in Target Profit</u>
.15 incremental share x .25 expended =	.0375
.40 incremental share x .75 unexpended =	<u>.3000</u>
composite share	.3375
.3375 new composite share	
<u>.15</u> previous share	
.1875 increase in composite share x .15 =	
.028125 x .75 remaining work =	+ .02109375
.15 incremental share x .25 expended =	.0375
.40 incremental share x .25 expended =	.1000
.20 incremental share x .50 unexpended =	<u>.1000</u>
composite share	.2375
.3375 previous composite share	
<u>.2375</u> new composite share	
.1000 decrease in composite share x .15 =	
- .015 x .50 remaining work =	<u>- .0075</u>
Net Increase in Target Profit	+ .0135975

The net effect is that the contractor is permitted to earn a genuinely handsome profit, both from the increase in target profit and from a greater share in cost savings, if he is willing to go to a steeper share early in the program; but the opportunities for increased profit diminish as he gets further down the road and the risk decreases. The formula is thus deliberately designed to induce the contractor to try, from the beginning, to get into a position to increase his profit, both by a higher share ratio and by a higher target profit; and he can get into that position only by controlling his costs as early as possible, while concurrently assuring himself that his technical performance and schedule commitments are being met.

This contractual arrangement does not present the possibility of excessive profit. In the extreme case, a maximum 50% incremental share elected after 25% of work completion involves a target profit of 12.953125% and a composite cost share of 41½%. If the actual cost is 10% under target, the incentive profit will be 4.125%, and the total profit will be 17.078125% of target cost, or 18.9757% of actual cost. But a 10% cost underrun, while possible if the target is set without competition, is unlikely if set under conditions of adequate competition. An underrun of this magnitude under competitive conditions would most likely mean, not a windfall profit, but that the contractor is in fact truly efficient.

One of the objectives of the TPPC is to provide a greater profit spread in order to encourage efficiency, and where the circumstances permit it the best way to do so is to set the target competitively and permit the ultimate profit to be determined by the efficiency of the winning competitor.

Of greater concern than unusually high profits is the fact that the winning competitor may have set too difficult a target, thereby creating a situation where the probability of exceeding the target is much greater than that of an underrun. This risk, of course, is ameliorated by the low initial cost share, and the fact that the winning competitor is not required to increase that share.

In order to help the Government to determine whether to use a fixed or flexible cost incentive in a Total Package procurement, it may, under appropriate circumstances, be appropriate to ask the competitors to submit alternate bids, on both bases.

ii. Performance Incentives. It is anticipated that where the basis of award is life cycle cost effectiveness, each bidder will submit a proposal setting forth the highest performance standards he is confident of attaining, since the Department of Defense will give consideration, in the competition, to the benefits to be realized from any performance standards in excess of the RFP requirements. The contract awarded to the winning competitor will incorporate the proposed standards as the minimum acceptable contract standards; and the contractor will be required to meet these standards under the Correction of Deficiencies clause.

Nevertheless, the Department may desire to incorporate incentives for achieving performance superior to the standards specified in the contract. Of particular interest is a total incentive formula, including productivity, expressed in terms of costs (development, production, investment, manpower, training, spares, maintenance, fuel), thereby allowing the Contractor the greatest latitude in increasing productivity per dollar.

The dollar levels of such performance rewards should be determined on the basis of value to the Department of any cost effectiveness increase over the anticipated total utilization during the period of first line use of the system. The performance reward should be equal to an amount derived by applying the Contractor's overrun/underrun share to this predicted value. Thus, in the case of a transportation system that will produce 28 billion ton-miles at \$.05 a ton-mile on the basis of the contract performance requirements, a reduction in the cost per ton-mile of 2% or \$.001 would be worth 28 million dollars to the Department.

Therefore, this performance increase is desirable if it can be obtained for a total cost to the Government of anything less than 28 million dollars. This 28-million-dollar figure must cover both the Government's share of the increased development and production costs and the contractor's performance reward. The Contractor will be motivated to attain this performance increase only if his share of increased costs of development and production is less than his performance reward. A simple equation can be derived by treating "less than" as "equal to." Thus, the Department desires the Government share of increased costs (IC) plus performance reward (PR) to equal value (V), while the Contractor desires the Contractor share in increased costs (IC) to equal performance reward (PR).

If value (V) is 28 million dollars, and the Incentive Share is 85/15, the Government is willing to pay a total of 28 million dollars in increased costs plus performance reward, or

$$.85IC + PR = 28 M.$$

The Contractor is willing to provide the increased performance, if his performance reward (PR) is equal to his share in increased costs (IC), or

$$.15IC = PR$$

Substitution, to make Government and Contractor trade-offs identical results in PR being equal to 4.2 million, or the Contractor share in increased costs multiplied by the value of the increased performance.

In the case of a flexible cost incentive contract, the performance reward should initially be established by application of the initial cost share specified in the formula and automatic adjustments to the performance reward should be made as the cost share varies in order to maintain the trade-off motivation balance originally established. This can be accomplished by multiplying the original performance reward by the new composite cost share and dividing by the initial cost share to establish the new performance reward level.

D. Administration.

Department of Defense procedures for program management and control and for administration of contracts were largely evolved in an environment of cost-type contracting. In such an environment, cost and performance requirements are established as goals and the Government and the contractor work hand-in-hand as partners toward meeting or exceeding them. In some instances, the Government could almost be considered the senior partner since it held and exercised the power of the purse. The advent of fixed-price type contracts alleviated the need for some of this Government control, if not the controls themselves.

Nevertheless, where operational performance and operational hardware price had not been fixed, as in the development phase of a new system, Government control in some areas remained vital. Clearly, when a contractor has made realistic contractual

commitments to price, performance, and delivery of operational equipment, the need for Government control of the program is further minimized, and cost and performance incentives can be structured so as to give every assurance that the contractor will be motivated to seize upon opportunities to reduce costs and improve performance, and that where faced with alternatives he will choose the course that is most beneficial to the Government.

However, the Department of Defense is not only a trustee of public funds but is also the guardian of the national defense, and thus cannot afford to wait with check-in-hand for the timely delivery of operational hardware meeting the contract requirements, but must act throughout the acquisition phase to provide reasonable assurance that the requirements of national defense will be met in a timely manner. A balance must, therefore, be struck between overcontrol and a complete hands-off attitude. The potential for damage to the national defense posture arising from a contractor's failure to fulfill his contractual commitments must be weighed against the costs of Government control and the potential for increased program costs, technical deficiencies and slippages arising from Government interference in the program management. Simply stated, where there are appropriate contractual terms, the Government should avoid detail control, but should retain sufficient visibility of the work to permit prompt action if control is in fact required.

V. THE AIR FORCE EXPERIENCE

To date, the TPPC has been applied up to contract award on only one system: the Air Force's C-5A, a heavy logistics air transport system capable of carrying outsized cargo over long ranges at speeds comparable to present commercial jet transports. Other programs have been identified for Total Package procurement in all of the Services and are in various preliminary stages.

Although the C-5A is the first Total Package procurement, the Total Package Concept is not the only first for the C-5A acquisition program. The C-5A is also the first system to undergo a comprehensive contract definition pursuant to DOD Directive 3200.9 and the first system in which the complete Air Force Systems Command 375 series of program management documents have been applied from the outset.

An RFP, containing, among other things, a Work Statement and Model Contract for CD, and a Work Statement and Model Contract for development and acquisition of the C-5A system, was distributed on December 11, 1964, to the three airframe and two engine contractors who had participated in the parametric studies leading up to the approval of the C-5A program. On December 31, 1964, the Air Force entered into a CD contract with each of the five contractors, the Work Statement of which called for the identification of, and preparation of performance specifications for, each end item required for an operational system, as well as a price proposal for development, production, and support of such hardware. Support would include all required aeronautical ground equipment, training equipment and contractor technical services, together with spares and maintenance through the Category II Test Period. Spares beyond Category II would be added to the contract by provisioning action and would be priced in accordance with a detailed pricing exhibit or a pricing formula stated in the contract.

Award of a contract would be made to the source whose cost and technical proposals as evaluated by the Air Force demonstrated the greatest overall cost effectiveness over a 10-year operating period of a system complying with all of the minimum performance requirements established in the RFP. To this end, the contractor was required to prepare a 10-year operating cost estimate on certain given assumptions. This was to be added to the RDT&E and production costs and compared with the productivity of the proposed system over the same period. Although the initial production airframe buy was only 57 systems, a priced option was obtained on 58 more, and costs and productivity for source selection purposes was to be computed on a buy of 115 total operational systems.

The technical proposals were submitted on April 20, 1965 and the cost proposals on April 27, 1965. Definitive FPI contracts for RDT&E, delivery of 57 total systems, and support as outlined above, were negotiated and signed by each of the contractors prior to the Source Selection announcement on September 30, 1965.

The contract delivery schedule for total systems was based on the airframe contractor's "most economic production" estimate designed to meet a December 1969 date for an operational capability of one squadron. The engine contract delivery schedule was in turn constructed to meet the total system schedule in the most economical manner. In both contracts, the development test plan, including timing and hardware to be used in test, was based upon the contractor's proposal for the most economic plan meeting the Air Force's

test data requirements. Both contracts contained alternate prices for delivery schedule changes and a specification change pricing clause designed to inhibit the initiation of specification changes.

Priced options in each contract will enable the Government to order up to 58 additional total systems, and formula options can be exercised to order up to 85 additional systems beyond the priced quantity of 115. Each contract provides for a target profit equal to 10% of the target cost and a ceiling price equal to 130% of target cost. Priced options will be added to targets and ceiling as they are exercised, as will provisioned spares, and the final incentive fee computation will be made on the basis of the 115 total systems and support. The formula option for an additional 85 total systems will be exercised in a separate fixed-price incentive contract with a 10% target profit and a 120% ceiling price.

Both the engine and airframe contracts contain an escalation clause to protect against abnormal fluctuations in the economy. Both contracts contain a clause providing for adjustments to targets and ceilings in the event of changes in the Federal Laws affecting labor-associated costs, and a clause providing for limited (but not "get well") adjustments in the option prices if actual production costs on the first 57 systems deviate substantially from the originally targeted production costs.

Both contractors proposed on the basis of three alternate cost-incentive formulas, 85/15 over target and 50/50 under, 70/30 over target and 50/50 under, and the flexible incentive with an initial share of 85/15 over and under target. The target prices proposed indicated a preference for the flexible incentive. Nevertheless, since the airframe contractor was willing to accept a 70/30 overrun share, and the consequently greater risk involved, at a relatively small increase in target price, the Air Force chose the 70/30 - 50/50 formula for the airframe contract, while inserting the flexible incentive in the engine contract. Neither contract provides for the construction or provision of additional Government facilities beyond those presently used by the contractors.

Performance incentives in both contracts have, to the extent feasible, undertaken to arrive at specific overall performance attributes. Rewards for increases in such overall performance characteristics have been computed on the basis of value to the Air Force in an operational environment of a three-squadron quantity over a 10-year period, with the contractor to receive an

amount in proportion to his share in cost overruns. The flexible incentive clause includes an automatic adjustment of performance awards as the cost share changes.

Both contracts provide for 90% progress payments during the RDT&E and production effort until such time as payments for hardware deliveries have reduced the contractor's unrecovered costs to a stated amount, at which time future progress payments will be made at 70% of total costs.

Correction of Deficiencies clauses in both contracts extend the time period in which actionable deficiencies in the total systems may be discovered, in order to include an adequate opportunity for utilization of each item of hardware in an operational environment. Costs involved in correcting such deficiencies are allowable costs under the terms of the incentive contract, but no adjustments are made in target price or ceiling price.

In recognition of the potential for disputes between the airframe and engine contractors as to responsibility for correction of deficiencies in the total system arising in an operational environment, and the resultant difficulty in assessing responsibility as between the two prime contractors, the airframe contract provides that given the airframe contractor's concurrence in the original engine specifications, any changes thereto, and the demonstrated compliance with those specifications, the airframe contractor will, as to the Government, assume responsibility for correction of any deficiencies in the total system. The Air Force has agreed to allocate costs of correcting such deficiencies between the contracts as determined by the airframe and engine contractors pursuant to an agreement to which the Government is not a party.

Although each contract calls for an RDT&E and production effort covering several years, a limitation on the Government's total liability in each year has been included which establishes a ceiling in the event of termination for convenience in that year.

Despite the magnitude of the initial efforts required by both the Government and the myriad number of contractors and subcontractors involved in the C-5A competition, application of the TPPC to the C-5A procurement is believed, on balance, to be an unqualified success. The largest plus factor apparent at this time was the Air Force's ability to engender performance and price competition on an initial acquisition program of about 2 billion dollars,

which will approximate 3 billion dollars if the competitively priced options are exercised.

Acceptance of the historical premise that only a small portion of this program would otherwise have been acquired in a truly price competitive environment, and application of the Department's historically generated price competition cost-reduction factor of 25%, gives a quick and dirty answer to any would-be critics of the Concept. To this must be added the inherent cost economies allowed for by a multi-year buy.

No historical factor has been established for potential cost reduction arising from the contractor's motivation to design for economical production and reliability and simplicity of maintenance,^{10/} nor from his motivation to obtain supplies and services from the most efficient sources, whether in-house or by outside contract, but the effects on total cost to the Government cannot be disregarded.

Similarly, the tightening of design and configuration discipline on both the Government and the contractors, both prior to and during the program, must have a beneficial effect by reducing the need for changes during the program. Other opportunities for economy, inherent in a concept which places maximum responsibility on the contractor for not only economic production, but economic operation as well, arise from the cost and performance incentives of the contract and will be garnered in years to come as reflected in the final acquisition and operating cost of the system.

Paled by the magnitude of the benefits derived, but nevertheless of substantial import when viewed individually, is the vast amount of national resources expended by both the Government and industry prior to contract award. Total competing contractor and subcontractor costs have been estimated to have exceeded 100 million dollars. Government resources expended, in addition to those involved in preparation of the 1500 page initial RFP and the approximately like number of pages of the clarifications issued during contract definition, include the 132,000 man-hours spent by source selection evaluating teams as well as time spent by higher echelons in coordinating and reviewing the teams' efforts to analyze and evaluate some 240,000 pages of data.

To summarize its benefits, it is believed that Total Package procurement will evoke competitive proposals involving neither "buy-in" bidding nor overcontingencies with respect to

performance or cost, that the contracts resulting therefrom will provide a framework in which respectable profits can be earned if the contractors meet their commitments and are in fact efficient, and that the Government will pay the lowest reasonable price for products of the desired quality.

VI. THE FUTURE OF THE TOTAL PACKAGE CONCEPT

The already demonstrated benefits of application of the TPPC to the C-5A program, without more, have been enough to engender considerable interest in the Concept and its potential applications. Identification of potential and preparation for Total Package contracting in the Air Force SRAM,^{11/} the Navy FDL,^{12/} and other programs attests to this fact. The Director of Defense Research and Engineering has asked the Air Force for a comprehensive analysis of its C-5A procurement experience to be distributed through his office to all Secretarial level OSD and Service offices dealing with Installations and Logistics and Research and Development. The Assistant Secretary of Defense (Installations and Logistics) has asked the Air Force to prepare a statement of broad policy guidelines for the application of the Concept for Department of Defense-wide implementation through the Armed Services Procurement Regulation Committee.

How wide an application the Concept will have within the Department of Defense is a function of many variables, some of which pertain to the basic requirements of our defense posture and its relationship to conditions in a constantly changing world. The Concept must be limited to cases where the technical factors and risks, and the product, can be defined within reasonable limits. But these limits are broader than one might suppose, for several reasons. Increasingly over the past several years, DOD has embarked on advanced development programs intended to establish experimentally the feasibility of subsystems and components before full development is initiated. This is the building block approach.

Thus, for example, in the C-5A, significant technical advances in the engine were needed to decrease fuel consumption and increase thrust, well beyond the then state-of-the-art. But several years prior to the initiation of the C-5A development, the Air Force funded a series of developments of engine components, and the testing of so-called demonstrator engines which incorporated certain critical structural, mechanical and aerodynamic features. Thus, the technical difficulties, even on a frontier-probing development, were identifiable and assessable before contractor commitments were made. Further,

the wide variety of cost incentive patterns, including the flexible incentive, permits the contractual arrangement to be tailored to the risk.

Consequently, if Contract Definition and the building block approach are pursued, most development-production programs will be candidates for Total Package procurement.

Other variables in determining the application of the Concept depend primarily on the selection techniques used to identify those systems that should be acquired.¹³⁷

Within the above constraints, the extent to which the Concept might be applied is a function of the benefits to be achieved as weighed against the disadvantages to be endured on the basis of a case-by-case analysis of the procurement involved. In view of its success to date in the C-5A program, maximum efforts are being made to eliminate, insofar as is possible, the problems experienced in that application.

As discussed above, one area of concern is the massive Government and industry efforts expended prior to and during the C-5A Source Selection period. While these efforts represented a marked increase over those expended prior to contract award in other programs, it should not be assumed that all, or even a substantial part, of such effort was unnecessary or of marginal utility. Inasmuch as the C-5A procurement was a vehicle for the initial application of full-scale contract definition and the AFSC - 375 management series as well as the TPPC, it is difficult to ascertain what, if any, significant extra effort was required by the Total Package approach.

Clearly, both contract definition and the 375 series are designed to require more thought and analysis by both Government and industry prior to contract award. The fact that more than one contractor is undertaking this effort, thereby automatically increasing the total industry effort and consequently the Government's evaluation efforts, is recognized as desirable by the Contract Definition Directive. The logical premise for this approach is the anticipation that greater efforts in a competitive environment prior to contract award will be more than offset by reduction of post-award effort and consequently result in lower program costs and higher technical performance. Extension of this approach to a Total Package procurement indicates that any additional effort required in

obtaining price and performance commitments will be offset by elimination of the post-development effort involved in negotiating definitive production, support and spares contracts on an annual basis, especially in a sole source environment.

In spite of these valid reasons for increased efforts prior to contract award, the Air Force's C-5A experience indicates that considerable room for improvement does exist. Government and industry effort in the precontract award period is designed to result in a verification that the system should, in fact, be developed and produced, selection of a source, and the execution of a definitive contract. Therefore, any effort expended must be evaluated in the light of its materiality to one or more of these goals. Orderly time-phasing of these efforts in terms of contractor generation and Government evaluation of data provides an opportunity for economy of manpower utilization not unrelated to a production learning curve.

Clearly, the stated goals of CD can be accomplished sequentially, thereby utilizing the educational benefits of prior involvement. Limitation of Government and industry effort prior to award to these stated goals is especially important in a competitive situation where the efforts of one or more of the losers, and the related Government effort expended in other areas, may be largely for naught. Thus, in addition to the sequential efforts approach, which should be undertaken in any contract definition, the key maxim of any competitive contract definition must be "Put off until tomorrow (post-selection) anything you don't have to do today (pre-selection)."

The Total Package approach itself offers two potential areas for reduction in pre-award effort. A substantial portion of the C-5A pre-award effort was in the preparation and evaluation of data required by the Government in order to provide a base for continuing data requirements designed to provide the Government with sufficient information upon which to exercise its management responsibilities. The Total Package Concept, by obtaining price and performance commitments at the outset of a program and providing incentives structured to motivate the contractor to make decisions to his and the Government's best interests, places a much greater responsibility on the contractor, and the Government's responsibility should decrease accordingly. This shift in responsibility should obviate the need for much of the continuing information requirement during the program and consequently the requirement for a data base during CD.

Moreover, where a contractor undertakes price and performance commitments in a truly competitive environment, the extent of the Government's evaluation efforts during source selection should be substantially decreased. The competitive atmosphere guards against conservatism, while the contractual commitment guards against "puffing." Thus, detail analysis of cost and pricing data may not be required prior to contract award. Likewise, detail technical evaluation of proposed designs to determine the validity of performance commitments may be capable of being reduced in the pre-award period.

This is not to say that detail cost and design data should not be required after award, if necessary, nor that application of a selective audit technique to both cost and technical proposals during source selection is undesirable. It is only intended that recognition be given to the fact that an earlier selection^{14/} has designated the competitors as being the most capable of developing and producing the system, and that each of the competitors, spurred on by the competition and constrained by the spectre of financial loss, is not likely to propose much more or less than he is convinced he can achieve.

In addition to an analysis of the magnitude of the precontract effort, an evaluation is also being made to assure that application of the Concept in Operational Systems Development does not inhibit creativity on the part of the contractor. The contrary may well be the case. The Concept provides great latitude for, and directly encourages, creativity as explained below.

1. Competition spurs all of us on to greater efforts.

- a. In a cost effectiveness-type competition, the contractor is encouraged to optimize performance in terms of a productivity/cost relationship.

- b. The source selection activity's attention is directed to total cost (investment, operation and maintenance) vs. mission performance relationships, rather than development cost vs. technological considerations; thereby allowing the contractor greater latitude to propose high cost development work which will substantially decrease production, maintenance or operating costs.

2. Identification of end items and establishment of end item performance specifications during CD is not peculiar to Total

Package acquisition, but rather, is a prerequisite to Engineering or Operational Systems Development as well.

3. While the Total Package approach and the consequent emphasis on accuracy of development and production cost estimates may require the contractor to engage in some design effort during CD, this by no means locks him in to the design upon which his Total Package proposal is based. If anything, these designs serve only as a baseline from which the contractor is motivated by the inclusion of cost and performance incentives in the Total Package contract to apply his ingenuity and creativity during the development stage. A flexible cost incentive with a related "total cost" (R&D, Production, Facilities, Maintenance, and Operation) over "productivity" incentive provides a contractor with maximum latitude for application of creative effort, and more important, rewards him handsomely when such efforts are successful.

In a situation where the benefits to be gained must be weighed against the efforts to be expended, reduction in precontract effort will automatically expand the field of potential application of the Concept. Nevertheless, new applications must consider the magnitude of the new benefits to be derived. The C-5A experience involved a competitive CD for a system designated for Operational Systems Development -- that is, full-scale engineering development and substantial production. This is clearly the most fertile situation for obtaining maximum incremental benefit from application of the Concept. When competition for some reason is not possible, the effort required for Total Package contracting must be weighed against the remaining advantages^{15/}.

Elimination of substantial production as in a straight Engineering Development Program involving only hardware for test and evaluation, reduces the area of benefit, but likewise reduces the precontract effort involved. In fact, the Department of Defense has been procuring such work as Total Package acquisitions for many years. Reciprocally, elimination of a substantial RDT&E effort, as in advertised procurements of off-the-shelf and commercially available items, likewise reduces the area of benefit and the precontract effort required. Whether such programs should be considered for Total Package procurement with regard to production and support equipment, including operation and training equipment, together with support services, should be an individual decision made by balancing the reduced benefits against the reduced precontract effort.

The immediate impetus for additional Total Package applications would seem to be in the area of competitive Operational System Development. The determinative factor in application to any such program should be the degree of stability of the engineering and production aspects of the program and the level of confidence that the program will not for any other reason change appreciably prior to introducing the system or equipment into the defense inventory. The sub-factors which influence this determination are (1) degree of technical risk, (2) certainty of system characteristics and requirements, (3) interface with an unstable system, (4) stability of force structure and production quantities required, and (5) feasibility and practicability of competing the program. It should be recognized that all of the above sub-factors are influenced by the degree of planning and effort expended prior to and during CD.

The greater the degree of planning applied prior to contract award, the greater the potential for application of the TPPC. Thus, no automatic barometer for application should be derived. Advance planning and good judgment will always be required to set the stage for successful applications. Moreover, the Concept itself has not been defined in detail and does not establish rigorous requirements in its application. Refinements will continue to be made and adjustments to a particular situation should be encouraged.

In short, the future of Total Package contracting depends solely on the continuation of the preponderance of benefits to be derived over the effort required -- which in turn depends on the ingenuity and imagination demonstrated by both Government and industry in suiting the concept to future programs.

FOOTNOTES

- 1/ Referred to hereafter as "the Department" or "DOD."
- 2/ See Fortune, November 1965; Space Age News, October 1965; Time Magazine, October 8, 1965.
- 3/ Referred to hereafter as "the Concept" or "TPPC."
- 4/ "Operational System Developments - Include research and development effort directed toward development, engineering and test of systems, support programs, vehicles and weapons that have been approved for production and Service employment. This area is included for convenience in considering all RDT&E projects. All items in this area are major line item projects which appear as RDT&E Costs of Weapon System Elements in other programs. Program control will thus be exercised by review of the individual research and development effort in each Weapon System Element." DOD Directive 3200.6 (Incl 3) dated June 7, 1962.
- 5/ CPFF defined and explained at ASPR 3-405.5.
FFP defined and explained at ASPR 3-404.2.
FPI defined and explained at ASPR 3-404.4.
- 6/ Negotiation of price on a production contract begins with cost negotiation and then proceeds to fee negotiation to result in a negotiated price or target price. Fee negotiation is in the form of a percentage to be applied to the cost established in the cost negotiation. The percentage, under the weighted guideline approach set forth in ASPR 3-808, reflects the resources to be applied and the risks to be undertaken by the contractor. While percentages vary from contract to contract, the greatest potential for fee maximization remains in the negotiation of a high estimated or target cost, and this in turn evolves from an analysis of the cost of the development hardware. Unfortunately, development of a high cost item leads to greater profit on production and follow-on support contracts.
- 7/ DOD Directive 3200.9, dated July 1, 1965.

- 8/ The extent of a competition relates to the quantitative area in which the competitors will be judged. If you ask men to ride a mile on horseback, but tell them that the winner will be selected on the basis of the first 1/4 mile, it can hardly be assumed that competition will exist over the last 3/4 miles. Similarly, the form of a competition relates to the qualitative criteria upon which competitors will be judged. In the case of the horsemen, this is demonstrated by the differences between a competition in which points are awarded for form and one in which points are awarded on the basis of position at the finish line. Finally, the intensity of a competition relates to the quality and motivation of the competition, which is usually a function of the wealth and/or prestige attached to the prize.
- 9/ This clause is discussed in the text dealing with maintaining price commitments (page 11).
- 10/ A rough estimate of potential savings can be drawn by analogy from Value Engineering (VE) savings potential. The Department considers 10% of contract price as a modest approximation of potential VE savings on production and operational costs. Application of this factor to the production portion of a Total Package contract would be conservative, inasmuch as many opportunities for production and operating cost savings are lost in the initial design phase and can never be regained by VE.
- 11/ SRAM is the acronym for a Short Range Attack Missile for use in an air-to-ground environment.
- 12/ FDL is the acronym for a Fast Deployment Logistic Ship with rapid cargo handling capabilities and embarked lighterage and helicopters for over-the-beach unloading in the absence of port facilities.
- 13/ Responsibility for policy generation in these areas lies with the Director of Defense Research and Engineering and the Assistant Secretary of Defense (Systems Analysis). Policy so promulgated will, as in the case of the potential for application of TPPC in the C-5A, SRAM, FDL and other programs, have a direct effect on procurement techniques.

14/ DOD Directive 3200.9 requires a source selection in accordance with DOD Directive 4105.62, April 6, 1965, to choose the contractor or contractors to undertake a contract definition program.

15/ See anticipated benefits of TPPC in text (page 3).