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Department of Defense

LIFE CYCLE COSTING PROCUREMENT GUIDE

(INTERIM)

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Department of Defense

LIFE CYCLE COSTING PROCUREMENT GUIDE

(INTERIM)

JULY 1970

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

9 - JUL 1970

This Guide represents the first attempt of the Department of Defense to establish procedures for employing the life cycle costing (LCC) concept in acquisitions of materiel below the level of complete weapon systems. These guidelines are not mandatory but rather are to be considered general guidelines that may be modified to suit the needs of a specific acquisition.

Implementation of life cycle costing involves the application of knowledge from a broad range of disciplines. Each procuring activity should assign responsibility for coordinating and monitoring the application of life cycle costing methodology to specific organizational elements. Included in the assigned responsibility should be the effective utilization of personnel, operating in teams, who collectively possess the materiel management, engineering, cost analysis, procurement and legal expertise needed in the execution of life cycle costing procurements. Management and administrative procedures to implement this policy should be prescribed by Service and subordinate level directives.

As experience is gained in the use of life cycle costing methodology, it is expected that additional policy and procedures will evolve to include complete weapon systems acquisitions. Changes and modifications to these interim guidelines will be issued when appropriate.

Barry Shillito
Assistant Secretary of Defense
(Installations and Logistics)

Director, Defense Research
and Engineering

DEPARTMENT OF DEFENSE

LIFE CYCLE COSTING PROCUREMENT GUIDE

(INTERIM)

This interim guide presents guidelines for applying the Life Cycle Costing concept in the procurement of material and hardware other than complete weapon systems. The provisions of this interim guide are appropriate for application by all DOD activities with procurement responsibilities. As experience is gained in the application of these guidelines, changes and modifications will be issued as needed.

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Chapter 1

INTRODUCTION

1-1 Life Cycle Costing (LCC). LCC is an acquisition or procurement technique which considers operating, maintenance, and other costs of ownership as well as acquisition price, in the award of contracts for hardware and related support. The objective of this technique is to insure that the hardware procured will result in the lowest overall ownership cost to the Government during the life of the hardware.

1-2 Scope. This interim guide is limited to the necessary guidelines for implementing LCC in the procurement of less than a complete weapon system in a competitive environment where the minimization of life cycle cost is the primary economic objective. As experience is gained in the use of LCC methodology in DOD procurements, it is expected that additional policy and procedures will be evolved to include complete weapon systems acquisition.

1-3 Limitations. At this time, complete weapon system acquisitions, procurements made for the Government by a prime contractor, local purchase items, and items which are procured incidental to contractual actions primarily for services and/or facilities need not be subject to the guidelines set forth in this interim guide.

1-4 Legal Basis. Title 10 of the United States Code, Section 2305(c), stipulates that "Award shall be made . . . to the responsible bidder whose bid . . . will be most advantageous to the United States, price and other factors considered." This statutory requirement is expressed in the Armed Services Procurement Regulation (ASPR) 3-801 which states: "It is the policy

of the Department of Defense to procure supplies and services from responsible sources at fair and reasonable prices calculated to result in the lowest ultimate overall cost to the Government." The purpose of this interim guide is to provide a workable methodology for the implementation of the above policy.

1-5 Changes to Guide. Since this is an interim guide, changes, additions, and deletions are to be expected. Each military department and DOD agency using this interim guide in its procurement activities will establish administrative procedures to receive, consolidate, process, and forward recommendations for changes, additions, and deletions. All recommendations shall be forwarded through appropriate channels to the Co-Chairmen, DOD Life Cycle Costing Steering Group, OASD(I&L), Directorate for Procurement Management.

1-6 Format of this Interim Guide. The position of the DOD is that any LCC element should be used in any procurement where that element is applicable and feasible. It is better to apply only a few (or even only one) LCC elements than to apply none. Therefore, this interim guide is structured by element. Chapters 3 through 9 discuss the application of LCC to procurements by element. Each chapter, where possible, includes both concept and specific application guidelines. General areas (e.g., verification, discounting, solicitation preparation and evaluation) are discussed in Chapters 10 through 13. The only exception to this format is that the procurement of non-reparable items presents a sufficiently unique problem that one chapter (Chapter 14) is included as a summary for the procurement of those items. Those responsible for applying LCC to procurements should, after determining the applicable elements from available or readily obtainable data, review the chapters pertaining to the specific elements to be included together with the general areas of preparation, evaluation, etc.

1-7 Two-step Procurements. Item complexity often dictates the

exact approach to be employed. In this connection, it is reasonable to expect that items not subject to repair can often be acquired utilizing a single step procurement process. On the other hand, the acquisition of complex items subject to repair will usually require a two-step approach, wherein the first step solicits a technical proposal which serves as the basis for eliminating non-credible proposals and reaching a mutual understanding on form, fit, function, performance and post-award verification of the alleged attributes of the alternative items proposed; the second step serves to definitize price for the purpose of ascertaining which offeror's equipment will result in the minimization of the Government's life cycle cost. In the event a two-step approach is used, the basis for proposal evaluation and award must be clearly defined in the first step.

1-8 Inclusion of LCC Elements. For any specific piece of equipment or material, a wide range of LCC elements may be included in the procurement of that item. The elements may include such diverse ones as item entry and management costs, training, fuel consumption, maintenance, and scrap value, to name only a few. However, no statement in this interim guide should be construed to mean that all applicable elements must be included in a specific procurement. Lack of data or verification techniques may limit the number of elements which may be included in any single procurement. It is preferable to include only a few (or even only one) LCC elements than to consider none. Therefore, one of the responsibilities of personnel charged with the conduct of LCC procurements will be to determine which elements should be included in a specific procurement and which should be deferred to subsequent procurements.

1-9 Cost Category Definitions. For LCC purposes, three cost element categories are established:

a. Acquisition (A) Costs are the sum of the unit prices

for the line items of hardware, data, and services being procured.

b. Initial Logistics (I) Costs consist of the one-time logistic costs which are identifiable and would be incurred by the Government for the item being procured. For example, these may include the costs of part and assembly introduction, initial technical data management, modification of existing support equipment or acquisition of new support equipment not included in the LCC solicitation, the cost to move or start up Government furnished equipment, the training cost of an initial cadre of maintenance or operating personnel, etc.

c. Recurring (R) Costs are those costs incurred by the Government in connection with the operation, maintenance, and management of the item being procured. This would include the costs of preventive and corrective maintenance, recurring costs of file maintenance on new technical data, recurring inventory management costs, recurring training costs, costs of operating materials or fuel, etc.

1-10 Casebook. In conjunction with this interim guide, a Casebook of Life Cycle Costing Procurements is being published. The purpose of the Casebook is to serve as an aid by presenting actual procurements which included one or more LCC elements or procedures. Thus, personnel can study real applications of the concepts presented in this interim guide. It is recommended that all personnel responsible for the application of LCC review the Casebook in addition to this interim guide.

Chapter 2

ITEM SELECTION CRITERIA

2-1 Item Selection. The objective of this chapter is to provide the criteria which should be employed in the selection of items for LCC procurement. The selection of appropriate items is very important in the application of LCC methodology. A situation must be avoided where the added expense of incorporating life cycle cost procedures will outweigh the expected total cost savings. A flexible approach to item selection is the key to a widespread and effective LCC program. The criteria contained in this chapter must not be considered inviolate; whenever the best interests of the Government are served by modifying these guidelines, it is imperative that flexibility be exercised. Specifically, this chapter will provide guidelines on the applicability of the concept, the limitations to be imposed, and a specific sequence of considerations which ultimately determines which items are appropriate for LCC procurements. It is impractical to prescribe minutely detailed criteria which can be effectively applied across the broad range of items presently in the inventory. Common sense application of the criteria, augmented by the logistics and engineering knowledge of a specific equipment's history, characteristics, state-of-the-art, and future use is essential.

2-2 Selection Process. As a first step in the item selection process, a thorough review of the total range of items being managed by a given activity should be performed periodically. This should be done in order to establish those groups or categories of items which provide the greatest potential for application of LCC methodology with the least expenditure of resources. Thus,

an early determination should be made of the limitations which would initially exclude items by groups or categories. Subsequent periodic reviews may indicate that previously excluded groups or categories should be reconsidered for LCC application. It is recommended that group or category inclusions and exclusions be reviewed at least annually. Below are some general guidelines that should be followed in making this evaluation. These guidelines are intended to be illustrative rather than all inclusive, and qualifying statements are included as deemed appropriate.

a. Inclusions:

(1) Items not subject to repair, for which the anticipated annual buy exceeds $50,000.

(2) Items subject to repair, for which the anticipated annual buy exceeds $100,000.

(3) Standard commercial items.

(4) Items having undesirably high failure rates.

(5) Items recognized as needing or being susceptible to improved reliability/maintainability

b. Exclusions:

(1) Items for which non-competitive procurement has been pre-determined under the DoD High Dollar Spare Parts Breakout Program (Codes 3, 4 & 5 only) or ASPR 1-326.

(2) Major weapon system procurements: The techniques treated in this interim guide are specifically developed to facilitate the source evaluation process during the acquisition of hardware and materials of a level less than a complete weapon system. The techniques provided are not optimally

structured for the acquisition of such major complete weapon systems as aircraft, ships, missiles, or ground electronic facilities. [1/]

(3) Items which have been designated as sole or limited source procurement, such as the following:

(a) Research & Development Hardware (ASPR 3-211).

(b) Procurement Standardization (ASPR 3-213).

(4) Item acquisitions which anticipate the use of service/repair warranties, although in certain situations (e.g., construction materials) the use of some form of product warranty may be a suitable substitute for verification tests.

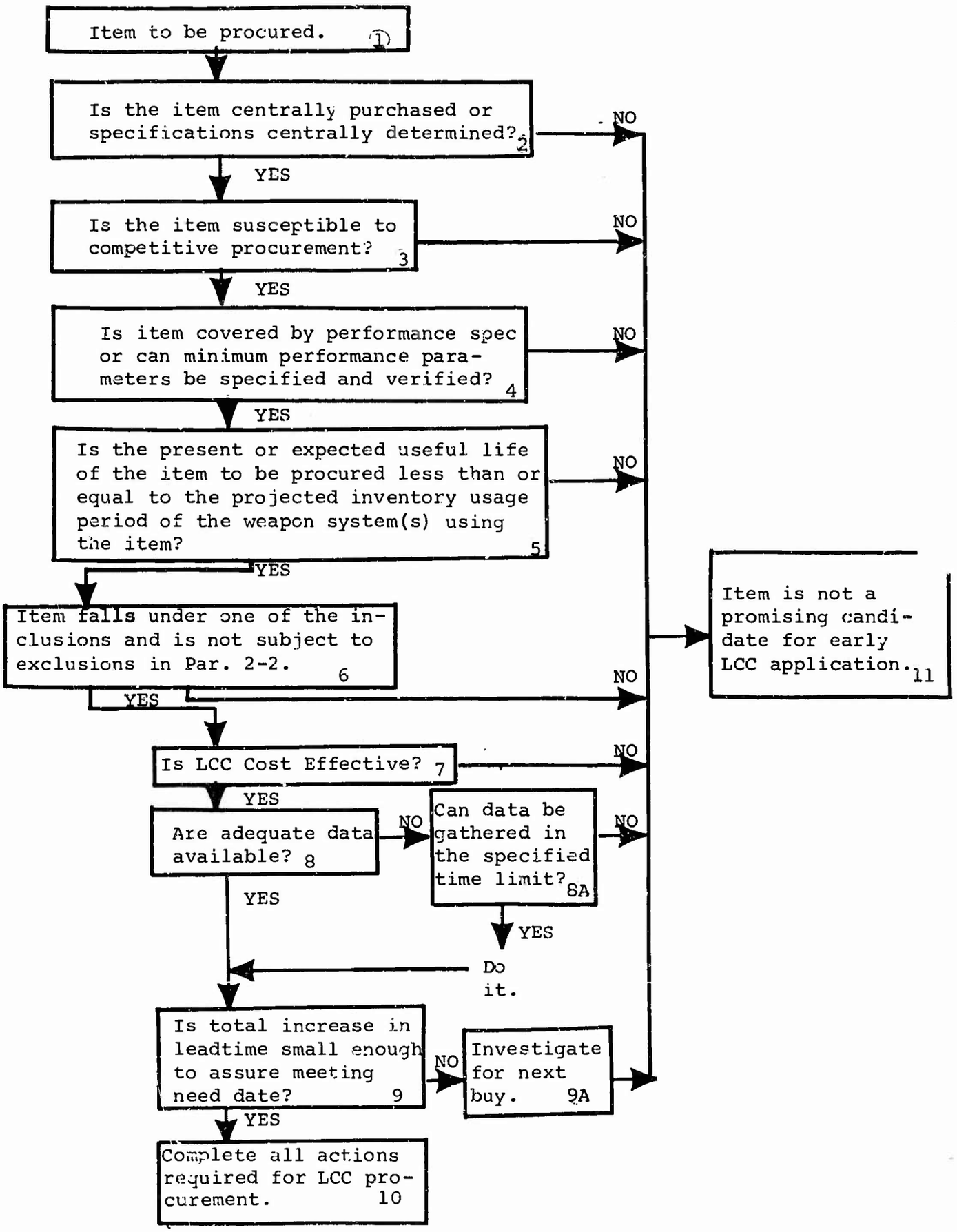
2-3 Decision Chart. Following completion of the categorization process described in Section 2-2, it will be necessary to review each item separately to determine whether it is in fact a valid LCC candidate. An item selection decision chart is shown in Figure 2-1 to assist in making a systematic search for promising candidates. It is not intended that the order of inquiry presented in Figure 2-1 be inflexible. The rearrangement of the order of inquiry to be more compatible with the items being managed by a given activity is encouraged if a faster and more fruitful item selection decision is obtained. A few typical considerations are cited for guidance:

a. Data availability inquiries require extensive time and effort to determine a response.

b. An item or category of items may have a readily discernible negative response to any in the series of inquiries, consequently the item or items can be rejected without further consideration.

[1/] Section 1-2 notes the advisability of deferring any attempt to apply the techniques in this interim guide to major system procurements.

FIGURE 2-1
ITEM SELECTION DECISION CHART



c. An item can be coded to indicate findings/rejection on previous reviews, thereby reducing to a minimum the time required for follow-on review cycles.

DECISION CHART EXPLANATORY NOTES

BLOCK 1. Source documents which list anticipated or projected buy requirements should be periodically reviewed in order to determine which items are going to be procured in the near future.

BLOCK 2. For the purpose of this interim guide the term "central purchase item" is defined as the procurement of a consolidated requirement. Local purchase items, as defined in ASPR 1-201.28, are excluded. In general, the engineering office which supports local purchase procurements is not adequately staffed to develop an LCC package, e.g., it is unlikely that the office would have a reliability engineer. However, items which may be specified by central procurement offices as QPL or "off-the-shelf" items may be purchased by the local office using LCC methodology if approval of verification techniques and application authority is received from the appropriate higher command level.

BLOCK 3. The general provisions of this interim guide are more readily applied on items for which adequate price competition exists or can be expected to exist. Some pertinent criteria are:

a. Competition exists when at least two or more offerors have previously contended independently for contracts for the same or similar items.

b. Competition does not exist in a situation where two bids or offers are received, one from the prime and one from the vendor, and the vendor is the source for both offers.

c. The item procurement data are such that full and free competition is assured. (Guidance provided in

BLOCK 8 will supplement information obtained for this consideration.)

BLOCK 4. In order to apply LCC, an item must have performance parameters which can be identified in a specification to prospective offerors and, in turn, can be verified by the Government. Without such characteristics, realistic prediction and verification cannot be accomplished. In this connection, a determination should be made early in the item selection process whether required/claimed performance can be objectively and quantitatively evaluated.

BLOCK 5. 1. The Projected Inventory Usage Period (PIUP)* is based on the length of time which an item is programmed to remain in the inventory.

2. For installed items and peculiar support equipment, PIUP is determined by review of program documents listing the programmed life of the weapon system in which the item is used or supports.

3. In the case of multi-weapon system application, the "Projected Inventory Usage Period in Months" should be based on the weapon system that is programmed to remain in service for the longest remaining period of time.

4. For common support equipment, PIUP is based on estimates of the programmed inventory period for the specific item.

5. The Projected Inventory Usage Period is considered to begin on the date of delivery of the first item or production quantity of the procurement being planned.

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*The Projected Inventory Usage Period is also discussed in Chapter 6 of this guide.

BLOCK 6. Section 2-2 provides guidelines for the initial inclusion or exclusion of items for LCC application. It is important to note that, as circumstances change, an item, group, or category initially excluded may be included in later procurements if subsequent periodic review indicates a probability of improving the Government's total cost of ownership.

BLOCK 7. 1. The cost to support an LCC procurement must be estimated before making a decision to proceed. Costs related to the development of the solicitation, publication of any new specifications, conduct of reliability tests, etc., have to be compared to the anticipated benefits that may accrue through the use of LCC methodology. If such costs are equal to or greater than the anticipated benefits, LCC will not be applied.

2. For items not subject to repair two factors must be considered before LCC is applied. Would additional service life in excess of the current service life be useful? Is it likely that additional service life can be obtained at such cost as to result in a lower total cost of ownership? If the answers to both of these questions are affirmative, LCC should be considered.

3. In order to determine when LCC may be cost effective, the task of estimating total life costs should be accomplished. For example, if the estimated Acquisition (A) Cost is $9,000,000, the total estimated Initial Logistic (I) Costs are $100,000 and the total estimated Recurring (R) Costs are $900,000, then LCC = A + I + R = $10,000,000. In this example, A ÷ LCC = .9; therefore the fraction of total cost of ownership represented by acquisition cost is so high that the practicality of applying life cycle costing is doubtful.* If, on the other hand, A = $1,000,000, I = $500,000,

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*Note, however, that at very high values of A ÷ LCC there is a possibility of converting a reparable item to one not subject to repair. If this possibility is feasible, the item should be reconsidered for LCC application as a consumable or non-recoverable item.

R = $8,500,000 and LCC = $10,000,000 as before, then A ÷ LCC = .1 and life cycle costing represents an ideal method of procurement. From the above illustration it is apparent that some estimate of LCC is necessary to determine the relative merits of applying life cycle costing methodology.

BLOCK 8. 1. The determination that adequate data are available or can be made available within the limits established under BLOCK 8A is an important criterion. The data referred to are the technical and cost data required to develop a detailed work statement for inclusion in the solicitation.

2. It should be noted that the requirement for technical and engineering data to be used in preparation of the solicitation could be substantially different when the contemplated LCC procurement is a reprocurement as opposed to an initial buy. In either case, the LCC team will be required to ascertain that adequate data are or can be made available to prepare detailed statements in the solicitation that will clearly define the technical and engineering requirements of the item, and fully and clearly state how the responses will be evaluated. Items listed in the solicitation will be augmented, as required, by:

a. Performance Specifications (updated as required).

b. Engineering Drawings.

c. Maintainability and Reliability Requirements.

d. Failure Definitions.

e. Conditions for test and statistical criteria for accept/reject decisions.

f. Latest configuration data.

BLOCK 8A. 1. A decision must be made concerning the data that were determined to be either inadequate or not available while considering the requirements under BLOCK 8.

2. Can the missing data be obtained and can the data that are inadequate be augmented by an expenditure of resources that would be considered economically justifiable relative to the total dollar amount of the procurement being considered for LCC? There is valid reasoning in establishing limits to the number of man hours that should be expended in developing the LCC technical and engineering data package. However, it also would appear that these limits should be established on a sliding scale with the total dollar amount of the procurement as the determining factor. Therefore, each office responsible for the application of LCC methodology within a procurement activity will establish general limits on resource expenditure based on the criteria noted above.

BLOCK 9. 1. It is difficult to predict, with any degree of accuracy, the time required in selecting an item and preparing and processing the required data for initial application of LCC methodology. Although it is apparent that lengthening of the administrative leadtime may be cause to reject the application of LCC methodology in the present item procurement, with effective planning, the time for the next procurement of the same item could be successfully met. Therefore, it is most unlikely that a potential life cycle cost candidate would be consistently rejected for reasons of insufficient administrative leadtime.

2. It is expected that reprocurements of items previously procured under LCC would continue to use LCC methodology since the knowledge, experience, data, and methods developed for the initial procurement could be readily applied to subsequent purchase actions.

BLOCK 10. Items which have been subjected to the selection criteria in BLOCKS 1 through 9 and received an affirmative answer in each case, should be processed for LCC procurement action.

BLOCK 11. 1. Those items that fail to qualify as an LCC candidate because a "no" decision was obtained in BLOCKS 1 through 9 of the decision chart should be subjected to further consideration in subsequent procurements. This is obvious since the conditions that caused the item not to be considered for LCC in the current procurement may change to the extent that a "yes" decision would be obtained at a later date.

2. Local procedures should be developed and implemented which will provide an efficient systematic method of identifying those items subjected to the LCC selection criteria that previously failed to meet the requirements for LCC procurement. The procedures developed should include a method of identifying the reason that the previous buy was eliminated from LCC consideration and a determination of the current validity or the reason previously used.

Chapter 3

ITEM MANAGEMENT COSTS

3-1 Introduction. The competitive procurement of reparable item often causes new parts to be added to the inventory because of the varied internal design features of alternate products offered by competing manufacturers. The introduction of new parts to the inventory causes the Government to incur additional costs, i.e., costs over and above those which would be required to manage items already in the inventory. Those additional costs are a proper element of consideration in material acquisitions of reparable items where it is the intent of the Government to minimize the total cost of ownership provided the offerors are afforded an opportunity to make tradeoffs against other attributes such as increased reliability or improved maintainability.

3-2 Scope. This chapter provides guidelines for the procedures and contractual provisions required for the proper consideration of item management costs in a procurement incorporating the LCC methodology, where LCC = Acquisition (A) Costs + Initial Logistics (I) Costs $\pm$ Recurring (R) Costs. Item management costs fall into both the "I" and "R" category. Service and subordinate level directives, consistent with the intent of this interim guide, may be issued to supply specific procedures and contract wording.

3-3 Methodology.

a. Item management costs can be classified into three general groups.

(1) General administrative costs which are incurred for all items by all DOD activities.

(2) Management costs which vary by Service, mission, deployment rate, functional use, etc.

(3) Special costs unique to a specific item (e.g., unusual storage requirements special data

handling needs, etc.).

This chapter covers group (1) above only. Chapter 9 discusses the special costs in group (3) above which should be carefully considered by the procuring activity in preparing an LCC solicitation. Since group (2) costs vary by Service and mission, these costs should be considered in instructions issued by each Service and subordinate level command.

b. Of the general administrative costs noted in a. above only those costs directly attributable to the addition of new items to the inventory should be considered. Fixed costs or costs that would be incurred whether the item is new or old should be considered as a group (2) cost and handled by the appropriate Service.

c. Separate cost factors should be used for computing the initial and recurring item management costs. The initial and recurring costs need to be identified separately because different discounting factors will be applied to each.

d. The OASD (I&L) will provide periodic updating of the procedures for developing general item management cost factors to be used in LCC applications. Therefore, specific official factors are not quoted in this interim guide. Throughout this interim guide, however, an arbitrary value of $100 is used in those sample calculations where an item management cost figure is needed.

3-4 Sample Computation.

a. An illustration of the item management costs cited above follows:

(1) Assume that the PIUP = 60 months.

(2) Assume that the item proposed by a given contractor is itself new, and that it consists of four line replaceable units (LRU).

(3) Assume that:

(a) Two of the four line replaceable units are subject to repair, common to the inventory, and contain only lower component levels of assembly, sub-assembly and piece-parts which are currently contained in the inventory records.

(b) One of the four line replaceable units is new to the inventory but it will not be identified below the LRU level because the LRU itself will carry a "discard-at-failure" recoverability code.

(c) One of the four line replaceable units is new to the inventory, contains four modules, three of which are common to the current DOD inventory while the fourth is new to the inventory. This fourth module, in turn, contains eight parts, three of which will not be provisioned, two of which are common to the inventory, and three more which will be provisioned as separately identified new line items.

b. From 3-4 a.(2) above, one new item is introduced into the inventory. From 3-4 a.(3)(b) above, one more new

item is introduced into the inventory. From 3-4 a.(3)(c), 1 + 1 + 3 = 5 more new items are introduced into the inventory. The Government acquisition of the contract item in question will introduce a total of 1 + 1 + 5 = 7 new items into the inventory. Assuming a general administrative item management cost of $100 for initial entry and $100 per year for recurring management for each of these seven new items, the initial logistics (I) cost derived from Government management activities will equal $100 X 7 = $700 and the recurring (R) item management cost will be $100 X 7 X $(\frac{PIUP}{12} - 1)$ = $100 X 7 X $(\frac{60}{12} - 1)$ = $2,800.00

3-5 Equations. From the illustration contained in paragraph 3-4 above, it is apparent that only two equations are required to compute item management costs.

a. For the item management costs to be included in the "I" category the formula is the item management cost factor times the total number of new items identified. New items refer to those which require new FSNs. They consist of those items which must be stocked, stored and issued by the military service in support of the repair and overhaul of the item that is being procured.

b. For the item management costs to be included in the "R" category, the formula is the item management cost factor times the total number of new items identified times $(\frac{PIUP}{12} - 1)$.

3-6 Sample Solicitation Formats. Having determined that item management costs will be one element of the LCC analysis, it is necessary to structure the solicitation in such a manner that there can be no doubt as to the method of evaluating these costs. Such

statements may be, in fact, a method of communication used to apprise potential offerors of the specific tasks for accumulating and submitting their required LCC item management data.

The following statement of work inclusions illustrate the degree of detail suggested to (1) guide potential bidders in the preparation and submission of essential data elements acceptable for computer processing, and which are necessary to the establishment of positive item identification and federal stock number association; and (2) provide the procuring activity with suitable data to rationalize the prospective offeror's recommendation that the DOD should stock, store and issue specified support items. These samples are provided for information and guidance only. Actual contract provisions should reflect any unique characteristics of the individual procurement and provisions of subsequent service and subordinate level directives implementing this interim guide.

a. Evaluation Data. For the purposes of establishing item management costs which will be used as a consideration in the Basis of Award, the following data will be furnished as separate documentation concurrently with the bid/proposal:

(1) A list in five copies of all items, bulk and otherwise, to be used in each end item. The listing will include vendor's (or manufacturer's) part number, item name (basic noun with significant adjectives), Federal Manufacturer's five digit code, and Federal Stock Number (if known). Indicate on the foregoing listing the recommended maintenance spare parts, by line item, excluding bulk items, that the Government should stock for repair or overhaul of the end item. The code "P" will be used to indicate each recommended item.

(2) An 80-column Punch Card Equipment (PCE) card for each part number identified to each recommended maintenance spare part. Instructions for card punching are contained elsewhere in this solicitation.

(3) Drawings, sketches, specifications and technical descriptions suitable for evaluating and determining, for maintenance purposes, assembly and part relationships.

(4) Three copies of a numerical master index of part numbers for all items contained in the five-part listing mentioned elsewhere in this solicitation.

b. Screening and Key Punching Instructions.

(1) The offeror and screening activities shall adhere to these key punch and screening instructions in providing data sufficient to establish the item identification, part number and federal stock number relationships.

(2) Each bidder shall submit for screening all items identified by part number and which have been recommended for stocking, storing and issuing as maintenance support items. Data for screening will be submitted in 80-column punched cards prepared in the format shown elsewhere in this solicitation.

(3) Screening will be accomplished by computer on a part number basis to determine the existence of a federal stock number.

(4) The responsible end item acquisition manager, identified in the data submittal prescribed elsewhere in this solicitation, will review the computer output product to determine which of the recommended ("P" coded) items are new to the DOD inventory.

c. Costs of Inventory Additions. In order to determine the added costs to the Government of introducing items into the existing inventory and stock system, the offeror will insert, on the indicated line below, the total number of new parts, components, units, sub-assemblies, or items which are to be used in maintaining and repairing his equipment and which are not stocked by the Government. A new part, component, unit, sub-assembly or item is defined as one not presently having a Federal Stock Number (FSN). The offeror may establish the number of new Federal Stock

Numbers required from reviewing previous parts lists or from repair parts requirements set forth in the basic contract specification. The offeror shall indicate in the following space the source used for his determination.

No. of New FSNs_____

Source:

d. Criteria for Proposed Evaluation and Award. The cost for initial introduction of a new FSN is_____. The cost for continuing inventory item management is _____ per year of estimated item life. The estimated item life for equipment being procured by this contract is ____ years. The total inventory holding period is _____ years. The total cost of inventory introduction and management for each new FSN is _____.

e. Recomputation of Item Management Costs. If, after the award of the contract, the successful offeror incorporates in the equipment parts which require the assignment of new Federal Stock Numbers (FSNs) other than the number set forth in his proposal and stated in the contract, the Item Management portion of the total LCC calculation detailed elsewhere in this solicitation shall be adjusted according to the number of new FSNs actually needed.

3-7 Equitable Adjustment. Regarding the sample solicitation format set forth in paragraph 3-6, particularly paragraph e., see paragraph 10-2 in Chapter 10.

Chapter 4

TRAINING COSTS

4-1 Scope. This chapter provides guidance for considering the life cycle cost of training that may be associated with a specific procurement. Life cycle training costs should be considered under either of the following conditions:

a. The Government's estimate of training costs that may be expected as a result of the procurement of a specific item reveals that there is a significant potential for variation in training costs among alternative offerors' hardware.

b. The Government's estimate for the worst cost situation is such that the total training cost (T) is of significant magnitude to meet at least one of the following criteria:

(1) T is greater than $10,000.00

(2) $T \div LCC$ is greater than .06, where LCC is the Government's estimate of the expected value of life cycle cost that will be associated with a specific procurement.

4-2 Evaluation Guidelines. For purposes of evaluating training costs, the following general criteria and guidelines shall apply:

a. The primary reason for segmenting training costs is for ease of accounting and discounting.

b. The cost of furnishing any training equipment, aids, material, or facilities by an offeror will be considered as acquisition (A) costs.

c. The cost of training an initial cadre of personnel, whether the training is performed by the offeror or

by the Government, will be considered as initial training (I) costs.

d. The cost of training of replacement personnel over the expected life of the equipment being purchased, together with accompanying texts, manuals, etc., will be considered as recurring training (R) costs.

e. Training conducted by the offeror may be costed in three ways: (a) through a line item in the hardware solicitation, (b) through exercise of an option clause which commits the contractor to a formula for computing training costs including course presentation costs per student hour and preparation cost per course hour, (c) through a separate solicitation prepared after the hardware contract. The first method gives the firmest cost figure for LCC purposes. In many instances, however, the extent of required training is not known early enough to create a realistic line item. In these cases, the cost of offeror training must be based on Government estimates utilizing the option formula when available, or Government estimates of offeror training to be procured separately.

4-3 Training Requirements. When training costs merit consideration as part of the LCC evaluation, the solicitation should define parameters or constraints established by the Government, such as the quality/quantity of military personnel available for training. Within these limitations, each offeror must identify, as an LCC factor, the training requirements for his specific equipment.

4-4 Facilities. When the training is to be conducted in a Government-owned facility, no attempt shall be made to assign a cost for the facility in which the training is to be conducted,

unless a significant modification or other facility-associated cost is involved. When the offeror is to provide the training facility, such costs will be included and considered as an acquisition (A) cost in the solicitation. If there is an option to use Government facilities for training, the cost of operating the facilities should be considered by offerors who propose this course. It is essential that the solicitation advise all offerors in advance on the decision or options, and that pertinent cost information be provided.

4-5 Elements. The general approach to aggregating training costs will be to consider the original costs (equipment acquisition) (A) and initial training (I) and the recurring training (R) costs associated with the item to be procured. Services may sub-divide these costs/cost formulae to denote the various levels of maintenance (i.e., depot, intermediate and organizational) and of operations where desirable. The appropriate terms and formulae are as follows:

a. Acquisition (A) training costs, denoted by A_{TR}, consist of equipment and material requirements for providing training including Government estimates of the costs of training materials listed as optional clause requirements. Typically, these might consist of operating units of bid items, full-size units with cutaways to illustrate operations and maintenance models, enlargements, training aids, etc. Likewise, each of the above equipments and materials may or may not be divided into sub-line items for the various levels of maintenance and operations.

b. Initial (I) training costs, denoted by I_{TR}, consist of all initial costs of training cadre personnel. These

costs will typically include such items as trainee salary, per diem, travel expense, etc. Again, these may be divided to identify training for various levels of maintenance and operations. In computing the cost of making trainees and/or instructors available, the Government shall apply the standard rates specified in the Composite Standard Military Rates for Costing of Military Personnel Services and shall assume an eight-hour day for such personnel. Per diem shall be based on the current rate for the type of personnel in question (military/civilian). Travel expenses to the Government shall be predicted on the basis of coach class air fare.

c. Recurring (R) training costs, denoted by R_{TR} shall be computed for all operations and maintenance personnel where this cost is not already included in the standard man-hour rates for operation and maintenance. This recurring cost element will also include recurring costs associated with training aids/equipment if such costs are not already included in the operating and maintenance costs of the basic equipment. These operating and maintenance costs are described in Chapters 5 and 6 of this interim guide.

(1) The requirement for recurring training will be generated by the requirement to replace personnel who are reassigned and/or attrited from positions requiring training and involving the item(s) being procured. Recurring training required within the scope of this interim LCC guide will normally be an add-on (special or supplementary in nature) for personnel already trained in their specialty/rating. The training

may be contractor furnished but will very likely be accomplished in-house by the service involved (particularly after several years). A generalized formula for calculating recurring training costs (whether for base, intermediate, or depot level personnel) is as follows:

$$R_{TR} = (D) \quad (TPRC)$$

where:

D = Number of personnel which must be trained during the Projected Inventory Usage Period to replace those reassigned or attritted (i.e., number required times an attrition rate which is appropriate at the time for the Service and the type of personnel involved).

TPRC = Cost per student to train personnel to operate and/or maintain the item(s) being procured (TPRC will be derived for the training required from data developed within the individual Service).

(2) If the attrition (entirely or in part) is from a new specialty/rating specifically developed to operate and/or maintain the item(s) being procured (as opposed to simple add-on training), the training cost will normally be higher and several computations to consider all specialties/ratings involved may be required.

d. Consistent with the ground rules stated in Section 4-2 above, the total cost of training (LCC_{TR}) to be associated with a specific material acquisition is:

$$LCC_{TR} = A_{TR} + I_{TR} + R_{TR}$$

4-6 Differences in Proposed Training. In the event that training costs are to be included, a two-step method of procurement may be necessary. The quantity and complexity of training required by one offeror may be radically different from that required by another offeror. Since the nature of the training to be provided will vary among alternative offerors' hardware, there will be a requirement for assessing the exact training required to support each offeror's hardware. Each hardware proposal should be reviewed to estimate the total life cycle training cost necessary to provide the skills/proficiencies required to maintain and operate the item offered by the contractor.

4-7 Sample Solicitation Formats. If it has been determined that training costs will be included in the LCC evaluation, it will be necessary to structure the appropriate statements in the solicitation so that potential offerors will have a clear and precise understanding of the method by which they will be evaluated. It will also be necessary to request the proper information so that Government evaluators can gain a true picture of the training requirements involved in each offeror's proposal.

The following sample solicitation formats are provided for information and guidance only. Actual solicitation and contract statements should reflect any unique characteristics of the individual procurement and provisions of subsequent Service and subordinate level directives implementing this interim guide.

Life Cycle Training Costs in Evaluation and Award

It is expected that, during the entire ownership period of this equipment by the Government, training must be provided on a recurring basis for the operation, maintenance and management of this equipment. The costs incurred by the Government to provide this training will be considered, evaluated, and used in the determination of the contract award and any subsequent cost evaluation.

(Sample Format - cont'd.)

Training requirements are divided into three categories - training equipment (materials and installations), initial training, and recurring training.

All materials (equipments, manuals, training aids, texts, guides, etc.) required to be furnished by the offeror for training purposes are in addition to the Items specified in the descriptions and specifications.

All training equipments and materials, aids, instructors, and other personnel are to be supplied in accordance with (cite appropriate directives, regulations, manuals, etc.) unless specifically changed by this solicitation or subsequent amendments to this solicitation.

All data and prices set forth under the following sections become a part of this solicitation and all materials and services specified will be delivered and performed at the designated prices.

Where it is indicated hereafter that the Government shall enter values and the offeror shall have an option, this is intended to mean that the offeror will bid against the Government's values but will have the opportunity to submit an alternative proposal on the basis of his own values. In such cases, the offeror will always provide the rationale substantiating his alternate values. The Government will reserve the right to accept or reject the offeror's alternative proposal.

A. The Life Cycle Training Cost to be used as a basis for evaluation and award will be

$$LCC_{TR} = A_{TR} + I_{TR} + R_{TR}$$

where

LCC_{TR} = Life Cycle Training Cost

A_{TR} - Cost of equipments and materials furnished by the offeror and installed or used at designated training schools.

I_{TR} = Initial costs of training selected personnel and employees who will then be used as a training cadre.

R_{TR} = Recurring training costs expected to be incurred over the estimated equipment life.

(Sample Format - cont'd.)

B. Equipments and Materials will consist of

1. Fully operational units of Item(s) 1.

2. Units of Item(s) 1 with appropriate cutaways to illustrate proper operation and maintenance.

3. Models, enlargements, and test equipment appropriate to the course of instruction to be supplied by the offeror.

4. Installation and pre-instruction testing for Items 1 through 3, above.

C. Initial Training Costs will consist of all costs incurred by the Government in the training of an adequate cadre of professional and maintenance personnel who will then become the instructors for recurrent training. The initial training will be conducted by the offeror at his plant unless specified otherwise in this solicitation. The costs to be considered include:

1. Student pay, per diem, and allowances.

2. Student travel.

3. All costs charged to the Government by the offeror in the performance of the initial training prescribed in this solicitation.

D. Recurring Training Costs are those costs incurred by the Government in the training of personnel to operate, maintain, and manage the equipment being purchased over its entire estimated life. These costs will include:

1. All student pay and allowances.

2. Student travel.

3. Offeror's course monitoring during a specified time period to ensure proper instruction.

4. All materials issued to each student (tests, guides, charts, manuals, etc.).

(Sample Format - cont'd.)

E. Calculation of Life Cycle Training Costs

	Data Supplied by			
	A	B	C	D
1. Equipment and Materials				
a. One operational unit of Item(s) 1 (Offeror shall enter same unit price as shown elsewhere in this Solicitation) $_____		X		
b. Cutaway units specified in B.2 above in sufficient quantity for use in one classroom and one shop or laboratory simultaneously $_____		X		
c. Models, enlargements, and test equipment specified in 1 above in sufficient quantity for use in one classroom and one shop or laboratory simultaneously $_____		X		
d. Total of Items 1.a. through 1.c above $_____		X		
e. No. of classroom/shop/lab units to be supplied _____			X	X
f. Installation costs				
No. of Class/ Shop/Lab/Units ___ Location _____			X	X
(No.) (Name and location of school) $_____		X		
(extend as needed)				
g. Total Equipment and Materials 1.d X 1.e $_____		X		

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

(Sample Format - cont'd.)

	Data Supplied by			
	A	B	C	D
h. Total Installed Equipment and Materials (A_{TR}) 1.f + 1.g $_____		X		
2. Initial Training Costs - conducted at _____.			X	X
a. Training will be conducted over a period of _____ after the date of this contract			X	X
b. Number of students training during period 2.a.				
(1) Professional level _____			X	X
(2) Maintenance level _____			X	X
c. Average estimated pay and allowances per student per week.				
(1) Professional level $_____	X			X
(2) Maintenance level $_____	X			X
d. Estimated round trip travel cost per student $_____ (Assume student source distribution to be equally divided between locations in 1.f and travel by commercial air.)		X		
e. Course length, _____ weeks		X		
f. Offeror's incurred costs, chargeable to the Government, per student, per course $_____		X		

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

(Sample Format - cont'd.)

	Data Supplied by			
	A	B	C	D
g. Total Initial Training Costs (I_{TR}) 2.e [(2.b.(1) x 2.c.(1)) + (2.b.(2) x 2.c.(2))] + [2.b.(1) + 2.b.(2)] [2.d. + 2.f.] $_____		X		
3. Recurring Training Costs (excluding initially trained cadre)				
a. Projected Inventory Usage Period, _____ years	X			X
b. Desired manning level for personnel knowledgeable of engineering and maintenance				
(1) Professional level _____			X	X
(2) Maintenance level _____			X	X
c. Estimated turnover rate for personnel knowledgeable of engineering and maintenance				
(1) Professional level __(yrs.)	X			X
(2) Maintenance level __(yrs.)	X			X
d. Average estimated pay and allowances per student per week.				
(1) Professional level $_____	X			X
(2) Maintenance level $_____	X			X
e. Estimated round-trip travel cost per student, $_____	X			X
f. Course length, weeks _____		X		
g. Cost of texts, learning guides, manuals, etc., supplied by offeror, per student $_____		X		
h. Cost to Government of conducting course, excluding student costs, per student-week, $_____			X	X

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

(Sample Format - cont'd.)

	Data Supplied by			
	A	B	C	D
i. Offeror's cost of monitoring classes during the _____ and providing needed changes in guides, texts, manuals, etc. $_____		X	X	X
j. Total life cycle recurring training costs (R_{TR}) $_____		X		
3.a $\left[\left[\frac{3.b.(1)}{3.c.(1)}\right.\right.$ (3.f(3.h+3.d.(1)+3.e+3.g)$\left.\right]$ + $\left[\frac{3.b.(2)}{3.c.(2)}\right.$ (3.f(3.h+3.d.(2)+3.e+3.g)$\left.\right]\right]$ + 3.i				
4. Total Life Cycle Training Costs, (LCC_{TR}) 1.h+2.g+3.j $_____		X		

F. Calculation of Present Value of Training Costs

All training costs as specified and calculated in Section E above will be discounted to a present value at a rate of 10% per year. The time flow characteristics will satisfy these assumptions.

1. Equipment and materials (A_{TR}) will be purchased and installed at a uniform rate during the first contract year.

2. Initial training costs (I_{TR}) will be incurred at a uniform rate over the first contract year.

3. Recurring training costs (R_{TR}) will be incurred at a uniform rate during the _____ through the _____ year.

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

Chapter 5

OPERATING COST

5-1 Scope. This chapter sets forth general guidelines relative to the identification of operating costs and the analysis of those costs as a part of the LCC quantitative evaluation. For the purpose of this interim guide an operating cost is defined as an expense which is regularly incurred during the normal operation of a hardware item, and commonly consists of manpower, fuel, power, special handling equipment, environmental control, etc.

5-2 Identification. The first step is to determine whether there are any operating costs associated with the item being reviewed for LCC acquisition. It will generally be a relatively straightforward matter to ascertain the existence of operating costs with regard to a specific item. The identification of operating costs should proceed in a systematic manner. The item should be reviewed to determine whether:

a. Any manpower resource is involved in the operation or monitoring of the operation of the item. In associating manpower resources with the operation of an item, a great deal of care must be exercised. A distinction must be made between the manpower costs to operate an end item which performs a mission in itself and to operate an end item incident to the repair of another item. For example, if an individual's services are required solely to operate or monitor the operation of a radar set, then such costs shall be charged to the operation of the radar set. If a piece of Ground Support Equipment (GSE) is used incident to the repair of the radar set,

then the manpower used to operate the GSE is a maintenance labor cost of the radar set but an operating manpower cost of the GSE. If a piece of GSE is used to provide the initial power supply to activate the radar set, the manpower used to operate this GSE is an operating cost of the radar set.

b. Any power or fuel is involved in the operation of the item.

c. Any fuel preparation or handling cost is involved in the operation of the item.

d. Any equipment is needed by operators in the operation of the item. This includes safety glasses, hard helmets, tools, etc.

e. Any unique environmental condition is involved in the operation of the item. This includes air conditioning, special lighting, fixtures, etc.

f. Other materials are consumed through operation of the equipment (e.g., the use of detergent in the operations of laundry or cleaning equipment).

g. Other identifiable cost is involved in the operation of the item.

5-3 Computation. When the questions set forth above have been answered, and one or more have been answered in the affirmative, the following should apply:

a. For each element of operating cost which has been affirmatively associated with a specific item, the question should be asked--is this element of operating cost subject to significant variation, per unit of service, between alternative proposed hardware designed for common form, fit and function? If not, this element of cost should not be further considered.

b. If it is concluded that a significant potential for variation exists, then provisions should be made to express the costs involved. For the operating costs likely to be pertinent, the following general equations are appropriate:

(1) Operating Manpower Cost = $W \times N_o \times OH_m \times L$ where:

(a) W = The average hourly cost of providing one operator.

(b) N_o = The number of operators required to operate or monitor the operation of the item in question.

(c) OH_m = The average number of operating hours per month per item procured.

(d) L = The Projected Inventory Usage Period (in months) of the item in question as defined in Block 5 of the decision chart in Chapter 2 and as determined by the acquisition manager.

(2) Power, Fuel, or Material Cost = $F \times C \times OH_m \times L$ where:

(a) F = The fuel, power or material consumption per operating hour expressed in

the appropriate units of measure, i.e., gallons, kilowatts, cubic yards at standard conditions of temperature and pressure, pounds, etc.

(b) C = The cost of one unit of fuel, power, or material.

(c) OH_m & L are as defined in (1) above.

c. For equation (1) above, W, OH_m and L are Government predetermined figures. N_o is a variable item and should be provided by the offeror in response to the solicitation. Similarly, for equation (2) above, C, OH_m and L are Government figures with F being an offeror proposal item. Operating hours per month, OH_m, is a predetermined estimate provided by the Government. Estimates may be obtained from various sources, including program documents, elapsed time indicator data, product performance data, etc. Regardless of the data source used, the estimate should be sufficiently factual to stand the test of reasonableness.

5-4 Solicitation Provision. When it has been concluded that a particular element of operating cost is subject to potential variation and an equation has been developed to express that element of cost over the Projected Inventory Usage Period, the next step is to prepare for inclusion in the solicitation a provision which will require the alternative offerors to submit the necessary elements of data for source evaluation. A typical provision, in which the costs are illustrative rather than factual, might read as follows:

The Government has concluded that the Engine Analyzer called for in Item 1 above may be such that the various articles proposed by alternative offerors will accrue varying operating costs to the Government over the Projected Inventory Usage Period. Therefore:

a. Consistent with the above, the cost of manpower and fuel for said analyzer, over a Projected Inventory Usage Period of eight years, will be a quantitative source evaluation factor in this acquisition. The Government has assumed that each analyzer procured will be operated at field level an average of 40 hours a month, and has further assumed that the average skill level to be utilized is such that labor to operate the analyzer will cost the Government $9.00/hour. It is further given that specification requirements may be achieved by an analyzer which utilizes gasoline, number 2 fuel oil, kerosene or propane as a fuel.

b. Based upon historical data, the Government has assumed that average future unit costs for these fuels will be as follows:

(1) Gasoline = ___¢/gallon.

(2) Number 2 Fuel Oil = ___¢/gallon.

(3) Kerosene = ___¢/gallon.

(4) Propane (under standard conditions) = ___¢/cubic yard.

c. In allocating operating costs to each offeror's hardware for the purposes of computing life cycle cost for proposal evaluation purposes, the following equations shall be used:

(1) Operating Manpower Cost = $W \times N_o \times OH_m \times L$ where:

(a) W = The average hourly cost of providing one operator.

(b) N_o = The number of operators required to operate or monitor the operation of the item including stand-by personnel.

(c) OH_m = The average number of operating hours per month per item procured.

(d) L = The Projected Inventory Usage Period (in months) of the item as set forth above.

(2) Fuel Cost = F x C x OH_m x L where:

(a) F = The fuel consumption per operating hours expressed in the appropriate units of measure, i.e., gallons, cubic yards at standard conditions of temperature and pressure.

(b) C = The cost of one unit of fuel.

(c) OH_m & L are as defined in (1) above.

d. For equation (1) above, W = $9.00/hour, OH_m = 40 hrs/mo. L = 96 months, and N_o shall be provided by the offeror in response to this solicitation. By virtue of providing a value for N_o to be used in the pre-award computation of LCC, the offeror agrees to provide reasonable rationale in support of the number provided, and to subsequently prove during the post-award acceptance that the value so provided is correct within the limitations established as a condition of acceptance. The rationale is best provided by historical experience data. If such data do not exist, the rationale shall be in the form of a personnel sub-system analysis. By virtue of providing a value for F to be used in the pre-award computation of LCC, the offeror agrees to provide reasonable rationale in support of the number provided, and to subsequently prove during the post-award acceptance test that the value so provided is correct within any limitations which may have been established as a condition of acceptance. Again, rationale in support of the reasonableness of the figure provided is best based upon test or experience data; but in the absence of this, a comprehensive combustion engineering analysis will suffice. The N_o and F values proposed shall be recorded by the offeror in the appropriate blocks of the quantitative source evaluation format provided as Attachment 1 to this solicitation. The supporting rationale shall be provided in that separate section of the offeror's response to this

solicitation entitled "Rationale in Support of Parameters Predicted by Each Offeror."

5-5 Development/Verification Responsibility. Section 5-4 provides the general approach that will facilitate the collection of operating costs from alternative offerors; however, it is purely illustrative in nature. Each procurement is unique, and the terms and conditions to be included in each solicitation are likewise unique. The individual who develops the wording to be included in a solicitation for operating costs should also be responsible for assuring that the appropriate inserts are provided for inclusion in the quantitative evaluation format to be completed by each offeror. In the event that operating cost parameters are to be verified during the post-award acceptance test, this same individual should also be responsible for developing the data collection procedures and reporting format for the contractor to apply in the collection of operating cost data during the acceptance test.

Chapter 10, paragraph 10-2, should be reviewed in considering the interaction of the various LCC elements in the post-award evaluation.

Chapter 6

MAINTENANCE COST

6-1 Introduction. This chapter presents and discusses eight equations which provide a method for converting numerical reliability and maintainability data into the common measure of dollars. In this interim guide, LCC = Acquisition (A) Costs + Initial Logistics (I) Costs + Recurring (R) Costs and maintenance costs fall into the "R" category. With one exception, the equations reflect the maintenance costs which may be expected to vary among alternative offerors' hardware. The exception is "maintenance float" assets which some organizations may consider as a maintenance cost, but which are discussed in Chapter 9 of this interim guide. The equations are structured as though the contemplated procurements would be for a single reparable item. For an equipment consisting of numerous reparables, an iterative application of the equations for all of the reparable items within the equipment would be required to obtain a total maintenance cost. Note that no equations are included to calculate indirect and General and Administrative (G&A) costs. Those costs may be included in the equations presented through the labor rates. Activities preferring to price out direct labor only in the man-hour rate would find it necessary to include separate equations for indirect labor and G&A.

6-2 Scope. The maintenance equations provided in this chapter can be used for both an initial and follow-on procurement of an item subject to repair. There is no single equation or explanation contained in this chapter that is complex; however, unless a deliberate and systematic effort is made to understand the relationship among all of the equations, serious errors may occur.

6-3 Equations. The following equations provide the methodology used in the calculation of maintenance costs:

a. Equation #1:

Maintenance Cost/Item = [(Expected Number of Failures during the Projected Inventory Usage Period) - 1] [(Labor Cost/Failure + Material Cost/Failure + Transportation Cost/Failure)] + [Preventive Maintenance Cost/Item].

Maintenance cost per item is a summation of the costs of labor, material, and transportation expected to be incurred in performing corrective and preventive maintenance on one unit for the Projected Inventory Usage Period (PIUP) of a given item. For the determination of PIUP see the narrative for Block 5 of the decision chart, Chapter 2. The term for the expected number of failures is decreased by one on the assumption that the equipment would be "junked" after the last failure rather than repaired. Equation #1 is a summation of the seven equations which follow, i.e., Equation #1 = [Equation #3] [(Equation #4) + (Equation #5) + (Equation #6)] + [Equation #7], where: Equation #2 is used to solve Equation #3, and Equation #8 is used in the calculations of Equation #7.

b. Equation #2:

Expected usage (in hours) of each item being procured = [(Projected Inventory Usage Period in Months) (Hours of Operation/Month/Installed Item)] [quantity installed] ÷ [the present number of items in the inventory + the quantity of this new procurement].

Since each of the interchangeable and substitutable items possessed will be in an installed status less than 100% of the time, it is necessary to distribute the maintenance costs that will accrue during the PIUP over all items on hand. If this is not accomplished, the quantity being procured will be charged with the costs of many repairs and preventive maintenance actions that will be accrued on items already owned by the Government. The ratio given by [quantity installed] ÷ [the present number of items in the inventory + the quantity of this new procurement] provides a reasonable estimate of the percent of the PIUP during which each of the newly acquired items will be in an active status generating a maintenance requirement.

This equation is equally applicable to an initial procurement when the present number of items in the inventory will be zero. The present number of items in the inventory must be obtained from appropriate sources in each Service and should be reduced to reflect expected condemnations. If data on present inventory are not available, an appropriately documented estimate may be needed. If the procurement is for a small number of items relative to the total inventory (less than 5%), a total stock level or present inventory level may be used as the denominator in Equation #2.

c. Equation #3:

Expected Number of Failures in Projected Inventory Usage Period/Item Being Procured = [Expected Usage (in hours) of Each Item Being Procured] ÷ [Mean Time Between Failure (MTBF)].

d. Equation #4:

Repair Labor Cost/Failure = (maintenance level 1 labor standard to detect, isolate, remove and replace) (maintenance level 1 labor rate) + $\sum_{i=1}^{N}$ (Labor standard to repair at i_{th} maintenance level) (labor rate for repair at i_{th} maintenance level) (% of removals repaired at i_{th} maintenance level/100)
N = the total number of maintenance levels performing actions on the item being procured.

Labor Standards. These should be predicated upon historical data for both the initial and follow-on procurement of an item. For an item being procured for the first time, historical data on a similar item or items may serve as the basis for estimating. For an item subject to re-procurement, the standard should be based upon historical data on that item. Note that all failures are assumed in this equation to be subject to detection, isolation, removal and replacement at the first maintenance level while only the repairs performed at a specific level are subject to the standards at that level. Each Service, through directives or supplements to this interim guide will specify the source of these standards. It may be necessary to consider new labor standards dictated by the new design.

Labor Rates. These rates should be determined by each Service and specified through appropriate directives and supplements to this interim guide.

% of Removals Repaired. These factors are an estimate (or proposal) of the percent of the total repair actions on the item being procured that is expected to take place at each maintenance level. Each Service, through directives and supplements issued subsequent to this interim

guide will specify the sources and procedures to be used in the quantitative determination of these factors.

NOTE: Since the LCC procedure requires proof of compliance for proposed items in the solicitation, the labor standards to repair should be demonstratable during reliability acceptance testing if, in fact, they are to be proposed items.

The offeror should normally be given the opportunity to propose values for either labor standard if he elects to do so.

In the event an option to propose is to be provided in the solicitation, the following procedure should be utilized. As in the case of a "no-bid" option, the quantitative source evaluation checklist will include a predetermined man-hour value adjacent to the block entitled "Labor Standard." Incident to evaluation of his own proposed hardware, any given offeror should determine whether the value for Labor Standard, as designated by the Government, is reasonably representative for his hardware. If it is, no action is required on the part of the offeror, and his submission of the quantitative source evaluation checklist without modification to the value described above shall be interpreted as concurrence with its adequacy. If it is not reasonably representative for his hardware, the offeror shall insert above the Government standard the notation "O.P." (Offeror Proposal) together with the value proposed in lieu

of the Government standard. If the offeror elects to propose his own standard, that section of his response entitled "Rationale in Support of Parameters Predicted by Each Offeror" shall include justification, preferably of an historical nature, or test data supporting the reasonableness of the value or standard he proposed. Moreover, the offeror must agree to subsequently demonstrate during the post-award acceptance test that the value he proposed is correct within any limitations established as a condition of acceptance. The Government will reserve the right to accept or reject the offeror's alternative proposal.

In a situation where the offeror elected to propose his own Labor Standard and the post-award acceptance test of his hardware did not generate failures requiring repair at the proposed maintenance level, then the proposed value should be considered as having been met for purposes of LCC re-computation. Should the acceptance test generate failures which require repair, then the re-computation of LCC should, as a general rule, be based upon the point estimates (averages) of the repair man-hours observed for the repairs generated by the acceptance test.

Because of the probabilistic nature of the acceptance test, modest variations in the sample averages from alleged population averages should be ignored in the post-award re-computation of LCC. In this

connection the following ground rules should apply. When the proposed value of "Labor Standard" is M man-hours, then a variation of less than 10% of M in the sample averages computed as a result of the acceptance test (M_1) should be ignored. Specifically, if $M_1 \leq 1.10M$, then M should be used in the re-computation. If $1.10M \leq M_1 \leq 1.20M$, then 1.10M should be used in the post-award re-computation of LCC. If $1.20M \leq M_1 \leq 1.30M$, then 1.20M should be used in the post-award re-computation of LCC, etc. This means that a full 10% degradation of the value in question must occur before it will impact upon the post-award re-computation.

NOTE: The same technique shall be applied where M_1 is less than M.

e. Equation #5:

Repair Material Cost/Failure = $\sum_{i=1}^{N}$ (material cost standard at i_{th} level of maintenance) (percent of removals repaired at i_{th} level/100).

N = the total number of maintenance levels performing actions on the item being procured.

Material Cost Standard. The same concepts, rationale and general procedures should apply in the development of these factors as were followed in the development of the Labor Standards discussed under Equation #4 above. Each Service will specify the data sources and detailed procedures through subsequent directives and supplements to this interim guide.

NOTE: Reference NOTE in Section 6-3d. The same rationale and procedure should apply to Equation #5, except the words "Material Cost Standard" should replace the words "Labor Standard."

f. Equation #6:

Transportation Cost/Failure = [2]* [Weight] (Standard Packing Labor Rate) + (Standard Packing Material Rate) + (Average Shipping Rate X Ratio of Packaged Weight to Unpackaged Weight)] X

$$\left[1 - \frac{\text{\% of Removals Repaired at 1st Maintenance Level}}{100}\right]$$

The sources, data, and standards for the Standard Packing Labor Rate, Standard Packing Material Rate, Average Shipping Rate and Ratio of Packaged Weight to Unpackaged Weight will be developed and presented by each Service subsequent to the issuance of this interim guide.

g. Equation #7:

Preventive Maintenance Costs/Item = [Expected Usage in hours of each item being procured] [Preventive Maintenance Man-hours per Month] [Organizational Labor Rate] ÷ [Hours of Operation/Month/Installed Item].

The separate terms in Equation #7 are defined and discussed in paragraphs 6-3b, 6-3d, and 6-3h.

The "Organizational Labor Rate" is used on the assumption that preventive maintenance is performed at the

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*This element provides for shipment to and from maintenance levels above the first level.

operational level for the equipments covered by this interim guide. When this assumption is known to be incorrect, appropriate modification should be made to Equation #7 to consider the cost of preventive maintenance at higher maintenance echelons.

h. Equation #8:

Preventive Maintenance Man-hours per Month

$$= \sum_{i=1}^{n} \left[F_i\right] \left[R_i\right]$$

F_i = Man-hours to accomplish preventive maintenance action i.

R_i = Number of times preventive maintenance action i must be performed per month.

i = Identification of specific preventive maintenance action.

n = Total number of specific preventive maintenance actions.

Example:

Preventive Maintenance Action	Frequency	Man-hours
#1	Daily	0.1
#2	40 hours	0.5
#3	200 hours	0.3

#1 = Oil four oil wicks and grease eight alemite fittings daily.

#2 = Change crankcase oil and oil filter each 40 operating hours.

#3 = Change spark plugs (8) and reset timing each 200 operating hours.

Operating hours per month (see paragraph 6-3b) 40.

Example solution of Equation #8:

$$\text{Preventive Maintenance Man-hours per Month} = \sum_{i=1}^{3} \left[F_i\right]\left[R_i\right]$$

$$= \left[F_1\right]\left[R_1\right] + \left[F_2\right]\left[R_2\right] + \left[F_3\right]\left[R_3\right]$$

$$= (0.1 \times 30^{*}) + \left(0.5 \times \frac{40}{40}\right) + \left(0.3 \times \frac{40}{200}\right)$$

$$= 3 + 0.5 + 0.06$$

= 3.56 Preventive Maintenance Man-hours per Month.

6-4 Quantitative Source Evaluation Checklist. A checklist for Equations #1 through #8 is provided as Figure 6-1. The checklist indicates, for each element, whether the Government or the offeror is to provide the data for inclusion in the equation. It further shows whether or not an element of data is subject to the offeror's option to provide, and denotes which elements of data are required to be entered by the Government prior to issuance of the solicitation. A checklist in this format is appropriate for use directly in the solicitation provided that appropriate explanations and guidelines are included.

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*Days in a month.

QUANTITATIVE SOURCE EVALUATION CHECKLIST

		A	B	C	D
A. EXPECTED NUMBER OF FAILURES IN PROJECTED INVENTORY USAGE PERIOD PER ITEM BEING PROCURED					
1. Expected usage (in-hours) of each item being procured. (Obtain from line B.6.)	_____	X			
2. MTBF cited by offeror in response to the solicitation.	_____		X		
3. Computation of Equation 3.	_____	X			
B. EXPECTED USAGE (IN-HOURS) OF EACH ITEM BEING PROCURED					
1. Projected inventory usage period in months (determine by review of program documents).	_____	X			X
2. Hours of operation per month (determine by review of program documents).	_____	X			X
3. Total quantity of installed items.	_____	X			X
4. Total of present inventory (installed, spares).	_____	X			X
5. Quantity of this procurement.	_____	X			
6. Computation of Equation 2.	_____	X			

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 6-1 EQUATION CHECKLIST

		A	B	C	D
C.	REPAIR LABOR COST/FAILURE				
	1. First maintenance level labor standard to detect, isolate, remove, replace. _____			X	X
	2. i_{th} maintenance level labor rate. _____	X			X
	3. i_{th} maintenance level labor standard to repair. _____			X	X
	4. % of removals repaired at i_{th} level. _____			X	X
	(Repeat C.2 through C.4 for all expected maintenance levels)				
	5. Computation of Equation 4. _____	X			
D.	REPAIR MATERIAL COST/FAILURE				
	1. i_{th} maintenance level material cost standard. _____			X	X
	2. % of removals repaired at i_{th} maintenance level. (Repeat D.1 and D.2 for all expected main levels). _____			X	X
	3. Computation of Equation 5. _____	X			
E.	TRANSPORTATION COST/FAILURE				
	1. Weight. This will be provided by the offeror in response to the solicitation. _____		X		
	2. Standard Packing Labor Rate. _____	X			X
	3. Standard Packing Material Rate. _____	X			X
	4. Average Shipping Rate. _____	X			X
	5. % of removals repaired at first maintenance level. _____			X	X
	6. Ratio of Packaged to Unpackaged Weight. _____			X	X
	7. Computation of Equation 6. _____	X			

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 6-1 (Continued)

			A	B	C	D
F.	PREVENTIVE MAINTENANCE COSTS/UNIT					
	1. Expected usage in hours of each item being procured. Obtain from B.6.	_____	X			
	2. Operating hours per month. Obtain from B.2.	_____	X			X
	3. Preventive maintenance man-hours per month. Obtain from G.6.	_____	X			
	4. Organizational labor rate. Obtain from C.2.	_____	X			X
	5. Computation of Equation 7.	_____	X			
G.	PREVENTIVE MAINTENANCE MAN-HOURS PER MONTH					
	1. Identification of specific preventive maintenance action. This is provided by the offeror in response to the solicitation.	_____		X		
	2. F_i, man-hours to accomplish preventive maintenance action i. Offeror provides in response to the solicitation.	_____		X		
	3. Number of times preventive maintenance action i must be performed in terms of days, or operating hours. Offeror provides in response to the solicitation. (Repeat G.1 through G.3 for all proposed preventive maintenance actions)	_____		X		
	4. Operating hours per month. Obtain from B.2.	_____	X			X
	5. R_i, calculated using G.3. and G.4. information.	_____	X			
	6. Computation of Equation 8.	_____	X			

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 6-1 (Continued)

H. MAINTENANCE COST PER UNIT		A	B	C	D
1. Expected number of failures during Projected Inventory Usage Period. Obtain from A.3.	_____	X			
2. Labor Cost per Failure. Obtain from C.5.	_____	X			
3. Material Cost per Failure. Obtain from D.3.	_____	X			
4. Transportation Cost per Failure. Obtain from E.7.	_____	X			
5. Preventive Maintenance Cost per Unit. Obtain from F.5.	_____	X			
6. Computation of Equation 1.	_____	X			

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 6-1 (Continued)

Chapter 7

RELIABILITY PREDICTION AND VERIFICATION

7-1 Scope. Reliability prediction and verification are particularly important because reliability determines the frequency of maintenance actions which, in turn, generate maintenance costs and weapon downtime. This chapter focuses primarily on:

a. The guidelines to be followed by the Government engineering staff in assuring a sufficient specification.

b. The guidelines to be followed by offerors in predicting the reliability of their respective hardware.

c. The guidelines to be followed by the Government engineering staff to assess the reasonableness of alternative offerors' predictions.

d. The procedures to be specified by the Government and utilized by the selected contractor in the verification of reliability predictions in a controlled test environment which simulates the operational conditions under which the hardware will subsequently be operated by the Government.

7-2 Figures of Merit. Before considering "how" to specify, predict, and verify, it is essential that "what" to specify, predict, and verify be identified. The figures of merit for the purposes of Life Cycle Cost material acquisitions should include the following:

a. When the item being procured is an item subject to repair, the figure of merit that should be used to evaluate the reliability characteristics of the item is Mean Time Between Failure (MTBF).

b. When the item being procured is an item not subject to repair, a figure of merit that should be used to evaluate the reliability characteristics of the item is Service Life. (Mean Time to Failure or Mean Life). (See Chapter 14).

7-3 Definitization Requirements. The reliability and related demonstration requirements that are to be incorporated in an LCC contract must be sufficiently defined to permit a clear measurement of contractor performance. This entails consideration of the following conditions:

a. Stipulating a figure of merit as set forth in paragraph 7-2 above.

b. Defining what constitutes failures.

c. Prescribing prediction methods.

d. Specifying the techniques that will be utilized by the Government in assessing the reasonableness of the contractor's predictions.

e. Prescribing a statistical test plan.

f. Prescribing the environmental profile that will be utilized for conduct of the acceptance test.

g. Stipulating the time phasing and sample size of the test.

7-4 Initial and Reprocurement Differences. The exact approach used in an initial procurement is generally tailored to the amount of facts and intelligence available on a given item. For the most part, the availability of information depends on whether the item has been previously purchased. Accordingly, the problem of meeting the conditions stipulated in Section 7-3

should be approached along the following lines:

a. On an initial purchase, a two-step method of procurement should be considered. The first step would consist of a request for technical proposal which will, as a minimum, include a requirement that each offeror propose a failure definition; a prediction of MTBF or Service Life and the rationale in support thereof; and a recommended reliability acceptance test, including statistical test plan, environmental profile, time phasing, and sample size. The Government engineering staff will then assess the reasonableness of each offeror's predictions. Inadequacies noted in the proposals will be identified, and every effort will be made to reach a position of mutuality with as many offerors as possible to attain the Government's requirements. When all responsive offerors have been identified, the Government staff would initiate step two by preparing a solicitation for distribution to those offerors who, in step one, submitted technical proposals determined to be acceptable. In preparing the statement of work for the solicitation, the Government should stipulate a single standard approach to reliability verification. This standard approach will incorporate the optimum features identified in the earlier proposals to the extent that such optimization does not constitute an unreasonable infringement upon proprietary rights or unduly restrict open competition. In the second step of the procurement action, each offeror should be required to submit price quotations in the manner prescribed by the solicitation, and may submit price quotations for any or all previously approved technical proposals.

b. For initial procurements and reprocurements, this interim guide makes no attempt to standardize upon a particular statistical test plan. Neither does it discriminate between laboratory type testing and environmental testing wherein the item is installed in actual operational equipment.

7-5 MTBF. Having stipulated that the Mean Time Between Failure (MTBF) should be a figure of merit for items subject to repair, this Section discusses the values of MTBF of interest in a material acquisition using LCC methodology.

a. The first MTBF value of concern is the minimum acceptable MTBF, θ_1, which is to be included in the specification of the item being procured and is based upon field operation of the item or the system or systems upon which the item being procured has been, or is being used, and an MTBF has been observed. This value may be determined by a review of documentation. In some cases it may be readily determined that hardware providing this observed MTBF provides a satisfactory contribution to weapons system effectiveness. In other cases, it may be necessary for the engineering staff to communicate with the operational command or commands utilizing the item or the equipment upon which the item being considered for procurement is used or installed. Notwithstanding the contingency for operational communications, the responsible engineer should determine the value of MTBF that will provide a minimum satisfactory contribution to weapon system effectiveness.

If it is considered practical to conduct a test for reliability measurement (referred to hereafter as a reliability acceptance test) utilizing an environmental profile that, in fact, reasonably simulates operational conditions, then this satisfactory MTBF shall be the value incorporated in the specification as a minimum acceptable MTBF, θ_1. In the event that it is considered impractical to conduct a reliability acceptance test in an environment that reasonably simulates operational conditions, then an appropriate adjustment should be made to the figure arrived at above. This adjusted value will then become the minimum acceptable MTBF, θ_1, incorporated in the specification.

Unfortunately, no specific guidance can be provided to facilitate the adjustment of the minimum acceptable MTBF, θ_1, to compensate for expected variations between the environmental profile of a controlled test and actual operating conditions. Such adjustments and modifications will require the application of judgment upon the part of the engineering staff of the procuring activity. It is extremely important to keep in mind that the minimum acceptable value incorporated in the specification must, in fact, represent the Government's true minimum requirement in order to preclude technological "gold-plating" and the undue restriction of competition.

The minimum acceptable MTBF, θ_1, will serve as a basis for evaluation of the responsiveness of each offeror.

If the Proposed MTBF (subsequently described) is less than the minimum acceptable MTBF set forth in the specification, then the offeror in question would be declared non-responsive to the Government's requirements. If the Proposed MTBF is equal to or greater than the minimum acceptable MTBF stipulated in the specification, then the offeror is responsive.

The specification minimum acceptable MTBF should have one further purpose. The Government reserves the right to terminate the subsequently awarded contract for default in the event that the estimate of MTBF computed from the failures observed during the post-award reliability acceptance test is less than the minimum acceptable MTBF stipulated in the contract. It should be recognized, however, that the practical implementation of default proceedings will depend on whether testing is completed before substantial deliveries of hardware have been made. Therefore, the option to default should only be used in a situation where hardware delivery can be made after the completion of verification tests.

In situations where concurrent testing and delivery are required, consideration should be given to the use of a clause which will require the contractor to rework delivered supplies at his own expense in the event post-award reliability tests demonstrate that the delivered hardware falls short of minimum specification requirements. In the event the contractor selected fails to pass the post-award reliability acceptance test relative to his proposed MTBF, but the estimate of MTBF computed from the failures observed during the reliability acceptance test is, in fact, greater

than the minimum acceptable MTBF, the contractor should be permitted to proceed with performance but the observed degradation in reliability should be considered under the price adjustment provisions of the contract.

b. The next value of MTBF of interest is the Proposed MTBF, which is the value that each offeror should propose to utilize as a specified MTBF, θ_o, incident to the post-award reliability acceptance test.

c. Assuming that an offeror's Proposed MTBF has been found to be responsive, the Proposed MTBF will become the specified MTBF, θ_o, for the reliability acceptance test to be conducted subsequent to contract award. Likewise, the minimum acceptable MTBF, θ_1, to be utilized in the post-award reliability acceptance test will be the same value used in the pre-award determination of responsiveness.

d. The final value of MTBF of interest is the value to be utilized in the post-award recomputation of Life Cycle Costs. This value will be a function of both the Proposed MTBF, θ_o, and the estimate of MTBF obtained in accordance with (1) below. Because of the probabilistic nature of the reliability acceptance test, it will generally be inappropriate to utilize the sample MTBF, figured by dividing the active operative hours by total failures, as the sole basis for recomputation of life cycle costs. Insignificant variations from the Proposed MTBF stipulated for the reliability acceptance test should be ignored. An incremental approach should be employed in measuring gross variations. The rules of order to be applied are:

(1) In the succeeding paragraphs, θ_o denotes the minimum Specified (Proposed) MTBF utilized in the reliability acceptance test, and θ denotes the estimate of MTBF computed by appropriate statistical methods in accordance with the contract.

(2) If the variation between θ and θ_o is 10% or less, then θ_o should be used in the re-computation of life cycle cost.

(3) If the variation between θ and θ_o is less than 20% but more than 10%, then .9 θ_o or 1.1 θ_o, as the case may be, should be utilized in the re-computation of LCC.

(4) If the variation between θ and θ_o is less than 30% but more than 20%, then .8 θ_o or 1.2 θ_o, as the case may be, should be utilized in the re-computation of LCC.

(5) If the variation between θ and θ_o is more than 30%, a similar procedure should be utilized in the re-computation of LCC.

(6) The purpose of these rules of order is to compensate for the probabilistic nature of the reliability acceptance test. A good estimate of the sample mean will not be believed to be quite as good a measure of the population as indicated. Similarly, a bad estimate of the sample mean will not be believed to be quite as bad as its computed value. In effect, degradation or enhancement of MTBF in increments of less than 10% would not be considered. In view of the random variations that may be expected in sampling, application of

such a technique becomes important in order to preclude the post-award assessment of price adjustments which might be unwarranted.

Figure 7-1 illustrates the interrelationship among the various MTBFs used in an LCC procurement and shows three examples of what could occur after reliability testing.

7-6 Reliability Prediction. Each offeror should be advised in the solicitation that his response must include a reasonable rationale supporting the attainability of his Proposed MTBF. Each offeror should further be advised that the procedures which are set forth in the following may be useful:

a. MIL-STD 756 "Reliability Prediction."

b. MIL-HDBK 217 "Reliability Stress and Failure Rate Data for Electronic Equipment."

c. MIL-STD 721 "Definition of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety."

d. MIL-STD 781 "Reliability Tests, Exponential Distribution."

e. MIL-STD 785 "Reliability Program for Systems & Equipment Development and Production."

f. MIL-HDBK 108 "Sampling Procedures and Tables for Life and Reliability Testing."

Conversely, each offeror should be advised that application of the techniques in the above references is not a sufficient basis for the Government's acceptance of the predicted values, that there are no limitations imposed upon the form and content of the rationale to be provided in support of the Proposed MTBF or service life and that it is incumbent upon each offeror to present a convincing case in support of his Proposed MTBF or service life.

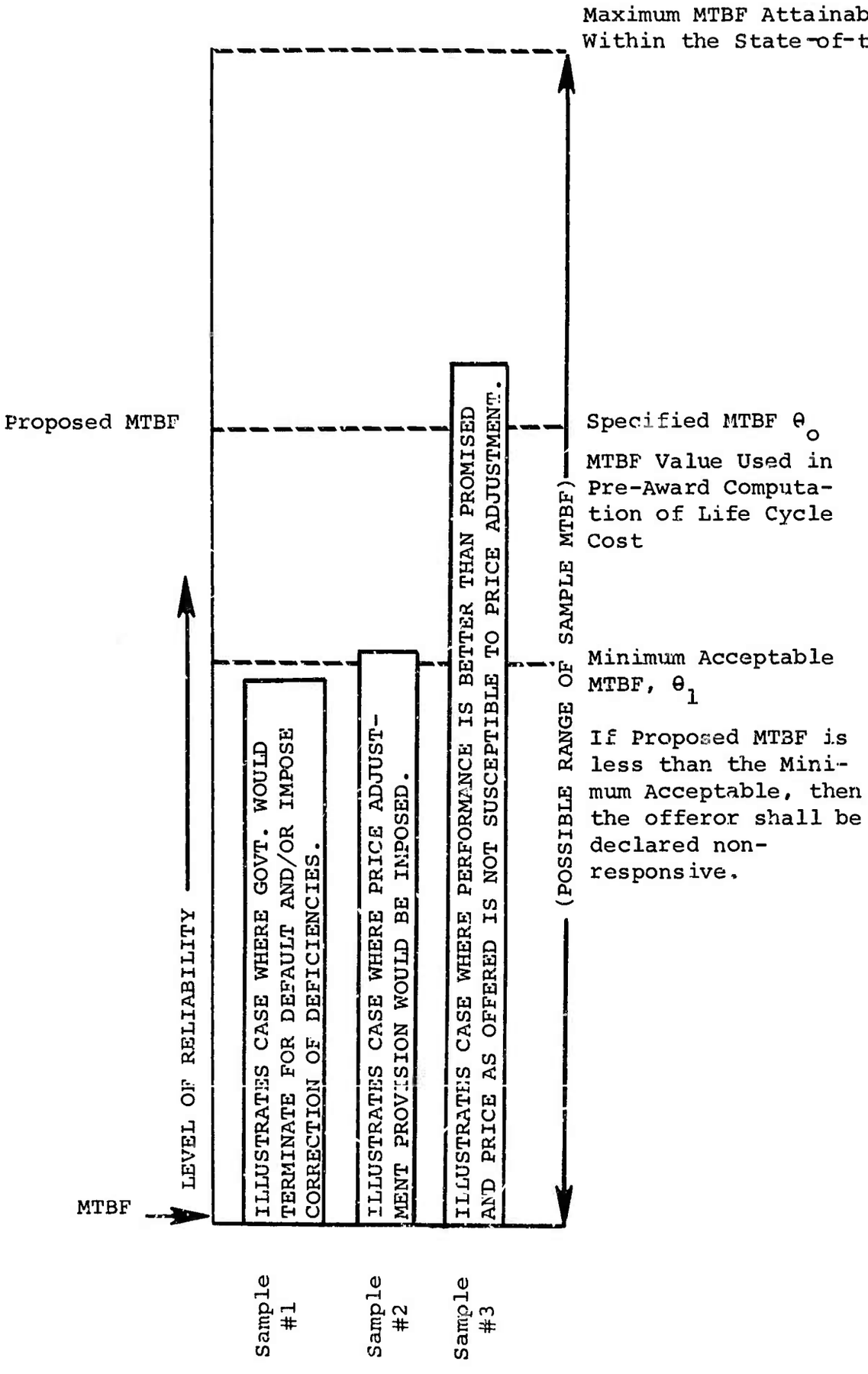

FIGURE 7-1 Illustration of Relationship Among Several MTBF's Used in LCC Procurement

While the above guideline may appear to be of a limited and general nature, it is not considered practical to require strict compliance with published Government procedures for reliability prediction since these procedures are quite heavily oriented to electronic type equipment. If the Government is unable to stipulate a specific methodology for the accomplishment of reliability prediction, it will almost invariably be necessary to use a two-step form of procurement. If the contractor is given a free hand in selecting prediction methodology during the first step, then the Government review of the technical proposals from each offeror creates the opportunity for a dialogue between the Government engineering staff and the offerors' engineering staffs to assess the credibility of each offeror's Proposed MTBF.

7-7 Government Assessment of Reliability Predictions. In those cases where the Government has historical experience on the same or similar hardware, it will be a relatively straightforward matter to assess the reasonableness of an offeror's Proposed MTBF. Likewise, the historical data will provide a basis for resolving differences after receipt of the offeror's technical proposal. Every effort should be made by the Government to identify a maximum number of technically qualified offerors, while at the same time precluding subsequent award to any offeror on the basis of a pre-award LCC computation predicated on an unrealistically high MTBF. In those cases where the Government has no historical experience, the Government engineering staff's assessment of the reasonableness of an offeror's claims will have to be based primarily upon the rationale provided by the offeror. Under these circumstances, the only factor working to assure that Proposed MTBFs will be credible is the threat of a downward price revision or other adjustment for value received as a result of the failure to verify predictions. Nevertheless, the offeror's rationale can

be evaluated and the following may be included in the special conditions section of the solicitation:

"The Proposed MTBF and substantiating rationale submitted by each offeror in response to this solicitation shall be reviewed by the Government engineering staff to ascertain the feasibility of obtaining an accept decision in the reliability acceptance test otherwise described in this solicitation. Upon review of the Proposed MTBF and supporting evidence of its reasonableness, the Government reserves the right to conclude that the Proposed MTBF is not reasonable for the hardware proposed, considering the rationale submitted in support of the Proposed MTBF. In the event that the judgment of the Government engineering staff results in arriving at a conclusion as described above, the Government shall disqualify the offeror in question from participation in the second step of the material acquisition described by this request for technical proposal."

7-8 Definition of Failure. Unless failures are defined accurately, a contractor may well be able to pass the most difficult reliability acceptance test with shoddy equipment, or create enough confusion so that it will be impossible for the Government to invoke a price adjustment provision without encountering litigation which may be more expensive than acceptance of sub-standard equipment at full price. Failures are generally defined in MIL-STD 781. The definition is of a general nature, and MIL-STD 756 recognizes the need of clearly defining failure in a unique way for each item that shall be subjected to a reliability acceptance test. Therefore, the solicitation, or Statement of Work for each material acquisition must tailor the description of equipment failures to the specification and failure modes of the item in question. Specifications vary widely in their adequacy. In some cases it will be possible to develop a satisfactory definition of equipment failure from the information provided in the specification. In other cases it may be necessary for the procuring activity to contact other activities to obtain a sufficient understanding of the equipment failure mechanisms. One very difficult point that must be covered is the discrimination

between operator adjustment and failure correction during the reliability acceptance test. Another is the discrimination between independent and dependent failures and the degree to which censoring of dependent failures will be permitted. Still another difficulty arises in stipulating what will be done in the event pattern failures occur during the reliability acceptance test. There is no single or simple answer to defining failures adequately, and this interim guide does not attempt to provide a standard approach. In view of the above, it is appropriate to incorporate a provision in the solicitation worded substantially as follows:

"Incident to conduct of the reliability acceptance test that will be required to fulfill the requirements of the contract contemplated by this solicitation, certain performance variances from specification and other standards made a part of the contract may occur on equipment undergoing test. The Government reserves the right as the final authority to decide whether or not such performance degradation constitutes equipment failure. Consistent with the above, failures have been defined in this solicitation in such a way that the possibility for disagreement is precluded. Should any offeror have any doubts as to the adequacy with which failures have been defined, such questions as may exist should be submitted in writing to the contracting officer. Within ten days the contracting officer shall respond to all offerors, furnishing each offeror a copy of both the question and answer provided. Further, the contracting officer may, at his discretion, stipulate in response to any or all of said questions that both the question and answer will be incorporated in the definition of failures in the contract to be awarded in response to this solicitation."

It is conceded that the merits of the above provision are subject to debate. Some offerors will undoubtedly attempt to make it a vehicle for extending the response date. There is also the possibility that some offerors with extremely good equipment may use the provision as a device for tightening up the specification requirements to the point where other legitimate offerors will be forced out of the competition. Conversely, the provision should encourage prospective offerors to disclose valid defects in the

failure definition description and, at the same time, mitigate, if not obviate altogether, any post-award claims by the seller.

7-9 Verification Tests and Pre-Award Tests. Reliability Acceptance Testing will generally be accomplished after contract award. For certain items the service life or Mean Time Between Failure may be so large that such an approach would result in unduly delaying completion of the contract. For these items, a truncated test plan may be devised and agreed to in the contract as the only feasible form of testing.

Chapter 8

MAINTAINABILITY

8-1 Introduction. Maintainability engineering in the context of life cycle costing is addressed to the following areas:

a. The first and frequently the primary objective of maintainability engineering is to minimize the amount of system downtime associated with performing corrective and preventive maintenance on an element or elements of a given system.

b. A second aspect of maintainability engineering is the minimization of resources expended in performing preventive and corrective maintenance on some lower level of a system.

8-2 Reference Documents.

a. MIL-HDBK 472 "Maintainability Prediction."

b. MIL-STD 721 "Definition of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety."

c. MIL-STD 470 "Maintainability Program Requirements for Systems and Equipments."

d. MIL-STD 471 "Maintainability Demonstration."

8-3 Maintainability Improvement Techniques. An offeror may be expected to propose improvement of maintainability through application of one or more of the following techniques:

a. Repackaging of high failure rate (low MTBF) items to facilitate removal and replacement.

b. Replacement of high MTTR items with items of the same form, fit and function having lower MTTR.

c. Assuring a high degree of clarity and accuracy in technical manuals and diagrams.

d. Introduction of improved fault isolation techniques through use of improved test equipment.

e. Application of the modular discard-at-failure concept when economically feasible.

f. Minimization of the requirements for peculiar test equipment and tooling.

g. Incorporation of built-in-test equipment to monitor equipment operation and identify defective units to the operator.

h. Introduction of redundant items that can be repaired while the system is operating.

8-4 Prediction Methodology and Data Requirements. This interim guide makes no attempt to dictate the type of maintainability program or maintainability data requirements to be used in an LCC solicitation. The LCC computations of maintenance costs and downtime are discussed in Chapters 6 and 9, respectively, and this chapter is to be considered solely as general information. Maintainability program and data requirements are the subject of numerous service directives, and provisions are made for the contractual incorporation of data requirements by the Data Management directives of the services. Whereas MIL-HDBK-472 may be useful to an offeror in predicting the maintainability parameters required by Chapters 6 and 9, the procuring activity should permit offerors to use any techniques where technical credibility can be established relative to specific type of material being acquired.

8-5 Quantitative Source Evaluation Checklist. The Quantitative Source Evaluation Checklist described in Chapter 6 requires each

offeror to submit data elements pertaining to corrective and preventive maintenance. The same elements of data required in support of the maintenance cost computation will provide the necessary information for assessing such costs as may be associated with weapon system downtime, as described in Chapter 9.

8-6 Maintainability Verification. Those elements of maintainability which are proposed items in any specific life cycle cost procurement will be verified by demonstration, at the same time as the reliability acceptance test.

Chapter 9

OTHER COSTS

9-1 Scope. Emphasis is given in this interim guide to those costs which have a high probability of being considered and included in an LCC procurement. The cost areas of item management, training, operation, and maintenance are usually large enough that they are readily identified as elements of life cycle cost for most hardware and material. There are other life cycle cost elements, however, which may be important for specific equipment or procurements. This chapter deals with these often less visible life cycle cost elements. Personnel responsible for conducting LCC procurements should attempt to include these elements if significant differences among offerors' proposals appear likely and if time permits. The elements discussed in this chapter are:

a. technical data reproduction;
b. delivery;
c. installation, check-out, and dismantling;
d. storage;
e. downtime;
f. pipeline asset differential;
g. terminal value;
h. test equipment.

The above list should not be construed as limiting personnel to those specific elements. Conversely, it is not expected that procurement personnel will attempt to apply all those elements to all LCC procurements.

9-2 Technical Data Reproduction. Procurement of some items may require changes and revisions to training, repair, or operating publications. Totally new publications may be required.

Costs would be incurred in the reproduction, distribution, and maintenance of this new information throughout the projected inventory usage period of the item being procured. These costs are not to be confused with the cost of purchasing reproducible copy, which would be covered in a separate contract line item for deliverable material. For clarity, these costs will be referred to as the Cost of Technical Data Management. Since the Cost of Technical Data Management is not dependent on operating or maintenance parameters, it should be treated as a separate element of cost in the total LCC computation. An equation that is applicable in the determination of this cost would be:

Cost for Technical Data Management = (Number of pages of Technical Publications) (Number of copies to be distributed) (Cost per page for initial reproduction and distribution) + (Cost per page for file maintenance in first year) (Number of pages of Technical Publications) + (Cost per page for file maintenance during second and remaining years of PIUP) $\left(\frac{\text{PIUP}}{12} - 1\right)$ (Number of pages of Technical Data).

EXAMPLE:

a. The offeror states in response to an Air Force solicitation that 44 pages of Technical Data (hard reproducible copies) are required for his item.

b. The applicable Air Force control office states that 1,103 copies are required for distribution.

c. The Air Force estimated cost standard for initial reproduction and distribution of Technical Data is $4.00 per page per 1000 copies or $0.004 per page.

d. The Air Force estimated cost standard for first year file maintenance per reproducible page is $14.00.

e. The Air Force estimated cost standard for second and each remaining years of the PIUP for file maintenance per reproducible page is $6.00.

f. The projected inventory usage period (PIUP) is 120 months.

Therefore:

Cost for Technical Data Management = (44 x 1103 X $0.004) + ($14.00 X 44) + ($6.00 X 9 X 44) = $3,185.00

9-3 Delivery. In many procurements, the hardware and material are purchased on an F.O.B. Offeror's Plant basis. Depending on the location of the offeror's plant with respect to the Government's receiving point, a significant difference in delivery costs can be realized between proposals. If the hardware and material are to be produced in more than one plant and shipped to more than one receiving point, the computation becomes more complicated. The generalized formula is:

> Delivery Cost = the summation of all shipments where the cost of one shipment equals (shipping rate from plant to receiving point) (weight of shipment).

EXAMPLE:

a. The Air Force is purchasing aircraft tires on a performance basis. The offeror proposes to supply 10,776 tires to meet the stated performance requirement.

b. The Air Force stated in the solicitation that shipments were to be made in five equal monthly installments with each shipment divided as follows:

Hill AFB, Utah	20%
Tinker AFB, Oklahoma	60%
Wright-Patterson AFB, Ohio	20%

c. The offeror submitted the following shipment rates, subject to Government verification, from his plant:

TO	$/100 lbs.
Hill AFB	$ 3.44
Tinker AFB	$ 1.22
Wright-Patterson AFB	$ 0.71

d. The offeror submitted a guaranteed maximum weight per tire of 14.7 lbs.

e. The delivery cost computation is:

Total Quantity	10,776
Quantity/month	2,156
Maximum Weight/tire	14.7 lbs.
Total lbs./month	31,693 lbs.

Rates to

Hill AFB	$3.44
Tinker AFB	$1.22
Wright-Patterson AFB	$0.71

Weight Shipped to

Hill AFB	6,338.6 lbs.
Tinker AFB	19,015.8 lbs.
Wright-Patterson AFB	6,338.6 lbs.

Cost/Shipment to

Hill AFB	$ 218.05
Tinker AFB	231.00
Wright-Patterson AFB	45.00
Cost/Shipment	$ 495.04
Total Delivery Cost - 5 Shipments	$2,475.20

9-4 Installation, Check-out, and Dismantling. For many equipments, the installation, check-out and dismantling costs are built into the cost of the item being procured. Thus, a solicitation may be worded so that the successful offeror, as a part of the item purchase, will dismantle and remove the present equipment, install his equipment, hook-up to existing ancillary systems, and check-out the performance of his equipment in place. For large equipments or material acquisitions, dismantling and installation may be separately included as a line item in the solicitation. Thus, a procurement of large stationary engines or replacement of EDP equipment may have separate line items covering the removal of existing equipment, installation of the new equipment, tieing in to existing utilities and auxiliary systems, and pre-operational testing. Likewise, procurements for construction materials, such as roofing, siding, piping, etc., may include the cost of removing the old as well as installing the new. Dismantling and installation could be significant costs for non-reparables where the procurement is based on a performance requirement. For example:

a. The Air Force performed field tests on aircraft tires and determined that the following costs are incurred.

1.	Remove and replace wheel on aircraft.	12 minutes @ $1.70/hr.	$0.34
2.	Dismount old tire and mount new tire on wheel in shop.	84 minutes @ $2.34/hr.	$3.28
3.	Total cost to remove and replace one aircraft tire.		$3.62

b. The Air Force purchased aircraft tires on the basis of number of landings. One procurement was issued for 1,184,760 landings.

c. Company A proposed to supply the landing requirements with 10,776 tires. Company B proposed to supply the landing requirement with 28,245 tires.

d. To accomplish the mission defined by 1,184,760 aircraft landings, the installation and dismantling costs with Company A's tire would be ($3.62 X 10,776) = $39,009.12 while the same mission performed with Company B's tire would cost the Government ($3.62 X 28,245) = $102,246.90.

9-5 Storage. In Chapter 3, the costs of item management were discussed and it was noted that the addition of items new to the inventory increases administrative costs. In Section 9-7, below, the variance in the MTBF and MTTR of equipment is discussed on the basis of the effect on the number of items required to perform the mission for which the items were purchased. Another cost incurred by the Government in both situations is the cost of storage which is defined here to include care, preservation, and packaging. Storage costs money. An investment is required for the storage facility itself and operating and maintenance costs are incurred as long as the storage facility is in operation. For those LCC procurements where the number of separate items may vary or the present Government stock of items is expected to change, procurement personnel should attempt to include storage and warehousing costs in the LCC computation. At this writing, the DOD has not established a standard policy on the cost of storage. Therefore, in this interim guide, it is recommended that all procurement activities conduct appropriate studies on the cost of storage, care, preservation, and packaging and that personnel responsible for conducting LCC procurements follow any directives, guides and manuals supplementary to this interim guide developed by each of the Services.

9-6 Downtime Costs. When a piece of equipment is down for repair, the Government incurs a cost over and above the direct maintenance cost. This added cost is the loss of mission capability. Loss of mission capability is a real cost only when the mission is so critical that additional equipments are purchased to maintain a standby capability or the mission is contracted out for continuance or completion. If the mission is postponable without loss of effectiveness, then the cost of mission loss is only theoretical and need not be considered in an LCC analysis. Purchase of additional items or use of outside contracting can be planned, and therefore included in the LCC computation, on the basis of the proposed MTBF, MTTR, and corrective maintenance procedures. This advance planning is well illustrated by the example in Section 9-4. In that example, the number of tires purchased varied depending on the expected landings per tire (an index analogous to MTBF) so that the Government would be assured of a number of items on hand to accomplish the desired mission. Requirements determination for reparable equipments may be achieved by dividing the total required operating time for all similar equipments on hand during the PIUP, by the net operating time per unit item after considering the proposed MTBF and MTTR.

9-7 Pipeline Asset Differential. Each military service and DOD agency has guidelines for equipment inventory and availability in order to meet its plans and programs. These guides provide a measure of the number of various items required in the inventory. If an offeror submits a proposed MTBF or MTTR which is significantly different from that of similar items presently in the inventory, this pipeline or float requirement may be substantially altered. For each of the Services and for different types of end items within each Service, there are different

objectives for end item availability. Thus, to achieve replacement availability, the Services utilize varying methods of computing requirements and considering safety levels. When appropriate, each procuring activity should consider the effect on maintenance and safety stock float of an LCC procurement and include the cost differences in the solicitation analysis.

9-8 Terminal Value. For most equipments and hardware, it is expected that they would be literally junked, destroyed, or otherwise lose all their economic value at the end of their operating life. This is not true for some hardware and materials however, and, in those procurements where a scrap value or economic utility exists at the end of the PIUP, a residual or terminal value should be considered in the evaluation. For example, EDP equipment may have a PIUP based on expected technological obsolescence to the purchaser. However, experience has shown that a market exists in second-hand EDP equipment. Other items, such as tires, may have a scrap value. When current practice or reasonable expectation indicates a terminal or scrap value, this value should be included in the LCC analysis.

9-9 Test Equipment. In the case of equipment or material which must be tested, new items might well change the test equipment requirements. This change might be to reduce external equipment by the inclusion of built-in test equipment. On the other hand, more precise equipment than is now used in a similar function might be required. The generalized formula is:

Test Equipment Cost = The summation of costs by type and location of all test equipment requirements changed by the offeror.

Chapter 10

VERFICIATION AND PRICE ADJUSTMENT

10-1 Introduction. The purpose of Life Cycle Costing is to insure that the Government obtains hardware and material which will accomplish the stated mission within the established limits and use of that hardware and material at the lowest total cost of ownership. Prior to actual delivery and use, the Government can only rely on the stated proposals of the offeror no matter how well documented. Even in the production of exact copies of existing hardware, the Government can only accept an offeror's promise to deliver exact copies. Only after the hardware and material are delivered, inspected, and used does the Government have actual knowledge of the true cost of ownership. Since the Government awarded a contract on the basis of an offeror's promises, it is necessary that some mechanism be provided that allows the Government to recoup losses suffered as a result of promises broken or otherwise not kept. This chapter presents guidelines on appropriate mechanisms designed to insure receipt of contracted value.

10-2 Equitable Adjustment. It is not in the Government's interest nor equitable to contractors to make price adjustments based on individual LCC elements when the total LCC using tested parameter values is equal to or less than the total LCC proposed by the contractor <u>when the equipment proposed to be delivered to the Government satisfies specified individual parameter values</u>. For example, assume that (i) a solicitation specifies a minimum acceptable MTBF of 200 hours and a maximum useful MTBF of 500 hours, and the award was based on a proposed MTBF of 400 hours, (ii) the contract reflects the same specifications regarding minimum and maximum MTBF as the

solicitation, (iii) the offeror proposed to limit additional new items entering the inventory to 5, and (iv) the equipment delivered has 450 hours MTBF and requires the Government to take 15 new parts into the inventory. In these circumstances, because the improved MTBF exceeds that which was proposed and is within the specified range, the total measured LCC may be less than that which was computed in the original award evaluation. If this is so, it would not be fair and equitable to require a price adjustment because the number of new parts entering the inventory exceeds the number proposed. On the other hand, price adjustment should be applied if the measured total LCC exceeds the proposed LCC or the equipment is not within the specified range of individual parameter values. In all circumstances when computing measured total LCC, the values used will not exceed the upper limits of the values in the specified range.

10-3 Full Recovery. It is the intent of the Department of Defense to obtain full value on all hardware and materials procured. Practical constraints to this intention are discussed in Section 10-4. Full recovery of contracted value may be obtained in three ways; 1) the contractor supplies a number of additional units, over the contracted amount and at no additional cost to the Government, sufficient to achieve the desired functional goal; 2) the unit acquisition price payable to the contractor is adjusted to a value that results in an actual unit cost of ownership equal to the proposed unit cost of ownership; and 3) a lump-sum rebate or payment reduction is levied against the contractor in an amount

equal to the difference between the proposed and the actual cost of ownership. It is understood that, in methods 2) and 3) above, the actual cost of ownership includes only those LCC elements specified in the solicitation as subject to influence by the offeror and verified through post-award inspection, test, and recalculation.

a. Recovery Through Supply. This technique can best be used in procurements where an amount of service is procured rather than a specific number of items. The solicitation requests proposals to supply the stated amount of service and offerors understand that they must supply whatever amount of material is needed to achieve the stated amount of service without any change in the total cost to the Government. One modification of this technique is to establish a Qualified Products List (QPL), determine a service life for each product through testing prior to issuance of the solicitation, and issue the solicitation on the basis of the prior tests with the qualification that the Government reserves the right to retest the article after receipt and adjust the number of items in order to obtain the needed service.

EXAMPLE 1. In this example, the Government wished to purchase aircraft tires. Tires were previously purchased from each manufacturer on the QPL with the understanding that the tires were being purchased for the

purpose of establishing their expected service life and that they were representative of normal production items. Actual service tests were then made and the numbers of landings per tire were found to be:

Company	Landings/Tire
A	110
B	60
C	42

The landings per tire then were defined as Landing Indexes and the subsequent solicitation was based on the number of landings desired. The solicitation provides that the Government may retest delivered production tires under the same conditions as the original test. If the retests yielded a lower Landing Index than previously determined, the manufacturer must deliver sufficient additional tires to give the desired total number of landings without additional cost to the Government. The Landing Index testing procedure allows for the introduction of new tire designs or manufacturers assignment of a Landing Index value and placement on the QPL. An example of appropriate solicitation language is:

NOTICE TO OFFERORS: Procurement will be made for quantities of tires which will provide the number of landings as indicated below. Offers shall be submitted in the space provided for the item(s) which corresponds to the landing index established by each offeror in prior Government Service Evaluation Tests at _____(location)_____.

The quantity of tires upon which each offeror shall submit offers has been computed according to the following formula:

NUMBER OF REQUIRED LANDINGS / LANDING INDEX LOWER LIMIT (XLL) = QUANTITY OF TIRES ON WHICH OFFERS SHALL BE SUBMITTED

NUMBER OF LANDINGS REQUIRED	LANDING INDEX (XLL) Company A	Company B	Company C	ITEM NR	QUANTITY
1,184,760	110			1	10,771
		60		2	19,746
			42	3	28,209

LANDING INDEX WARRANTY

(1) The offeror warrants that production tires delivered under any contract resulting from this Solicitation will provide a landing average equal to or greater than the Index (XLL) upon which the award was based, with a confidence level of 95%, when retested under similar circumstances as follows:

The Government reserves the right to conduct a new controlled Field Service Evaluation of such production tires at the same location and under similar circumstances and conditions as the original test was conducted.

(2) If such retests are deemed necessary by the Government the contractor shall be notified in writing of the date that a new service test will be conducted. Notice of new Field Service Test may be given by the Government at any time within 180 days after final scheduled delivery under this contract, notwithstanding the fact that further extension of time may be required in order that the time period of any retest will coincide with the time period of the original test. Tires shall be selected from the Government stock of the production tires received under this contract. If, upon completion of the test, the new landing average does not meet the above criteria the contractor shall provide additional tires to make up the difference in the number of landings lost. The date of manufacture of the majority of the sample lot selected for retesting will establish the effective date from which to compute the number of tires due to the Government under this warranty. See formula for computing replacement tires in example set forth below. Delivery of replacement tires will be at the same monthly rate as called for in this contract for

the tires already delivered and delivery shall commence not later than 30 calendar days after notification of the results of the new service test. Replacement tires shall be shipped, transportation charges prepaid by the contractor.

(3) The following is an example of the method which will be used by the Government in determining the number of tires requiring replacement under this warranty.

Example:

Contract Awarded for 1,000 Tires:

NUMBER TIRES	X	LANDING INDEX (XLL)	=	NUMBER LANDINGS
1,000	X	20	=	20,000

After delivery of 300 tires a sample lot of 125 tires is selected from production tires for retesting. The test results are:

NUMBER TIRES	X	NEW AVERAGE LANDINGS (95% CONFIDENCE)	=	NUMBER LANDINGS
125	X	15	=	1,875

The number of tires required as replacement is computed as follows:

NUMBER TIRES	X	NEW AVERAGE LANDINGS (95% CONFIDENCE)	=	NUMBER LANDINGS
125	X	15	=	1,875
700	X	15	=	10,500
175*	X	20	=	3,500
		TOTAL		15,875

20,000 - 15,875 = 4,125

4,125 ÷ 15 = 275 tires as replacement

*As noted in Section 2 above, only the tires tested and subsequent tires delivered were assigned the new Landing Index. Tires delivered prior to testing retain the original Landing Index assigned.

(4) This Landing Index Warranty (XLL) is an addition to the clause of this contract entitled "Correction of Deficiencies" and in no way abrogates the "Correction of Deficiencies" clause as to any other contract specification requirement, and any notice remedy, proceeding or other condition not clearly provided for in this clause as to the warranties stated herein shall be governed by the "Correction of Deficiencies" clause.

EXAMPLE 2. This is an example of the providing of a service. The Government purchased an electronic data processing (EDP) installation. The maintenance on this installation was to be provided by the offeror as a separate line item in the solicitation. A number of operating programs (two in this case) were defined by the Government and the solicitation included space for cost proposals on the contractor maintenance to be performed under each program. Depending on the operating program actually used, the contractor would be required to perform all maintenance at the cost stated in his proposal. The clause binding the contractor to his proposed performance would be similar to:

> The contractor shall perform all scheduled and on-call maintenance for a period of ____ years after the date of equipment installation and acceptance by the Government and will bill the Government at his usual rates for services performed. The Government will pay all annual maintenance charges billed up to and including the amounts shown for maintenance on Operating Schedule A or B, whichever is applicable. The Government will not pay for maintenance performed in excess of the amount shown for maintenance on Operating Schedule A or B, whichever is applicable. However, the contractor will continue to provide all scheduled and on-call maintenance after the maximum annual billing amount is exceeded.

b. Recovery Through Unit Price Adjustment. Rather than obtaining the full proposed value in the form of additional equipment, it may be decided that an adjustment in unit price may be most appropriate. This decision must be made prior to the issuance of the solicitation since any price adjustment provisions must be included in the solicitation. A unit price adjustment is very appropriate where the proposed number of units will still meet the functional requirements but total cost of ownership will be changed through a difference from the proposed operating or management cost (operating manpower, fuel, oil, or material consumption, training, inventory and data management, etc.). This method should be considered carefully, though it is by no means precluded, if the maintenance cost element is included since a difference in MTBF or MTTR may require additional units to meet functional requirements. Since total life cycle costs (LCC) have been defined to equal Acquisition Costs (A) + Initial Logistics Costs (I) + Recurring Costs (R), then the unit life cycle cost (ULCC) = (A+I+R)/no. of units purchased. If the post-award tests of the parameters available for the offeror's option result in a higher value of total LCC than that calculated in the solicitation evaluation, then the value of A must be recalculated (A^1) to arrive at the same value of total LCC. The payment to the contractor is then adjusted so that the unit price equals A^1/no. of units purchased. Appropriate solicitation language for this method of value recovery would be:

Price Adjustment

A purpose of this procurement is to minimize the total life cycle cost of ownership of this item to the Government consistent with the required form, fit, and function. Therefore, the offeror whose proposal is accepted will be required to submit samples, as determined by the Government, of his initial production for testing as provided herein. The purpose of the tests specified herein will be to establish the true values of parameters proposed by the offeror and shown on the Quantitative Source Evaluation Checklist or any other point of proposed parameter submission in this solicitation. The Government will then recalculate the total life cycle cost of ownership in the manner shown on the Total LCC Equation Format using the test results for the parameter values. Any parameters not tested will retain their values used in the original solicitation evaluation. If the value of Total LCC using tested parameter values is higher than the value of Total LCC calculated for the olicitation evaluation, the unit price used in the cquisition Cost Equation Format will be adjusted so that Total LCC using tested parameter values will be exactly equal to Total LCC used in the solicitation evaluation. This recalculated unit price based on test results will be the maximum unit price payable by the Government for the items procured herein pending additional testing.

Additional testing on production items may be performed as specified herein for the same parameters tested in the initial production tests specified above. These tests will be made at the discretion of the Government. Using the results of the additional testing, the unit price will be recalculated so that the value of Total LCC will be the same as the value used in determining the unit price prior to the additional testing. If the new unit price as calculated after the additional testing is lower than the unit price in effect prior o the additional testing, the new unit price will become the maximum payable for all item units tested and all item units delivered to the Government subsequent to the additional testing.

he replacement by the contractor at no cost to the overnment of any items whose utility is lost due to

destructive testing as specified by the Government will not be required.

If the unit price in effect at any time during the contract period is less than the unit price originally proposed in the solicitation, the contractor will have the option to request additional testing for the purpose of recalculating the unit price. However, the contractor will pay all costs of testing, including the replacement of items lost through destructive testing, if the contractor requests additional testing. If the contractor requests additional testing, the unit price payable by the Government will not be changed as a result of Total LCC recalculation unless the new unit price is within 5% of the unit price proposed in the original solicitation. Under no circumstances will the Government pay a unit price higher than that proposed in the original solicitation.

c. Recovery Through Lump-Sum Payment. This form of LCC value recovery is merely a variation on the method described in Section 10-2.b. above. For a lump-sum recovery, the unit price as calculated in Section 10-2.b. is cumulated for all items delivered under the contract. The difference between this cumulated value and the sum of all payments made through the contract period is payable by the Government or the contractor, as the case may be.

d. Combination of Item Replacement and Price Adjustment. In some procurements, a loss in the availability of the specific items being procured under one solicitation may compromise the mission attainment desired for those items in addition to resulting in higher cost of ownership to the Government. For instance, if an item as received is tested and found to have a lower MTBF and higher MTTR and operating parameter values, more items will be required in the inventory to attain the desired on-line capability and the total LCC of ownership will

be higher than anticipated. In the procurement of these items, it is desirable to combine item replacement and price adjustment. The solicitation must contain an expected scenario which will specify the operating rate and the time that the equipment is expected to remain in the inventory. Approximate solicitation language may be expressed as follows:

Total Life Cycle Cost

A purpose of this procurement is to minimize the total life cycle cost of ownership to the Government of all items included herein consistent with the required form, fit, and function. One of the elements of total cost of ownership for this procurement is the inventory requirement to maintain the availability of the item in the performance of its function. Therefore, the offeror whose proposal is accepted will be required to supply the number of items specified in this solicitation or the number of items required to meet the mission goal of the Government consistent with the offeror's proposed MTBF and MTTR, whichever is greater. In addition, the mission and cost objectives as proposed by the offeror in this solicitation will be maintained as the goal of the Government and all recalculations of unit price and quantity requirements will be such that Total LCC will not be higher than the value calculated in the original solicitation evaluation. Therefore, the offeror whose proposal is accepted will be required to submit samples, as determined by the Government, of his initial production for testing as described herein. The purpose of the tests specified herein will be to establish the true values of parameters proposed by the offeror and shown on the Quantitative Source Evaluation Checklist or any other point of proposed parameter submission in this solicitation. The Government will then recalculate the total life cycle cost of ownership and the number of item units required to meet the original availability calculated from the offeror's proposed MTBF and MTTR. Any parameters not tested will retain their values used in the original solicitation evaluation.

As a result of the above calculation, this contract will be automatically amended to show the required number of

item units to be either the number originally specified in the solicitation or the number resulting from the above calculation, whichever is greater.

Using the number of units in the amended contract as specified in the preceding paragraph, and the cost parameters stated in the original solicitation as amended by the initial production tests, the unit price for the amended number of item units will be recalculated so that the Total LCC, as defined on the Cost Equation Formats, will be exactly the same on the contract amended under the terms of the preceding paragraph as the Total LCC calculated in the solicitation evaluation.

Clauses similar to those shown in Section 10-2.b. above should be included to cover additional testing at the request of either the Government or the contractor.

As an example of the combination of item replacement and price adjustment, note Example 1 in Section 10-2.a. and installation cost data in Section 9-4.a. The two references may be combined in a manner similar to the following:

Example:

Contract awarded for 1,000 tires:

NUMBER TIRES	X	LANDING INDEX (XLL)	=	NUMBER LANDINGS
1,000	X	20	=	20,000

After delivery of 300 tires a sample lot of 125 tires is selected from production tires for retesting. The test results are:

NUMBER TIRES	X	NEW AVERAGE LANDINGS (95% CONFIDENCE)	=	NUMBER LANDINGS
125	X	15	=	1,875

The number of tires required as replacement is computed as follows:

NUMBER TIRES	X	NEW AVERAGE LANDINGS (95% CONFIDENCE)	=	NUMBER LANDINGS
125	X	15	=	1,875
700	X	15	=	10,500
175	X	20	=	3,500
			TOTAL	15,875

20,000 - 15,875 = 4,125

4,125 ÷ 15 = 275 tires as replacement

In addition, the Government has determined by the testing procedures noted elsewhere in this solicitation, that the total cost to the Government to remove and replace one aircraft tire is $3.62.

This cost to remove and replace has been used in the bid evaluation procedures shown elsewhere in this solicitation to determine the total life cycle cost to the Government of purchasing and owning the tires covered by this solicitation as well as the successful bidder to this solicitation.

Therefore, the total payment to the contractor will be reduced by the amount $3.62 x 275 = $995.50 to cover the added cost to the Government of receiving and using the replacement tires calculated above.

10-4 Partial Recovery. As noted in Section 10-2 above, it is the intent of the Department of Defense to obtain full value on all hardware and materials procured. However, it is also realized that, for some procurements, the magnitude of the total cost of ownership is so large compared to the acquisition cost that potential offerors may not submit proposals because of the risk of financial disaster or that full recovery may be impossible. For instance, engines with a total acquisition cost of $10,000,000 may consume hundreds of millions of dollars worth of fuel during their anticipated service life. A 10% difference between proposed and actual fuel consumption rate would result in an LCC difference greater than the total revenue to the

offeror and possibly greater than the worth of his business. It is therefore necessary to permit some compromise mechanism that will motivate offerors to provide full value and compensate the Government for the unexpected loss of anticipated value.

At this time, the Department of Defense cannot specify the exact form of partial penalty to be applied in all cases where such a partial penalty is justified. It will therefore be left to the executive judgment of the contracting officer or the appropriate administrator of procurement policy in each service or agency to decide on the exact form of partial penalty applicable to a specific procurement. It is noted that some apparent success has been achieved in LCC test cases where the penalty has been: a) a stated fraction of the difference between actual and proposed LCC or, b) a variable fraction of the difference between actual and proposed LCC based on the relationship between acquisition and total life cycle cost of ownership. It is expected that the final decision on the form of partial penalty will include consideration of the best bargain that could be negotiated by the Government, considering the risk involved in producing the item and the possible deviation of test results from actual value.

Chapter 11
DISCOUNTING COSTS

11-1 Scope. Prior to the preparation of an LCC solicitation for an item subject to repair, it is essential that the procuring activity reach a fully supportable position with regard to the PIUP. This chapter discusses the effect of PIUP choice on life cycle costs and extension of this effect when discounting of future cash-flows is done according to DOD Instruction 7041.3.

a. It must be recognized that the time period of the PIUP (effective economic life to the Government) will significantly affect the relative impact of Recurring (R) cost in the overall LCC evaluation. For proposal evaluation purposes, LCC = Acquisition (A) cost + Initial Logistics (I) cost + Recurring (R) cost, where the objective is to award the contract to that offeror whose item will result in the lowest LCC to the Government. If the PIUP is long, greater emphasis will be placed upon the R costs; conversely, a short PIUP will emphasize low unit acquisition price.

b. Once the PIUP has been selected, it is important to recognize that the LCC dollars being considered fall into two categories:

(1) "A & I" dollars which will usually be spent over the first year of contract performance.

(2) "R" dollars which will usually be spent over the entire PIUP. Therefore, the Government may be faced with a situation where one offeror's hardware might cost less to buy but more to maintain and operate, and an alternative offeror's hardware might cost more initially but less to

maintain and operate over the PIUP. In this situation there will be some time frame over which LCC will be minimized if the contract is awarded to the second offeror.

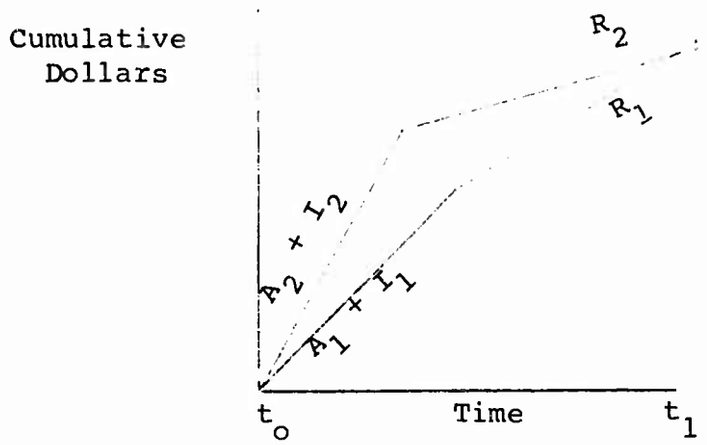

FIGURE 11-1 EFFECTS OF TIME ON LIFE CYCLE COSTS

As seen on Figure 11-1, if the PIUP is less than $(t_1 - t_o)$, then the item proposed by Offeror 1 will minimize cost to the Government. If the PIUP is greater than $(t_1 - t_o)$, then the item proposed by Offeror 2 will minimize cost to the Government.

11-2 Discounting Cash Flows. The basic reason for using a discounted cash flow or present value analysis is to provide a management decision-making tool in choosing among alternative investment opportunities. Conceptually, the rationale behind discounting future cash flows is the realization that the deferral of expenditures allows the present use of money in alternative investments which will yield some beneficial return. If funds must be expended in the present, their use in alternative investments is lost. The criterion of choice is therefore the discount factor which is a measure of the alternative beneficial rate of

return. In applying discounting or present value techniques to LCC procurements, it is very important to choose supportable values for the PIUP as well as a reasonable estimate of the expected cash flows during the PIUP. It is then necessary to apply the appropriate discount factor to each flow increment to obtain the correct present value.

11-3 Criteria for Application to LCC. To obtain consistency among LCC procurements as well as consistency with other DoD investment analyses, the following criteria will apply in the application of discounting to LCC procurement.

a. Personnel responsible for LCC procurements in each procuring activity will become thoroughly familiar with DoD Instruction 7041.3, 26 February, 1969, as well as any subsequent changes and supplementary information as may be issued by the Services.

b. Discounting of future cash flows to arrive at a present value should be done only for items subject to repair. Items not subject to repair which may have a residual value or maintenance costs should also use discounting in proposal evaluation.

c. The discount rate will be the rate specified in DOD Instruction 7041.3.

d. The zero time point (the point in time to which all cash flows and proposals will be discounted) will be the point of contract award.

e. Acquisition costs will be considered to be incurred uniformly over the period of acquisition. This is an especially important consideration for a multi-year procurement where acquisitions will take place over a number of years in the future.

f. Initial logistics, recurring, and termination costs will be considered to be incurred uniformly over the year of incurrence.

g. A notification that discounting will be used and a statement of the specific discount rate must be in the solicitation and, for a two-step procurement, this notification must be included in the first step.

h. The above criteria may be modified in specific procurements if the modifications are supportable under the provisions of DOD Instruction 7041.3, 26 February, 1969.

11-4 The Discount Factor. The specific factors to be used in discounting life cycle costs to a present value will be those shown in DOD Instruction 7041.3, 26 February, 1969. Extensions or modifications of the factors may be used if supplied by the appropriate office responsible for the implementation of DOD Instruction 7041.3.

Chapter 12

PREPARATION OF THE SOLICITATION

12-1 Introduction. The role and responsibilities of procurement personnel in life cycle costing require a greater involvement than normally expected in most procurement actions. The other chapters of this interim guide present a complete set of procurement guidelines and philosophy for LCC. It is impractical to reconstruct all of this in one chapter inasmuch as each point must be read and understood in the context of the subject matter to which it pertains. It is, therefore, essential that procurement personnel involved in an LCC acquisition become familiar with the contents of this interim guide. Experience indicates that LCC can be successfully applied to both formally advertised and negotiated procurements. In either case, adequate price and technical competition are prerequisites to the success of an LCC procurement.

12-2 Life Cycle Procurement Packages. The solicitation will contain, as nearly as possible, all of the documentation required to accomplish an LCC transaction. This documentation shall include, but need not be limited to, the following:

a. A Purchase Request setting forth known requirements.

b. A Statement of Work or Purchase Description which has been approved by the LCC Team, as described in Section 1-5. It is imperative that the Statement of Work or Purchase Description be written in such a manner as to insure that its contents will permit free and open competition.

c. Contract award evaluation criteria and a related checklist which will set forth all of the constant and variable factors and the method of computation to be employed in calculating the LCC for each offeror's product.

12-3 Statement of Work or Purchase Description. The Statement of Work or Purchase Description, as the case may be, should be as complete as possible and in sufficient detail to minimize the effort expended in preparing the solicitation. Special provisions applicable to a specific procurement will be prepared by responsible technical personnel and forwarded with the purchase request. It is recognized that in some cases it may be necessary for the buyer to develop additional special provisions for the purpose of highlighting specific aspects or objectives of the individual procurement.

12-4 General Award Criteria. It is expected that each solicitation will include a statement which sets forth the LCC philosophy substantially as follows:

a. For Items Not Subject to Repair. "In accordance with the Armed Services Procurement Act of 1947, it is the policy of the Department of Defense to procure supplies and services from responsible sources at fair and reasonable prices calculated to result in the lowest overall cost to the government. In furtherance of this policy, award of a contract based on this solicitation will be made to that responsive and responsible offeror whose product provides the lowest cost per unit of service life computed in accordance with the award evaluation criteria contained herein."

b. For Items Subject to Repair. "In accordance with the Armed Services Procurement Act of 1947, it is the policy of the Department of Defense to procure supplies and services from responsible sources at fair and reasonable prices calculated to result in the lowest overall cost to the government. In furtherance of this policy, award of a contract based on this

solicitation will be made to that responsive and responsible offeror whose product results in the lowest total cost of ownership to the government computed in accordance with the award evaluation criteria contained herein. Cost of ownership is defined to include acquisition costs, initial logistic costs, and those recurring and termination costs associated with the management, operation, maintenance, and condemnation of the item called for by this solicitation for the projected life cycle period set forth herein."

12-5 Other Requirements. In addition, each solicitation for an LCC procurement will normally include the following features:

a. For Items Not Subject to Repair.

(1) A statement that award will be based upon lowest cost per unit of service life.

(2) A statement indicating the lowest acceptable service life.

(3) A formula and factors indicating how service life will be calculated.

(4) A requirement for the offeror to submit his rationale in support of his proposed service life including the Government options related thereto.

(5) A statement indicating the method by which the claimed service life will be validated; usually this is in the form of a reliability test program.

(6) A clear definition of failures.

(7) A clause for adjusting the contract unit price downward in the event the post-award reliability tests demonstrate that the production articles do not meet the service life predicted by the offeror and used as a basis for contract award.

b. For Items Subject to Repair.

(1) A statement that award will be based upon the lowest calculated total life cycle costs.

(2) A projected inventory usage period.

(3) A maintenance concept.

(4) A statement of the elements which will be included and evaluated in the life cycle cost.

(5) Factors and formulas for calculating total life cycle costs.

(6) A statement of the information and/or rationale required from the offeror in support of his proposed values, including the Government options related thereto.

(7) Requirements for the reliability and/or maintainability testing program which will be used to calculate such parameters as MTBF and MTTR.

(8) A statement indicating that LCC costs will be recalculated based upon reliability testing results and other observed conditions prior to final contract payment.

(9) A clause to adjust the contract unit price downward in the event that recalculated LCC costs exceed proposed LCC costs.

12-6 Price Adjustment Features. The objective of LCC, as stated throughout this interim guide, is to make competitive awards on the basis of the lowest total cost of ownership to the Government. Except in those instances where the results of pre-award tests will be available, LCC awards will be made in large part on the basis of competing offerors' unverified claims. Offerors must be encouraged to submit realistic proposals with attainable objectives. Moreover, it is essential that the Government be protected in the event that the manufacturer's product selected for award, after translating its proposed characteristics into dollars, fails to perform or meet the LCC proposed by the contractor. Accordingly, each LCC contract shall contain a "Price Adjustment Provision," which will act as a motivational force and at the same time

adequately compensate the Government in the event the item procured does not achieve the economic goals predicted and proposed by the successful offeror. The recomputation of LCC should be made by the procuring contracting officer following the completion of all testing required in accordance with the contract and upon receipt of documented data verifying the actual experience related to all variables utilized in the original award evaluation. If the computation reveals that the measured LCC of the item is equal to or less than the proposed LCC, no further action should be required. Should the computation reveal that the measured LCC exceeds the proposed LCC, then a price adjustment provision should be applied. Under no circumstances should final payment be accomplished until all LCC computations required under the contract have been completed.

Chapter 13

EVALUATION OF PROPOSALS

13-1 Non-Reparable Items. For items not subject to repair, the evaluation is rather simple. The formula $CSL = \frac{UP + UL}{MTTF}$ is used where CSL is the cost per unit of service life to be calculated, UP is the proposed item unit price submitted by the offeror, and MTTF is the proposed mean time to failure (operating life) submitted by the offeror. The unit logistics cost (UL), consisting of all the cost elements associated with ownership of the item, except for the unit price, is sometimes a constant for all offerors as determined by the requiring activity. However, it is recommended that each procuring activity consider the possibility of allowing an offeror to propose a value of unit logistics cost (UL) so that improvements developed by individual offerors can be advantageously utilized by the Government.

EXAMPLE: The offeror's proposed unit price is $500, the proposed MTTF (service life) is 200 hours and the Government-determined logistics cost is $150 per unit. The evaluation would be $\frac{\$500 + \$150}{200} = \$3.25$ LCC cost per hour of service life. Note that the same formula can be used with other criteria rather than service life such as cost per landing for aircraft tires or cost per charge/recharge cycle per battery, etc.

13-2 Reparable Items. For items subject to repair, the evaluation become more complex. Calendar times become more important in the evaluation. Costs should be categorized as Acquisition, Initial, or Recurring Costs as defined in Section 1-9. The categories should then be appropriately discounted (Chapter 11) and summed to arrive at a Total

Life Cycle Cost. It is advisable to prepare appropriate formats for such an evaluation and to include the formats in the solicitation.

13-3 Checklists. The detailed elements which collectively comprise the "I" and "R" costs will be identified by the requiring activity as being applicable to the individual procurement. They will then be assembled in a format suitable for incorporation into the solicitation. Such a format has been illustrated with respect to the computation of corrective and preventive maintenance costs (see Chapter 6) and training (see Chapter 4). The format must clearly indicate to the offeror the cost elements which must be supplied by him, how they will be used in each computation, and how they will be aggregated to determine the proposed LCC. While the final responsibility for accomplishing LCC evaluations rests with the contracting officer working with the designated LCC office and team, certain segments of the evaluation may be delegated by him to persons in other functional areas who have the professional skills and knowledge required to properly evaluate individual segments of the LCC cost.

It is recommended that a comprehensive, summary checklist be prepared and included in the solicitation. This checklist would serve a dual purpose. It would remind the contracting officer of the LCC elements included or excluded in a specific procurement and would provide a convenient checklist for potential offerors to assure coverage of all pertinent elements. An example of such a checklist is provided below. After each LCC element, the contracting officer would indicate the treatment to be accorded that element in the procurement.

LCC Element Summary Checklist

Element	to be supplied by offeror	not to be supplied, but will be considered in making the award	not applicable to this procurement
(1) Purchase Price			
(2) Delivery Cost			
3) Testing Cost			
(4) Installation Cost			
(5) Inventory Management			
(6) Training			
(7) Service Life and/or MTBF			
(8) Operating Labor			
(9) Operating Materials and Utilities			
(10) Preventive Maintenance			
(11) Corrective Maintenance			
(12) Dismantling			
(13) Residual Value			
(14) Other (list)			

13-4 Proposed Evaluation Format. A sample evaluation format is attached to illustrate the degree to which these factors should be defined. While the attached format includes many of the elements which might comprise "A", "I" and "R" costs, it should not be construed as a complete list of all costs that might go into an LCC computation. It serves only as a model and should be altered, as necessary, to fit the individual case.

EXAMPLE

Total LCC Equation Format

LCC = A + I + R

	OFFEROR 1	OFFEROR 2	OFFEROR 3
Acquisition Cost (A)	$466,100.00	$482,950.00	$536,200.00
Initial Cost (I)	17,200.00	13,095.00	15,650.00
Recurring Cost (R)	180,092.01	153,449.58	134,149.38
Total LCC	$663,392.01	$649,494.58	$685,999.38
Discounted Total LCC	$572,635.21	$568,288.94	$609,570.44

NOTE: Above are examples to illustrate computation of LCC = A + I + R by each cost category. The figures used in the above example are to clarify the computational technique and should in no way be construed as a guide for values expected on any specific contract.

FIGURE 13-1 TOTAL LCC EQUATION FORMAT (EXAMPLE)

EXAMPLE

Acquisition Cost Equation Format

A = (UP) (N) + BTD

A = Acquisition Costs
UP = Unit Price
N = Number of Items to be Procured
BTD = Basic Technical Data

		OFFEROR 1	OFFEROR 2	OFFEROR 3	A	B	C	D
1.	Total Price (UP) (N)	$464,100.00	$481,950.00	$535,500.00	X			
	Unit Price (UP)	1,300.00	1,350.00	1,500.00		X		
	Number of Units (N)	357	357	357	X			
.	Basic Technical Data (BTD)	2,000.00	1,000.00	700.00		X		
3.	Total Acquisition Cost (A)	$466,100.00	$482,950.00	$536,200.00	X			
4.	Discounting Factor (DF)	0.954	0.954	0.954	X			
5.	Present Value-Acquisition Cost	$444,659.40	$460.734.30	$511,534.80	X			

NOTE: Above are examples to illustrate computation of A = (UP) (N) + BTD by each cost category. The figures and format used in the above example are to clarify the computational technique and should in no way be construed as a guide for values or specific format expected on any specific contract.

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 13-2 ACQUISITION COST EQUATION FORMAT (EXAMPLE)

EXAMPLE

Initial Logistic Cost Equation Format

I = TDMI + IMCI + TSTG

I = Initial Logistics
TDMI = Technical Data Mgt. Initial
IMCI = Item Mgt. Cost Initial
TSTG = Acceptance/Reliability Testing (Govt.)

	OFFEROR 1	OFFEROR 2	OFFEROR 3	A	B	C	D
1. (TDMI)							
Technical Data	$ 7,200.00	$ 5,850.00	$ 8,400.00	X			
Number of Pages	400	325	475		X		
Number of cys distribution	1,000	1,000	1,000	X			X
Cost/page for initial reproduction & dist.	.004	.004	.004	X			X
Cost/page for file maintenance 1st year	$ 14.00	$ 14.00	$ 14.00	X			X
NOTE: Refer to para.___, page ___ for computation.							
2. (IMCI)							
Item Mgt Cost Initial	$ 8,000.00	$ 6,500.00	$ 5,000.00	X			
Number of new Items ("P" coded)	80	65	50				
One-time item entry costs (per new item)	$ 100.00	$ 100.00	$ 100.00	X			X
NOTE: Refer to para.___,							
3. (TSTG)							
Acceptance/Reliability Testing	$ 2,000.00	$ 745.00	$ 2,250.00	X			
4. (I)							
Total Initial Logistic Cost	$ 17,200.00	$ 13,095.00	$ 15,650.00	X			

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 13-3 INITIAL LOGISTIC COST EQUATION FORMAT (EXAMPLE)

FIGURE 13-3 (Continued)

	OFFEROR 1	OFFEROR 2	OFFEROR 3	A	B	C	D
5. Discounting Factor	0.954	0.954	0.954	X			
6. Present Value-Initial Logistic Cost	$16,408.80	$12,492.63	$14,930.10	X			

NOTE: Above are examples to illustrate computation of I = IDMI + IMCI + TSTG by each cost category. The figures and format used in the above example are to clarify the computational technique and should in no way be construed as a guide for values or specific format expected on any specific contract.

EXAMPLE

Recurring Costs Equation Format

R = TDMR + IMCR + MC

R = Recurring Cost
TDMR = Technical Data Mgt. Recurring
IMCR = Item Mgt. Cost Recurring
MC = Maintenance Cost

	OFFEROR 1	OFFEROR 2	OFFEROR 3	A	B	C	D
1. Technical Data Recurring	$22,800.00	$18,525.00	$27,075.00	X			
Number of Pages	400	325	475		X		
Cost/page for file maintenance 2nd & subsequent years	6.00	6.00	6.00	X X			X X

NOTE: Refer to para. ___, page ___ for computation.

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 13-4 RECURRING COSTS EQUATION FORMAT (EXAMPLE)

FIGURE 13-4 (Continued)

	OFFEROR 1	OFFEROR 2	OFFEROR 3	A	B	C	D
2. (IMCR) Item Mgt. Cost Recurring	$ 76,000.00	$ 61,750.00	$ 47,500.00	X			
Number of new Items ("P" Coded)	80	65	50	X			
Recurring Annual Material Mgt Cost (per new item)	100.00	100.00	100.00	X			X
NOTE: Refer to para. ___, page ___ for computation.							
3. (MC) Maintenance Cost	$ 81,292.01	$ 73,174.58	$ 59,574.38	X			
NOTE: Refer to para. ___, page ___ for computation.							
4. (R) Total Recurring Cost	$180,092.01	$153,449.58	$134,149.38	X			
5. (DF) Discounting Factor	0.6195	0.6195	0.6195	X			
6. Present Value - Recurring Costs	$111,567.01	$ 95,062.01	$ 83,105.54	X			

NOTE: Above are examples to illustrate computation of R = TDMR + IMCR + MC by each cost category. The figures and format used in the above example are to clarify the computational technique and should in no way be construed as a guide for values or specific format expected on any specific contract.

A. Government Shall Enter
B. Offeror Shall Enter
C. Government Shall Enter With Offeror's Option
D. Entry Shall Be Made Prior to Solicitation Preparation

FIGURE 13-4 RECURRING COSTS EQUATION FORMAT (EXAMPLE)

Chapter 14
NON-RECOVERABLE ITEMS

14-1 Introduction. This interim guide has been structured according to general cost areas (operation, item management, maintenance, etc.). Each chapter has presented general guidelines to be followed in applying LCC to a specific cost area in all procurements and for all hardware and materials when applicable. One category of hardware and material, however, is sufficiently unique in LCC application that it is worthy of special discussion. This is the category of non-recoverable items. This chapter deals only with non-recoverable items and discusses the guidelines to be followed in applying LCC to this category of equipments.

14-2 Definition. A non-recoverable item is any item which will not be repaired and returned to service upon failure or expiration of its utility. A non-recoverable item may be reparable or maintainable. However, a decision has been made that it is uneconomical to repair and maintain the item.

14-3 Changes Between Recoverability and Non-Recoverability. Application of the LCC methodology in a theoretically correct manner allows for a change of category at the discretion of the offerors. The solicitation for an item now being repaired and returned to service should permit submission of a proposal to provide an item which would be discarded upon failure. The criteria for choosing among submitted proposals would be lowest life cycle cost rather than the reparability of the item. Conversely, an offeror should be permitted to submit a proposal changing a presently-discarded item to a reparable one if the change is proven to be economically feasible using LCC. A practical difficulty is recognized however, in the theoretical application of this convertability principle.

It would be possible for an item to fluctuate between recoverability and non-recoverability with each procurement of an incremental requirement resulting in serious confusion in inventory management. Therefore, each procuring activity should establish guidelines covering the frequency of category conversion permitted for the various classes of items which it procures. A typical guideline may include a time limitation in addition to a value limitation. For instance, an activity may determine that it would be uneconomical for an item to change categories more than once every three years unless there was to be at least a 20% improvement in life cycle costs.

14-4 Figure of Merit.

(1) For non-recoverable items, the figure of merit should be the unit life cycle cost per unit of service life. In equation form, this is shown as

$$\$/\text{service life unit} = \frac{\text{all life cycle costs}}{\text{expected units of service life}}$$

(2) It is important that all life cycle costs included in the numerator of the equation above be in total dollar terms (i.e., not in terms of $/unit or $/year, etc.). For instance, if the expected units of service life will span a two-year period, then cost criteria usually shown as dollars per year should be multiplied by two to obtain the total dollar cost expected to be spent for that LCC element. Care should be taken to insure that all applicable costs are included. Examples of LCC element applicable

to non-recoverable items, are acquisition price, testing costs, transportation charges, dismantling and installation costs, operating and corrective maintenance (if any) costs, and inventory management costs.

(3) The units of service life should be expressed in readily understood units or units widely accepted through custom. Thus, the service life unit for vehicle tires would be miles, landings for aircraft tires, hours for light bulbs, etc. Combinations of units may be obtained by properly structuring the testing procedures. For instance, the number of off-on cycles may be a requirement for light bulbs in addition to hours of operation. The verification tests would be structured to include the minimum number of expected off-on cycle in the determination of bulb life.

14-5 Verification of Actual Cost. In Section 13-1, the formula $CSL = \frac{UP + UL}{MTTF}$ is used to evaluate the cost per unit of service life (CSL). In both that Section and in Section 14-4.2. above, it is noted that a number of cost categories can be included in the unit logistics cost (UL) and that the offeror may be permitted to submit proposals on various parameters in addition to the mean time to failure (MTTF) and unit price (UP). All parameters proposed by the offeror should be subject to verification testing. The discussion in Chapter 7 is applicable here to the verification of MTTF. All cost parameters should be tested by appropriate procedures as developed by Government technical personnel.

14-6 Application of LCC Elements. The chapters in this interim guide cover individual cost categories. Use of these categories for non-recoverable items are discussed in each chapter together with the application to reparable items. As an aid in using this interim guide for the LCC procurement of non-recoverable items, the following table is a listing of LCC subjects and the Section where guidance may be found for application to non-recoverables.

Subject	Section
Item selection	2-2 and 2-3
Item management	Only one item involved. See Chapter 3 for development of concept of management cost
Training	Chapter 4
Operating costs	Chapter 5
Preventive maintenance	6-3g, 6-3h, 6-4f, & 6-4g
Figure of merit	7-2b and 14-4
Definitization of reliability requirements	7-3
MTBF (or MTTF)	7-5
Reliability Prediction	7-6
Government assessment	7-7
Technical data costs	9-2
Delivery costs	9-3
Installation, check-out and dismantling	9-4
Storage	9-5
Downtime	9-6
Pipeline Asset Differential	9-7
Terminal value	9-8
Price adjustment	10-2
Solicitation requirements	12-4, and 12-5
Solicitation evaluation	13-1, 13-3, 13-4

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