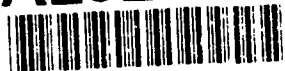


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OPERATING AND SUPPORT
COST-ESTIMATING GUIDE

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OFFICE OF THE SECRETARY OF DEFENSE
COST ANALYSIS IMPROVEMENT GROUP

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OFFICE OF THE SECRETARY OF DEFENSE
COST ANALYSIS IMPROVEMENT GROUP

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14. ABSTRACT (Maximum 200 words) This document provides guidelines for preparing, documenting, and presenting operating and support (O&S) cost estimates to the Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG). It discusses the requirements for O&S cost estimates, provides instructions for developing such estimates, and presents standard cost element structures (CES) and definitions for specific categories of weapon systems including aircraft, ships, missiles, combat vehicles, and electronic systems. Documentations and presentation requirements also are provided to assist in preparing for CAIG reviews. The primary objective of the guidelines is to achieve consistent, well-documented O&S cost estimates that can be replicated and verified by an independent party.				
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PREFACE

This guide was prepared by the Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG) for use by Department of Defense (DoD) components in developing estimates of weapon operating and support (O&S) costs. This guide supersedes previous O&S CAIG guides, and should be considered the authoritative source document for preparing O&S cost estimates.

There has been an increased emphasis on operating and support costs in recent years. Independent review and validation of O&S estimates is critical to informed decisionmaking on major systems that will require the commitment of O&S funds for many years into the future.

This guide implements several DoD instructions and directives that are further explained in Chapter 1. It should be used to prepare O&S cost estimates for systems that will be reviewed by the CAIG. The guide also may be used to develop O&S estimates for weapon systems reviewed outside the Defense Acquisition Board (DAB) process. General guidelines for preparing and documenting O&S estimates are provided in Chapters 3 through 6. Cost element structures and definitions for various categories of major weapon systems are presented in the appendices.

Questions or comments concerning this guide should be addressed to OASD(PA&E), Room 2D278, The Pentagon, Washington, D.C. 20301, or telephone DSN 227-4311 or commercial (703) 697-4311.

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1. INTRODUCTION

1.1 PURPOSE

This document provides guidelines for preparing, documenting, and presenting operating and support (O&S) cost estimates to the Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG). It discusses the requirements for O&S cost estimates, provides instructions for developing such estimates, and presents standard cost element structures and definitions for specific categories of weapon systems. Documentation and presentation requirements also are provided to assist in preparing for CAIG reviews.

The primary objective of the guidelines is to achieve consistent, well-documented O&S cost estimates that can be replicated and verified by an independent party. This document supersedes previously published O&S guides and is the authoritative source of information on preparing O&S cost estimates for CAIG review.

1.2 AUTHORITY AND REFERENCES

The foundation for the development and review of life-cycle cost estimates within the Defense Acquisition Board (DAB) process is described in the documents listed below. These documents identify the responsibilities of the various participants in the acquisition process, from the Office of the Secretary of Defense to Department of Defense (DoD) field activities. The requirement to prepare O&S estimates is discussed primarily in the context of preparing life-cycle cost estimates. The following paragraphs provide brief summaries of the purpose and scope of the major acquisition-related documents:

- **DoDD 5000.49, "Defense Acquisition Board,"** dated September 11, 1989. DoDD 5000.49 implements relevant portions of key DoD acquisition documents and establishes the Defense Acquisition Board as the senior advisory body to the Under Secretary of Defense for Acquisition, with the functions, responsibilities, and authorities necessary to perform its mission.
- **DoDD 5000.1, "Defense Acquisition,"** dated February 23, 1991. DoDD 5000.1 establishes a disciplined approach for acquiring systems and defines the acquisition responsibilities of key officials and forums. The actual authority for each position is described in individual DoD directives. DoDD 5000.1 assigns the CAIG responsibility for providing independent cost estimates in support of the DAB review process.
- **DoDI 5000.2, "Defense Acquisition Management Policies and Procedures,"** dated February 23, 1991. DoDI 5000.2 implements DoDD 5000.1 by establishing a consolidated set of policies and procedures that can be implemented down to the program manager and field operating level without supplementation.
- **DoD 5000.2-M, "Defense Acquisition Management Documentation and Reports,"** dated February 23, 1991. DoDD 5000.2-M establishes procedures and formats for various acquisition-related reports, such as milestone documentations, periodic in-phase status reports, and statutory certifications. The manual is intended for direct implementation by the DoD components without supplementation.
- **DoDD 5000.4, "OSD Cost Analysis Improvement Group"** (revised edition forthcoming). DoDD 5000.4 establishes the CAIG and describes its responsibilities as the cost-estimating advisor to the DAB. It also establishes requirements for preparing and presenting estimates to the CAIG.

These directives and instructions make the CAIG responsible for establishing criteria, standards, procedures, and documentation requirements for cost estimates. After reviewing a cost estimate prepared by a DoD component, the CAIG must submit a report to the DAB presenting its findings.

1.3 APPLICABILITY

This guide focuses primarily on the preparation of O&S cost estimates for major weapon systems that will be reviewed by the CAIG prior to a DAB milestone review or DAB committee program review. The guide also applies to CAIG reviews of cost estimates of systems for which milestone review authority has been delegated to a military department.¹ The guide also may be used for any other O&S cost analyses performed during or after the acquisition process (including cost-effectiveness, trade-off, and design-to-cost impact analyses), whether or not a DAB review is scheduled.

This document explains how to construct a complete O&S estimate. A complete estimate of O&S costs will typically include the costs of personnel, consumables, goods and services, and sustaining support and investments associated with the peacetime operation of a weapon system. The reporting requirements and procedures outlined in subsequent chapters are designed to allow the analyst to choose models and cost-estimating techniques that are appropriate for the particular acquisition milestone and phase at which a system is being reviewed.

¹All acquisition programs are placed into acquisition categories based on specific selection criteria. The acquisition category to which a program is assigned determines the milestone decision authority and reporting requirements for that program. DoDI 5000.2 identifies the selection criteria employed and describes each acquisition category.

2. REQUIREMENT FOR O&S COST ESTIMATES

2.1 INTRODUCTION

The decision to field a new system requires a commitment to support that system for years into the future. Decisions to develop, procure, and support new systems are based on many factors, one of which is the projected cost of the systems over their operational lifetime. Operating and support costs normally constitute a major portion of system life-cycle costs and, therefore, are critical to the evaluation of acquisition alternatives. The foundations from which O&S costs are derived are initial design-to-cost efforts and trade-off studies conducted by the system design team. Trade-off studies that affect O&S costs are reviewed by the DAB committees and are part of the major system acquisition review process within DoD.¹ This chapter presents a brief overview of the life-cycle cost phases of weapons programs, describes the DAB decision process, and discusses the uses of O&S cost estimates in acquisition decisions.

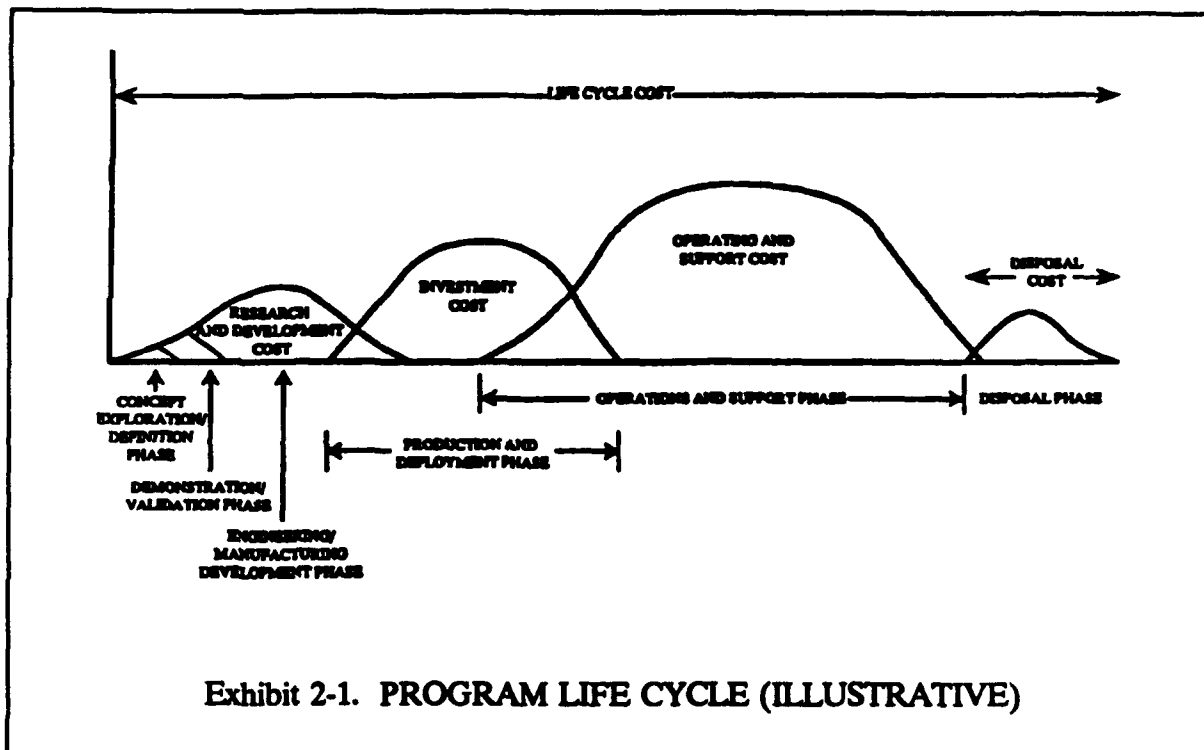
2.2 OVERVIEW OF LIFE-CYCLE COSTS

Since decisions to commit funding are made throughout the acquisition process, it is important to understand the decision milestones and how they relate to the life-cycle cost of a weapon system.

The life cycle of a weapon system begins with the determination of a mission requirement and continues through the engineering and manufacturing development, production and deployment, and operations and support phases to the eventual disposal or

¹DoDI 5000.2, "Defense Acquisition Management Policies," dated February 23, 1991, Part 13, Section A, paragraphs 3.c(3) and 4.n(1)(g)3, and DoDD 5000.1, "Defense Acquisition," dated February 23, 1991, Part 1, paragraph B.3.b.

demilitarization of the system by the government. For purposes of cost estimating, life-cycle costs typically are divided into four components: research and development, investment, operating and support, and disposal. Exhibit 2-1 illustrates the program life cycle and shows how its various phases relate to the phases of a system's life-cycle cost. The figure is intended for illustrative purposes only; actual programs may deviate from the pattern shown.



Depending on the system, costs or spending rates can peak at any phase in the program life cycle. Likewise, spending for a program phase may fall and then rise again, rather than attain a single peak or plateau as shown in the exhibit. Program phases also may overlap considerably. For example, research and development costs in the Engineering and Manufacturing Development (EMD) phase often extend into the Production and Deployment Phase, overlapping with investment costs. Likewise, the Operating and Support

phase overlaps the Production and Deployment phase as systems are deployed. Finally, a program may be so closely related to one or more other programs that these external relationships will influence the amount and phasing of the program's costs. To show how the cost distribution can vary from one program to the next, Exhibit 2-2 provides a breakout of the costs incurred during the key acquisition phases for two different weapon systems.

	<u>R&D</u>	<u>Investment</u>	<u>O&S</u>
F-16 Fighter	2%	20%	78%
M-2 Bradley Fighting Vehicle	2%	14%	84%

**Exhibit 2-2. PERCENTAGE OF LIFE-CYCLE COSTS
INCURRED IN VARIOUS PROGRAM PHASES**

The following paragraphs summarize the primary cost categories associated with each life-cycle phase.

- **Research and Development.** Consists of costs incurred from program initiation at Concept Demonstration and Approval (Milestone I) through the Engineering and Manufacturing Development phase. Includes costs of feasibility studies; modeling; trade-off analyses; engineering design; development, fabrication, assembly, and test of prototype hardware and software; system tests and evaluation; system-specific support equipment; and documentation.
- **Investment.** Consists of costs incurred during the Production and Deployment phase (from Milestone III through completion of deployment). Encompasses costs associated with producing, procuring, and deploying the primary hardware and directly associated hardware and activities, such as system-specific support equipment, training, data, initial spares, and military construction.
- **Operations and Support.** Includes all costs of operating, maintaining, and supporting a fielded system. Encompasses costs for personnel; consumable and repairable materials; organizational, intermediate and depot maintenance; facilities; and sustaining investment. The O&S phase overlaps with the Production and Deployment phase. O&S costs

are incurred in preparation for and after a system's fielding and continue through the end of the system's useful life.

- **Disposal.** Captures costs associated with deactivating or disposing of a military system at the end of its useful life. These costs typically represent only a small fraction of a system's life-cycle cost and are excluded from most analyses. The main exceptions (for which estimates must be provided) are disposal of nuclear waste, missile propellants, and other materials requiring detoxification or special handling.

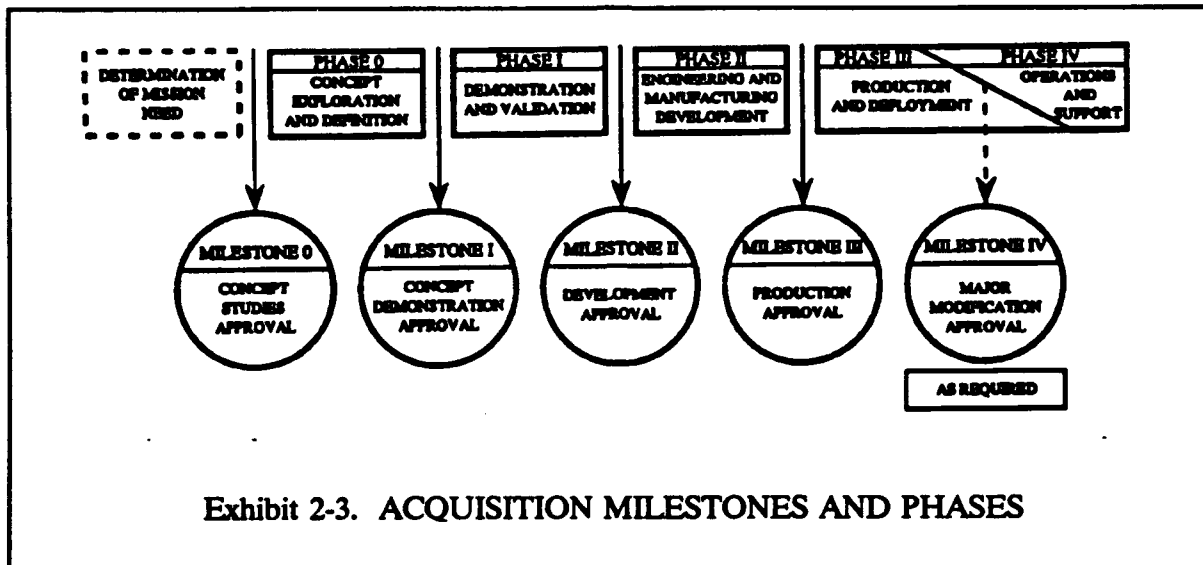
DoDI 5000.2 requires the DoD component or Joint Program Office responsible for an acquisition program to prepare life-cycle cost estimates in support of decision milestones and other reviews. Each estimate and supporting documentation is provided to the CAIG for its review.

2.3 O&S ROLE IN DAB DECISIONS

The DoD acquisition system is "a uniform system whereby all equipment, facilities, and services are planned, designed, developed, acquired, maintained and disposed of within the Department of Defense. . . . The DAB is the senior advisory body to the Under Secretary of Defense for Acquisition (USD(A)) to advise the USD(A) in enforcing policies and procedures governing the operations of the DoD Acquisition System."² The DAB also makes recommendations on milestone decisions for DAB-designated programs. The DAB process is supported by three committees that review the documentation for cost analyses prior to DAB meetings and raise issues for DAB consideration. The CAIG is one of several bodies that support the DAB and the DAB committees.

²DoDD 5000.49, "Defense Acquisition Board," dated September 11, 1989, paragraphs B.2 and C.

Five major milestone decision points and five acquisition phases (beginning with Milestone 0) provide the basis for management and program decisionmaking by the DAB. Exhibit 2-3 shows the milestone decisions associated with the various acquisition phases.



The paragraphs below, taken from DoDI 5000.2, explain the focus of each acquisition phase and describe the activities leading up to and resulting from the various decision points:³

- **Milestone 0, Concept Studies Approval.** The decision authority must determine if a validated mission need warrants the initiation of a study of alternative concepts. This milestone marks the initial interface between the requirements generation process and the acquisition management system. A favorable decision authorizes a minimum set of alternative concepts to be studied.
- **Phase 0, Concept Exploration and Definition.** The purpose of this phase is to explore materiel alternatives that could satisfy a documented mission need. Cost and operational effectiveness analyses (COEAs) are prepared for review at Milestone I. A proposed acquisition strategy is developed for the most promising system

³DoDI 5000.2, "Defense Acquisition Management Policies and Procedures," dated February 23, 1991, Part 3, paragraphs 3.a - 3.j.

concept(s), and initial cost, schedule, and performance objectives are established.

- **Milestone I, Concept Demonstration Approval.** At this milestone, the decision authority assesses the results of Phase 0 and evaluates the affordability of a proposed new program. A favorable decision establishes a new acquisition program, which is authorized to enter Phase I. A "concept baseline" identifying initial cost, schedule, and performance objectives is established.
 - **Phase I, Demonstration and Validation.** The objective of this phase is to ensure that critical technologies and design approaches are understood and are attainable. Cost, schedule, and performance trade-offs are made within affordability and design-to-cost constraints. A "development baseline" is proposed, and the analyses and information needed to support a Milestone II decision are developed.
- **Milestone II, Development Approval.** The purpose of this review is to determine if the results of Phase I warrant a program's continuation. The decision authority must assess the program's affordability and establish a development baseline containing refined cost, schedule, and performance objectives.
 - **Phase II, Engineering and Manufacturing Development.** The objective of this phase is to translate the preferred design approach developed in Phase I into a stable system. Configuration controls are established, and demonstration testing is conducted. The acquisition strategy, system performance requirements, and system cost estimates are refined. Resources are committed commensurate with the control and reduction of risk.
- **Milestone III, Production Approval.** The purpose of this review is to determine whether the results of Phase II warrant continuation of a program. The decision authority must assess the program's affordability, ensure that the system design is stable and producible, and establish a "production baseline" containing refined cost, schedule, and performance objectives.
 - **Phase III, Production and Deployment.** The objective of this phase is to establish a stable, efficient production and support base. The ability of the system to satisfy the validated mission need is assessed. Performance and quality are monitored in follow-on operational support

and testing. Needs for major upgrades or modifications requiring Milestone IV approval are identified.

- **Milestone IV, Major Modification Approval.** This review is conducted "as required" to determine if new procurement or major upgrades to a system currently in production are warranted. The need for a new system or major modifications may arise from a change in the threat or a revision in the Defense Planning Guidance, from a deficiency identified during Phase III testing, or from an opportunity to reduce the cost of ownership (O&S costs). Prior to committing to a major modification, the decision authority may ask for a review of other alternatives, thus reentering the process at Phase 0.
- **Phase IV, Operations and Support.** This phase overlaps with Phase III, Production and Deployment. The beginning of this phase is marked by the declaration of an initial operational capability or the transfer of management responsibility from the developer to the maintainer. Fielded systems are monitored until the time of their disposal in order to assess their capabilities and the effects of aging. Where appropriate, modifications are undertaken to extend service life.

As noted earlier, life-cycle costs are considered at each decision milestone in the acquisition process. Although the recurring portions of O&S costs are not actually incurred until after a system is deployed, the major decisions that ultimately determine O&S costs are made long before a system is fielded. Beginning with Milestone I, the CAIG must review the program office and independent cost estimates prepared by the sponsoring DoD component to ensure that an independent projection of system costs is available to the relevant DAB committee and to the DAB. Life-cycle cost estimates figure heavily into the evaluation of system alternatives. To compare alternatives over the long term, O&S costs must be estimated and evaluated, particularly in those areas subject to possible change or uncertainty. Since the O&S cost of a weapon system often exceeds both the development and production costs, a thorough analysis of O&S costs is required at each acquisition milestone. For each milestone review by the DAB, the CAIG prepares a report

summarizing its evaluation of the cost projections submitted by the program office and by an independent cost-estimating team. The CAIG provides any additional estimates that may be required to remedy deficiencies in the cost estimates under review and, if serious problems are found, it may suggest that the DAB committee defer its meeting on the program.

The CAIG also assists the OSD components in their reviews of program costs. The goal here is to determine whether:

- The O&S costs of all alternatives have been considered in the selection of the preferred alternative;
- Cost drivers have been identified and positive action has been taken in the design and development stages to reduce support costs; and
- The new system will be affordable to operate and support.

2.4 NEED FOR O&S COST INFORMATION

The cost of operating and maintaining a system over its useful life is driven primarily by policy, system design, operating rate (optempo), and reliability and maintainability decisions, which typically are made prior to entering production. O&S cost information is used for a variety of purposes in the acquisition process, including to:

- **Support the current design-to-cost (DTC) program.** All new Acquisition Category One (ACAT I) programs are required under DoDI 5000.2 to have rigorous but attainable DTC goals. These goals are established at Milestone I (Concept Demonstration Approval). The objective is to identify cost drivers and high-risk areas that provide the greatest opportunity for design trade-offs and to determine which options offer the lowest life-cycle cost consistent with performance and schedule requirements. To attain this goal, O&S estimates help both designers and managers focus on those aspects of design or program strategy that drive costs. DTC parameters for O&S are normally expressed in terms of dollars, personnel, or reliability and maintainability requirements. By preparing O&S cost estimates for competing alternatives, effective trade-offs can be made.

- **Support management reviews.** These reviews may occur at major milestones at which program decisions are made, or they may be held for informational purposes only. Whatever their objective, such reviews are the primary impetus for development of complete system O&S estimates.
- **Discriminate between competing systems.** Often in management reviews, O&S costs are addressed in comparative analyses that assess the costs of a new system relative to those of the most comparable existing system (called the reference system). Such comparisons help in determining whether a new system will require more or fewer resources to support than an existing system if operated in a similar manner. In preparation for Milestone I, COEAs are conducted to compare the various alternatives. It is possible for two or more competing systems to have comparable performance and production costs and yet have significantly different O&S costs.
- **Support budget estimates.** While development and production estimates play a major role in decisions on the Future Years Defense Program (FYDP) and the President's Budget, O&S costs have an important, if less visible, role. This is because the support segments of the budget are organized by functional area rather than by weapon system. The functional areas are characterized by personnel, unit-level consumption, various levels of maintenance, sustaining support, and indirect support costs. These areas are identified in the cost element structure established for weapon systems; however, cost shares must often be calculated in order to develop a cost estimate for each element. Although the costs of certain elements (such as personnel) can often be identified explicitly, other elements may be common to more than one weapon system. The cost of these latter elements must be allocated among the respective systems. The functional approach to budgeting tends to mask the contribution of each specific weapon system; however, it can be useful in checking the cost-allocation process.

The nature of cost estimates and cost comparisons depends on the acquisition program phase and the specific issues involved. At Milestone I, very little may be known about the design of a proposed system. It is also generally difficult to obtain accurate organizational and operational cost projections for a Milestone I analysis, but rough estimates are expected. The affordability of the program must be judged, alternatives must be compared, and DTC goals must be established at this formative stage. The most

significant impact on O&S costs can be achieved at Milestone I. As designs become firm, the opportunity to influence O&S costs diminishes.

In preparation for Milestone II, O&S cost estimates and cost comparisons ought to show increased accuracy, consistent with more fully developed configurations and support concepts. By Milestone II, the subsystem cost drivers most likely to influence O&S costs should be identified. (Cost drivers are characteristics of a system or subsystem that have a large or major effect on the system's cost.) An understanding of the system's configuration is necessary in order to identify the cost drivers. Although the specific determinants of cost may vary by system, they can generally be grouped into three categories: physical characteristics (weight, volume, density); policy parameters (optempo, maintenance concept, crew ratio); and performance characteristics (power, speed, range, reliability). Alternative approaches, design trade-offs, and the sensitivity of O&S costs to changes in these cost drivers should be evaluated in the cost and operational effectiveness analysis.

The O&S cost estimates prepared for Milestone III should be based on the current design characteristics of the weapon system, the deployment schedule, and the operation and maintenance concept. Critical subsystems and any DTC goals established for them must be validated. Operating experience obtained during system tests and evaluation should be used to verify progress in meeting logistics goals or to identify problem areas.

O&S estimates prepared for Milestone IV decisions should be based on costs associated with an upgrade or modification to a system currently in production. The need for a major modification or upgrade may arise from a change in the threat, a deficiency identified in the system, or an opportunity to reduce ownership costs. The O&S cost analysis should consider the costs and consequences of all alternatives, including maintaining the status quo.

3. O&S COST METHODOLOGY

3.1 INTRODUCTION

DoDD 5000.4 authorizes the CAIG to establish criteria and procedures for preparing and presenting cost estimates of defense systems requiring DAB review. O&S estimates reviewed by the CAIG should be developed according to a standard set of procedures. This section discusses the CAIG review criteria and presents a costing methodology and conventions for preparing and documenting O&S estimates.

3.2 CAIG REVIEW

The OSD CAIG is charged with improving the quality of cost analysis within the Department of Defense. As such, it serves as the principal advisory body to the Under Secretary of Defense for Acquisition on matters relating to cost. For major programs, the CAIG is responsible for ensuring that the DAB has available to it an independent estimate of program costs. In addition to presenting the CAIG's own cost estimates, the CAIG report to the cognizant DAB committee and to the DAB contains an evaluation of the estimates developed by the DoD component responsible for the program. It therefore is incumbent upon the DoD components to submit well-documented, credible estimates that are ready for review and can be replicated by a third party.

Accordingly, the CAIG has established criteria and procedures for preparing and presenting cost estimates. The criteria apply to the development, investment, and O&S phases of a system's life-cycle cost. The CAIG criteria and procedures are discussed in DoDD 5000.4 (Enclosure 2), which addresses the scope of the analysis, analytical methods, and presentation of results.

3.2.1 Cost Assessment Criteria

Variations in cost-estimating situations are too great to permit an exhaustive listing of the factors the CAIG may consider. The following criteria, however, will be considered in all cases:

- **Completeness**
 - All pertinent costs included?
 - Costs time-phased by fiscal year (up to steady state)?
 - In constant dollars (unless otherwise specified)?
 - Sensitivity analysis performed/results analyzed?
 - Key cost drivers identified?
- **Reasonableness**
 - Factors used reasonable?
 - Ground rules and assumptions reasonable?
 - Proper normalized historical cost data base used?
 - Appropriate estimating methodology used?
 - Estimates in relation to reference system reasonable?
- **Consistency**
 - Correct OSD inflation indices used?
 - Estimate consistent with current deployment schedule?
 - Differences between prior and current estimates explained?
 - Estimate consistent with current program documents?
 - Assumptions consistent between alternatives and reference system?
- **Documentation**
 - Data sources documented?
 - Cost model documentation provided?
 - Cost estimates for each cost element fully documented?
 - Documentation detailed enough to permit replication?
- **Credibility**
 - Cost model validated?
 - Data types identified (budgeted, prototype, or actual)?

If an estimating methodology or supporting documentation is insufficient and does not permit a reasonably firm appraisal of the estimate, the CAIG will recommend that the DAB committee review and the full DAB review be deferred until the deficiency is remedied.

O&S costs typically exceed both development and investment costs over a system's useful life. Therefore, in assessing the total costs of two competing systems, the costs of operating and supporting each system are a primary consideration.

3.2.2 Lessons Learned from CAIG Reviews

The lessons learned from previous CAIG reviews are presented here to highlight some of the areas in which cost estimates have been deficient or additional emphasis has been needed:

- **Insufficient Documentation.** The estimate cannot be replicated by a third party. The documentation does not sufficiently describe the data sources, methodologies, calculations, or assumptions used.
- **Omitted or Incomplete Cost Elements.** Some O&S costs that are applicable to a program have been omitted from the estimate. For example, requirements for unique training equipment should be identified and the associated O&S costs must be estimated.
- **Programmatic Information Missing.** The basic program description or the operating, maintenance, and deployment concepts established in the program documentation are not presented with the O&S estimate. The estimating assumptions do not match the program documentation.
- **Inconsistency with Previous Estimates.** No explanation is given for differences in cost that result from changes in policy, manning, operating concepts, procurement quantities, etc.
- **Presentation of Results.** No standard format is used to present results at the various milestones. The level of detail is insufficient. No reference system is identified for purposes of comparing the proposed alternatives.

3.3 O&S COST-ESTIMATING PROCESS

O&S cost estimates focus on the costs likely to be incurred by a defense system under specified conditions. Although the cost analysis must consider historical costs, it should do

more than just extrapolate from past cost trends. The proper approach is to present normalized empirical data derived from the ground rules provided or to show the relationship between an assumption and its related cost impacts. The O&S estimating process described in the sections below is most appropriate for major acquisition programs reviewed by the CAIG. However, the approach is applicable to all acquisition programs, regardless of the review authority.

Preparation for a CAIG review requires formal identification of the estimating approach, coordination with the CAIG action officer, updating of the current estimate, and preparation of an independent estimate. Exhibit 3-1 lists the primary activities entailed in preparing cost estimates for review by the CAIG.

3.3.1 Develop Approach

The selection of an estimating approach involves four basic steps: identification of key O&S issues; selection of a reference system; development of ground rules and assumptions; and selection of a cost element structure. The paragraphs that follow describe each of these steps in turn, and provide some guidelines for accomplishing them.

3.3.1.1 Identify Primary O&S Issues

The analytical approach and presentation structure selected must be able to accommodate the unique aspects of the program being assessed. A good way to ensure that all pertinent issues have been identified is for representatives of the CAIG to meet with staff members from the DoD component conducting the analysis. As shown in Exhibit 3-2, the objective of such "pre-CAIG review" meetings is to discuss the issues addressed in the analysis and agree on the approach that will be used to estimate O&S costs

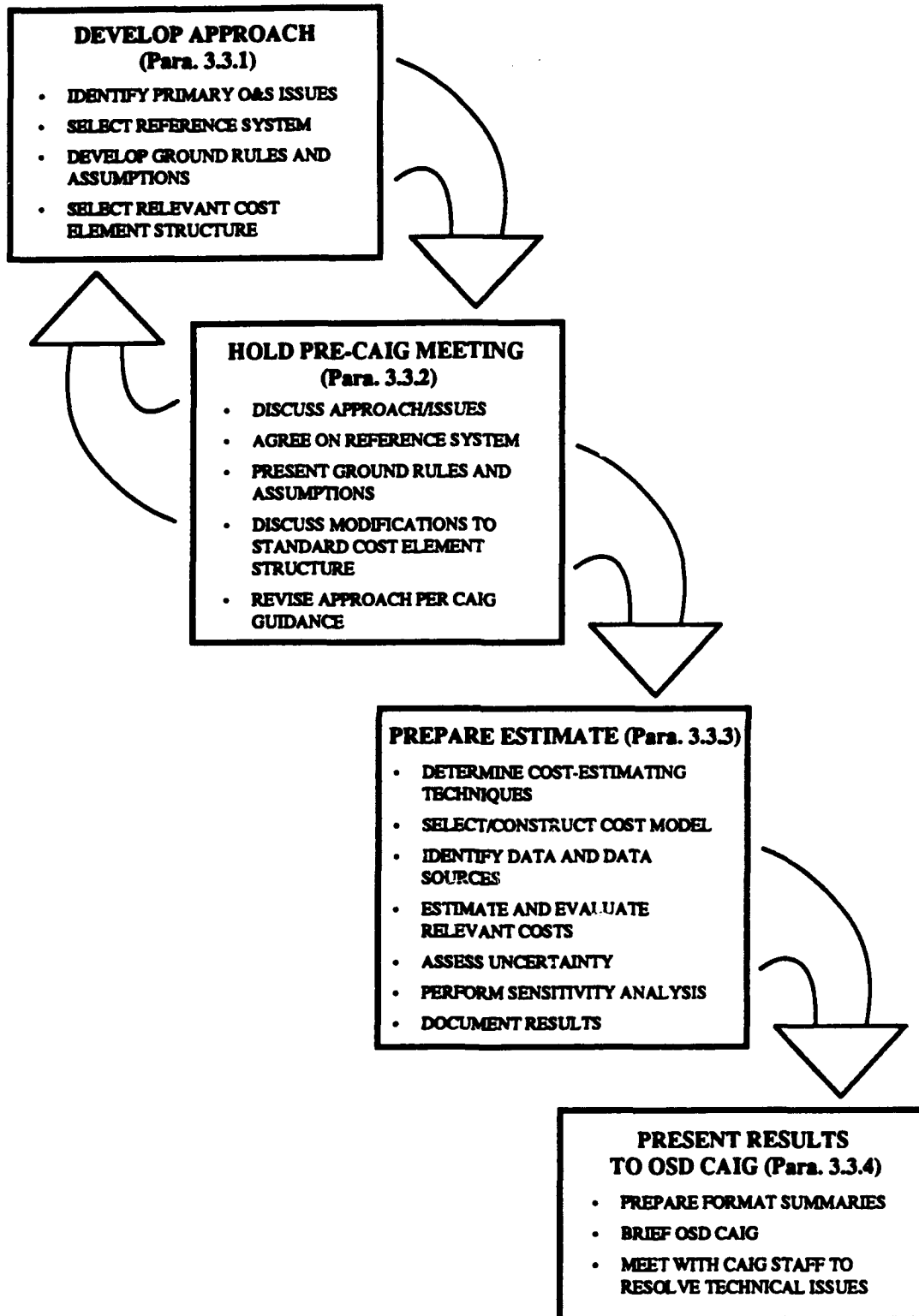


Exhibit 3-1. O&S COST ESTIMATE PREPARATION PROCESS

9006/172-104

- Potential modifications to CAIG-recommended cost element structure
- Proposed reference system characteristics and description
- Description of proposed alternatives
- Identification of historically relevant cost drivers for reference system and differences for the proposed system
- Identification of unique operations and support philosophies that could influence requirements
- Specification of ground rules and assumptions, including costs to be included or excluded
- Specification of significant trade-off issues to be quantified and presented
- Proposed presentation formats

Exhibit 3-2. PRE-CAIG REVIEW MEETING TOPICS

(or to update a prior O&S estimate). Where necessary, specific guidance will be provided by the CAIG representative with respect to the estimating approach and CAIG expectations. This guidance must be documented by the organization preparing the estimate, and the estimating approach should be revised accordingly.

3.3.1.2 Select Reference System

A reference system is an existing operational system with a mission similar to that of the proposed system. It is usually the system being replaced, unless some other system provides a better basis for the analysis. Where data on the proposed new system are not available, a reference system is used as a proxy for that system as well.

Since reference systems are normally in current operation, there are a variety of sources of data on their cost, technical characteristics, and performance. One source of historical cost data specifically directed by DoDD 5000.4 is the Visibility and Management of Operating and Support Costs (VAMOSOC) system. DoDD 5000.4 requires

that historical data be used to identify and allocate functional costs among major defense systems and subsystems. One of VAMOSC's objectives is to enhance the visibility of O&S costs in DoD cost analyses. Validated VAMOSC data should be used to calculate the O&S costs of the reference system unless some other sources or data bases are clearly more appropriate.

Much of the technical and performance information for the reference system can be obtained from contractor reports, historical government acquisition reports, maintenance data collection systems, and current operational concepts. Similar data for the proposed system may be found in the Cost Analysis Requirements Document (CARD), which is prepared by the DoD component responsible for the program. The CARD provides detailed information on the scope of the program estimate.

The assumptions, ground rules, and cost-estimating methodologies for both the reference and proposed system should be similar. This enables the analyst to pinpoint differences in resource consumption that arise from differences in weapon system characteristics. If a comparison of the characteristics of the reference and proposed systems has not been completed for the CARD, a suggested format is provided in Exhibit 3-3. This summary may be presented and discussed at the pre-CAIG review meeting. If a reference system is not available or applicable, the sample format can be used to describe the proposed system.

3.3.1.3 Develop Ground Rules and Assumptions

A prerequisite to the development of useful O&S cost estimates is a detailed definition of how a system will be operated, maintained, and supported in peacetime. The basic ground rules and assumptions are derived from this information. The

CHARACTERISTICS	REFERENCE SYSTEM	PROPOSED SYSTEM MS-I AS OF:___	PROPOSED SYSTEM MS-II AS OF:___
System Designation/Name			
General			
Crew Composition			
Performance			
Speed (max)			
Speed (sustained)			
Range			
Payload			
Configuration			
Weight (empty)			
Weight (gross)			
Dimensions			
Height			
Width			
Length			
Acquisition			
Unit Cost/Design-to-Cost			
Goal (prototype/100th prod unit)			
Number of Systems			
Acquire(d) (proposed)			
Deploy(ed) (proposed)			
Operating Concept			
No. of Equipped Deployable Units			
(sqd/companies)			
Average No. Systems/Unit			
Operating Hours/Year/System			
Maintenance Concept			
Interim Contractor Support			
Contractor Logistics Support			
In-House Support			
No. of Maintenance Levels			
Performance Goals			
Operational Ready Rate (%)			
System Reliability			
(Mean Time Between Removals)			
(Mean Time Between Maintenance Action (inherent))			
Maintenance Hours Per			
(Fly Hr/Oper Hr)			
Major Overhaul Point			
(Fly Hrs/Oper Hrs/Miles)			

- NOTE: 1. The elements under each category should be expanded, deleted, or revised to accommodate the system under study.
2. Include additional columns for subsequent milestone reviews as appropriate.

Exhibit 3-3. SYSTEM DESCRIPTION SUMMARY

ground rules include descriptions of relevant missions and system characteristics, as well as manning, maintenance, support, and logistics policies. The assumptions "bound" the estimate (that is, they define its scope). The ground rules and assumptions are identified in the study documentation. They must be stated clearly and presented in a way that permits them to be referenced easily. Also, the ground rules and assumptions used to estimate O&S costs must be consistent with those employed for non-O&S elements (such as initial spares). Specific O&S cost conventions to consider in developing ground rules and assumptions are discussed in Section 3.4.

3.3.1.4 Select Relevant Cost Element Structure

A cost element structure (CES) establishes a standard vocabulary for identifying and classifying the costs of a system. A generic CES format is presented in Chapter 4 and discussed in Appendix B. Weapon-system-specific CESs are presented in Appendices C through G. The CESs are designed to capture as many relevant costs as practical within the O&S phase. However, due to differences among programs, the basic structure may have to be modified to accommodate the unique characteristics of the system(s) being investigated. The revised structure should be checked to ensure that all relevant costs are represented and defined in a manner compatible with the cost estimate. If a decision will affect costs not explicitly described in this guide, those costs should be identified and included in the O&S estimate. For cost estimates requiring CAIG review, modifications to the CES format recommended here must be approved by the CAIG prior to the start of the analysis.

3.3.2 Hold Pre-CAIG Meeting

The CAIG action officer, his or her program office counterpart, and the independent cost estimate (ICE) team chief should meet to discuss the scope, methodology, and ground rules and assumptions for the cost analysis. As presented in Exhibit 3-2, topics covered in these discussions include system characteristics, operating schemes, the specifications of each alternative and of the reference system, the cost element structure, historically relevant O&S cost drivers, costs to be included and excluded, data sources, estimating methodologies, cost models, back-up documentation, and significant trade-off issues. All of these matters should be discussed and agreed upon with the CAIG representative. The initial pre-CAIG meeting should be held shortly after the DAB planning meeting, which is normally conducted 180 days in advance of a DAB review.

3.3.3 Prepare Estimate

The paragraphs below describe how to construct an O&S estimate once the CAIG has approved the initial estimating approach. The discussion summarizes the steps entailed in selecting a cost-estimating technique, choosing a cost model, collecting data, and estimating the relevant costs. The requirements for conducting sensitivity analyses and documenting cost estimates also are discussed.

3.3.3.1 Determine Cost-Estimating Techniques

A number of techniques may be employed to estimate the O&S costs of a weapon system. The specific approach chosen will depend to a large degree on the maturity of the program and the level of detail of the available data. Most O&S analyses are accomplished using a combination of three estimating techniques: parametric,

analogy, and engineering. As a system progresses from concept development to operations, more detailed information becomes available about it. Initial parametric variables or analogous data may then be updated or replaced with test or operational data.

The paragraphs below summarize the key features of the three estimating techniques used in O&S cost assessments. Regardless of the technique employed, the approach must be documented in the materials accompanying the estimate.

- **Parametric Estimation.** Parametric estimation employs cost-estimating relationships (CERs) to develop projections of weapons costs using various statistical techniques (typically regression analysis). A CER is simply an equation that relates one or more characteristics of a system to some element of its cost. CERs should be current, appropriate for the range of data being considered, and applicable to the system in question. Over time, changes in policy and technology alter the reliability, maintainability, and supportability of a weapon system. The data used to develop the original CER become outdated, and the CER must be revised as data bases are updated. CERs have some distinct advantages, especially in the early phases of a program, when little specific information is available. At this initial stage in the program life cycle, the physical characteristics of a system may be a suitable proxy for purposes of estimating costs. Before using CERs, the underlying cost-estimating relationships should be thoroughly understood. If CERs are improperly applied, the result could be a serious estimating error.
- **Analogy Estimation.** In this technique, a currently fielded system (reference system) similar in design and/or operation to the proposed system is identified. The cost of the proposed system is then calculated by adjusting the cost of the reference system to account for differences between it and the new system. Where data are limited, subsystems from other fielded systems may be used to represent the subsystems of the proposed system. The analogy method of cost estimating is widely employed because it avoids many of the negative aspects of CERs. However, one drawback to analogy estimating at the subsystem level is the extensive amount of detailed technical and engineering data required. The analogy approach places heavy weight on the opinions of "experts." Therefore, the rationale used to arrive at a position must be clearly documented. Historical data bases available through the Visibility and Management of Operating and Support Costs (VAMOSC) system may be used to identify the operating costs of

weapon systems and subsystems that are similar to the proposed system.

- **Engineering Estimation.** This approach produces detailed build-up, or "bottoms-up," estimates. It is the most time-consuming of the three techniques. An engineering estimate is constructed by consolidating estimates for individual work segments into a total project projection. The objective is to determine as accurately as possible all of the actions that would occur in the "real world." Estimating by engineering methods requires extensive knowledge of a system's characteristics. The system is typically broken into lower-level components, each of which is costed separately. Although much detailed data and many manhours are required for this approach, the quality of the estimates are highly dependent on the milestone to which a program has progressed and on the credibility of the data used in the analysis.

3.3.3.2 Select/Construct Cost Model

O&S estimating is most often accomplished using computer models of cost methodologies. Specific models are not prescribed in this guide because the characteristics of a program normally determine the estimating process. However, most O&S models fall into one of three categories:

- **Parametric Model.** A parametric model contains a set of equations, each of which relates O&S costs to parameters that describe the design, performance, operating characteristics, or operating environment of a weapon system. Such models typically are used during the early stages of a program, when cost, technical, and hardware data are limited.
- **Accounting Model.** An accounting model is a set of equations used to aggregate elements of O&S costs (such as manpower, materials, spares, fuel, transportation, modifications, and support equipment) from simple relationships or direct inputs. Some elements are computed on the basis of unit cost and procurement quantity. Others are estimated using separate models or methodologies and are provided as throughput in order to arrive at an aggregate estimate of O&S costs.
- **Simulation Model.** This type of model uses computer simulations to determine the effect on O&S costs of a system's characteristics, operational constraints, basing concept, maintenance plan, and spare and support requirements. Simulation models break O&S costs into

workable elements for which estimates are then developed using hardware parameters such as reliability, maintainability, etc. Over time, statistical simulations generate probability density functions that describe the impact of system characteristics, operations, and maintenance concepts. However, the large amount of data required normally limits the use of such models to the later program phases, when sufficient amounts of detailed data are available.

In general, when selecting or constructing a model for O&S cost estimating, one should consider not only the system whose costs are being assessed, but also the acquisition milestone to which the system has progressed and the accuracy expected from the estimate. For example, a cost estimate in support of a Milestone I review is not expected to be as detailed as an estimate prepared for Milestones II or III. As a program matures, the cost model and estimating methodology should be adapted to accommodate more precise information. To satisfy both estimating and review requirements, a good model should have the following characteristics:

- **Consistency in Cost Element Structure (CES).** The basic cost structure should not change as a system progresses through the various acquisition phases. However, the basic elements and their sub-elements should be expanded to capture greater levels of detail. For this reason, the cost structures presented in this guide are hierarchical (that is, the sum of each set of lower indenture elements equals the next higher indentured element). In this manner, the cost structure allows flexibility in selecting the level and method by which the various cost elements will be estimated.
- **Consistency in Data Elements.** The data elements of the proposed defense system should be consistent with those of operational systems for which actual data exist. This allows the costs and cost-driving parameters of the reference and proposed system to be compared. The data should be derived from the most reliable or credible data base for a given cost element.
- **Flexibility in Estimating Techniques.** The estimating techniques should be allowed to vary as a program progresses through the various acquisition phases. For example, in preparation for a Milestone I review, when cost data are scarce, it may be possible to estimate only major elements of cost using unadjusted analogous data or by applying

a statistical cost-estimating relationship (CER). However, as more detailed information becomes available at subsequent milestones, some elements may be costed using engineering analysis, and others by employing CERs at aggregate or much lower levels of detail.

- **Simplicity.** Complexity is not desirable in an O&S cost model. The cost, labor hours, and schedule required to set up and provide data for a complex model may prohibit its effective and timely use in the decision process. Although some analyses will inevitably require complex models, complexity in itself does not lend credibility to a model or its results. Models should be structured in a way that allows them to accommodate more detailed information as a program progresses through the acquisition life cycle.
- **Usefulness to the Design Process.** While estimating costs for a CAIG review is an important function, a model's applicability to day-to-day program office and contractor decisionmaking is equally important. Feedback to the design, operation, and support decision processes is the primary way to minimize life-cycle costs. Consequently, the methodology used should be responsive to design and operational changes and should take account of relevant design and operational factors, such as reliability, maintainability, and operating tempo.
- **Completeness.** Completeness is a measure of a model's ability to capture all significant O&S costs that will be incurred by a defense system over its useful life. To ensure that all relevant cost elements have been identified, the CES recommended for the category of weapon being assessed (see Appendices) should be compared to the CES of the cost model selected for the analysis. Any unique features of the weapon system should be identified and incorporated into both the CES and the cost model.
- **Validity.** Validity describes a model's ability to provide sound, reproducible results for its intended application. Validity is a function of several factors. First, the model must be appropriate for the type of system and program phase for which the estimate is being produced. The utility of the model may be tested by using it to calculate costs for a similar existing system and then comparing the results with the actual costs of that system. Second, the model's cost computation methodology must be sound, and the results must be reproducible by another qualified analyst using the model. Finally, the model must be able to capture the parameters being assessed, such as reliability or maintainability. An understanding of the model's capability to accommodate external policy decisions is necessary. For example, if maintenance manning is determined by policy decisions and not by system failure or

operating rates, then an increase in reliability will not result in a decrease in manning levels.

3.3.3.3 Identify Data and Data Sources

Three types of data are used in O&S estimates: programmatic, technical, and cost. Data of each type must be provided for both the proposed system and the reference system.

Programmatic data are facts or assumptions about the fielding, operating concepts, and support requirements of a weapon system. Technical data focus on system specifications and characteristics, and on performance capabilities or goals. For acquisition programs, this information is available from many of the source documents required by DoDI 5000.2 and from Title 10 of the United States Code. (Appendix A provides a brief summary of the purpose and scope of the major source documents.) Each DoD component may have additional source documents from which similar information may be obtained.

The basic source of cost data for most weapons analyses is the historical resource-consumption rates of analogous systems. These values are expressed in terms of dollars, manning levels, and material quantities. Although the concept is straightforward, most categories of historical O&S costs are actually derived values because large portions of the operations and maintenance budget are not broken out by weapon system. Rather, the budget figures are presented by functional area (e.g., depot maintenance, base operating support, training). To calculate O&S costs for individual weapon systems, various allocation techniques have been developed.

An important consideration when collecting data is the type of cost represented. Three types of data typically are used:

- Budget
- Expenditure
- Consumption.

As a general rule, one should use the type of data that best describes the system-related O&S cost. Most O&S cost estimates are derived from two forms of data: raw and processed.

- **Raw data.** Raw data can be used to examine the historical costs of existing systems in the areas of personnel, unit-level consumption, and depot maintenance. Raw data are normally found in unit manning documents and in unit-level and depot-level maintenance reports.
- **Processed data.** Processed data are raw data that have been collected or allocated by weapon system. Cost and planning factors handbooks and data bases have been developed by several organizations to provide factors and summary-level information on existing systems. In addition, DoDD 5000.4 requires the DoD components to establish VAMOSC systems that show the historical O&S costs of weapons programs. Logistics support data and associated costs incurred by each weapon system are maintained in the VAMOSC data bases.

3.3.3.4 Estimate and Evaluate Relevant Costs

The selection, design, development, maintenance, and support concepts for a defense system influence how its O&S costs are analyzed and evaluated. In order to compare system alternatives fully, it is necessary to identify and estimate all relevant O&S costs. For example, the number of crew members needed to operate a weapon system may be identical regardless of the alternative selected. However, the reliability of alternative systems may result in very different maintenance manning and material costs, which are relevant to the decision at hand. The purpose of O&S cost analyses changes as a system

moves through the various acquisition phases. For example, one of the primary aims of a Milestone I analysis is to explore and quantify the relative cost advantages of different system alternatives, concepts, and design options (e.g., changes in system availability, requirements, alternative support policies, etc.). As a program matures, the cost analysis focuses on trade-offs within the selected alternative, such as deployment, support, and affordability issues. A fundamental objective of this process is to ensure that the alternative selected satisfies mission requirements at the lowest possible life-cycle cost.

3.3.3.5 Assess Uncertainty

Estimates of future O&S costs are subject to some degree of uncertainty. It is important to identify and bound the scope of variables that contribute to uncertainty in ground rules and assumptions. The following are some of the areas that can cause uncertainty and that must be addressed before developing an O&S estimate: mission scenario, deployment plans, operating tempo, system quantity, system availability, operating environment, and cost-estimating methods. These areas are typically identified as non-cost elements that may affect the O&S costs of a system. A sensitivity analysis is conducted to determine the cost impact of the uncertainties inherent in each system estimate. When quantifying uncertainty proves impractical, a qualitative assessment must be made.

The CAIG must also be informed of any major risks in the acquisition program that may alter O&S costs, and of all feasible alternatives for reducing risk. For example, an O&S cost estimate is often sensitive to the goals established for the reliability and maintainability of a system and selected subsystems. If attainment of these goals appears unlikely or will be too costly during the development phase, the costs of

reducing reliability and maintainability thresholds should be estimated and, if significant, presented to the CAIG.

3.3.3.6 Perform Sensitivity Analysis

Given the number of variables that affect O&S costs, it is useful to perform sensitivity analyses to identify explicitly the nature and magnitude of the uncertainty. The documentation provided with the analysis should explain the methods used to bound the estimate and describe the elements included in the sensitivity analysis. The key cost drivers must be identified in order to determine the impact on cost of changes in performance characteristics, reliability, maintainability, and operating tempo. Sensitivity analysis of suspected cost drivers places the uncertainty associated with an estimate in the proper perspective. The sensitivity analysis requires estimating the effect of the high and low uncertainty ranges for significant input factors and showing the effect of this range on total O&S costs. Each parameter should be examined and tested independently.

3.3.3.7 Document Results

Detailed documentation must be provided for each O&S cost estimate presented to the CAIG. The documentation serves as an audit trail of backup information, methodologies, and results that is used to track a program's costs as it moves from one milestone to the next. The documentation also provides the information needed for the estimate to be replicated by another experienced analyst. The value of a well-documented estimate is so important that Chapter 5 is devoted entirely to the issue of preparing documentations for O&S cost estimates.

3.3.4 Present Results to OSD CAIG

After completing a cost estimate, the results must be communicated in a clear, concise manner to the CAIG. The presentation should focus not only on total life-cycle O&S costs, but also on those aspects of a program that have the greatest effect on O&S costs and, therefore, affect decisionmaking. To aid in structuring this material, Chapter 6 reviews the requirements for presenting O&S cost estimates and provides some formats for displaying the results. Although the formats represent a standardized approach for presenting costs, they should not preclude good judgment in providing additional detail relevant to the program under review.

3.4 O&S COST CONVENTIONS

This section discusses some conventions that should be observed when developing O&S estimates for CAIG review. Some deal with ground rules; others address the scope of the analysis. The specific conventions applied should be documented in the cost estimate. The best way to ensure that the appropriate conventions are applied is through early coordination with the CAIG representative. Deviations from the standards presented here should be discussed with the CAIG representative and documented in the estimate.

- **O&S Period.** The O&S estimate should extend over the full life expectancy of a weapon system. This period will include the phase-in years, the time during which the total system is in steady-state operation, and the period in which the system is phased out of the inventory at the end of its useful life. Exhibit 3-4 lists the major categories of defense systems and gives the designed life expectancy of each. If a system is determined to have a life expectancy that differs significantly from the figures presented in the exhibit, the life expectancy and steady-state operation periods should be discussed with the CAIG representative.

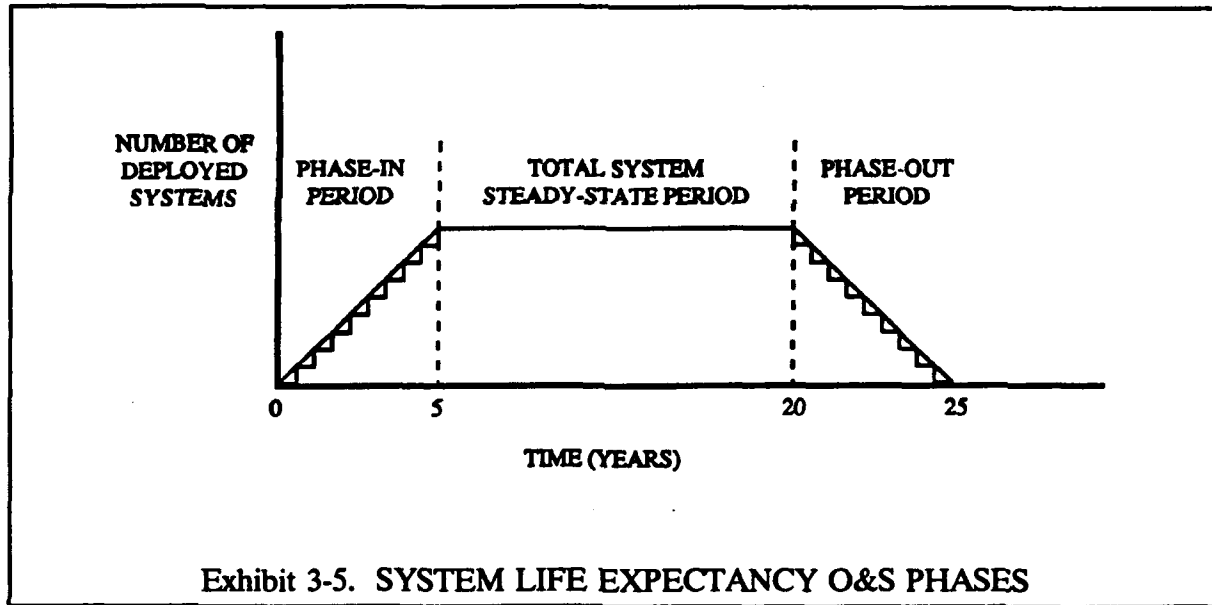
- **Phase-In Period.** The phase-in period used for the analysis should be consistent with the planned deployment schedule. Estimates of phase-in costs should take into account the increasing support requirements of newly deployed systems, training assets, and the higher initial failure rates that some systems may experience. Cost data must be provided for each fiscal year through the end of the deployment period.

<u>SYSTEM TYPE</u>	<u>YEARS</u>
CARGO AIRCRAFT	25
BOMBER AIRCRAFT	25
FIGHTER AIRCRAFT	20
HELICOPTER AIRCRAFT	20
SMALL MISSILES (AIRCRAFT)	15
LARGE MISSILES (ICBM)	20
ELECTRONIC EQUIPMENT	10
SHIPS	
• BY CLASS	20-40
GROUND COMBAT VEHICLES	
• TRACKED VEHICLES	20
• NON-TRACKED VEHICLES	20

Exhibit 3-4. DESIGNED SYSTEM LIFE EXPECTANCY

- **Steady-State Period.** The recurring steady-state period is identified as the period between phase-in and phase-out, when all systems are available for operation. Exhibit 3-5 shows the phase-in, steady-state, and phase-out periods for a hypothetical system with a 20-year life expectancy. Assuming the phase-in and phase-out periods each last 5 years, a system deployed in year 1 would be phased out in year 20, and a system deployed in year 5 would be phased out in year 25. The steady-state period and the total number of systems to be deployed must be identified in the estimate. After the O&S cost for the total number of systems has been developed, an annualized steady-state cost per operational system (or per typical deployed unit) should be developed. These steady-state estimates may be used for comparison to the reference system, other alternatives, and the independent estimate. Equal steady-state periods of operation may not necessarily translate into identical annual O&S costs. Programmed depot maintenance overhaul cycles, system modifications, changes in failure

rates, and sustaining investment costs for replacement support equipment may result in annual differences in O&S costs. Although cost figures for each fiscal year in the steady-state period may be provided, the presentation of an annualized cost for the entire steady-state period smooths out annual cost differences and facilitates the comparison of alternatives.



- **Phase-Out Period.** As systems reach the end of their useful lives and are phased out of the inventory, their total operating costs will decline. Estimates of O&S costs during the phase-out period should be presented by fiscal year. In most instances, the cost of disposing of systems will not be addressed in O&S estimates. Exceptions for which salvage values and disposal costs must be estimated are identified below.
- **Disposal.** In some instances, disposal costs should be included in a life-cycle cost estimate. These costs should be identified for systems requiring detoxification or long-term waste storage, such as the disposition of nuclear assets, solid-fuel propellants, and hazardous material. Where applicable, salvage values and disposal costs incurred during the phase-out period should be listed in a separate category of the estimate, labeled "Disposal."
- **Scope of O&S Estimate.** The O&S estimate will include a projection over the life-cycle for the total deployed system and may include the annualized costs for a single operational system or for a typical deployable unit. The estimate should show the projected resource

requirements, given the system characteristics, deployment schedule, and operation and support policies assumed.

- **Annualized Cost Per Operational System.** The O&S costs required to support the total weapon system during the steady-state period may be reduced to the average cost of supporting a single operational system on an annualized basis.
 - **Annualized Cost Per Typical Deployable Unit.** A typical unit (real or hypothetical) should be selected to show the annualized cost impact of operating, maintaining, and supporting the system during the steady-state period.
 - **Total System Life-Cycle Cost.** This estimate shows the expected costs of operating a system over its useful life (i.e., over the phase-in, steady-state, and phase-out periods).
 - **War/Peace Conditions.** O&S cost estimates are based on projected peacetime operations. The peacetime scenario that best reflects the expected use of a weapon system should be used to estimate that system's resource requirements. In calculating peacetime costs, it is important to remember that some force elements are routinely maintained at levels necessary to support wartime operations. Three such elements are unit personnel, support equipment, and wartime reserve material (WRM). Life-cycle estimates for these elements should therefore reflect wartime requirements. (Note: WRM costs are not included in O&S estimates. However, O&S analysts should verify the accuracy of WRM estimates since this material is ultimately required to address consumption needs.)
- **Types Of Dollars.** Unless otherwise specified, O&S costs should be presented in constant dollars of the present fiscal year. Adjustments for discounting and/or inflation (if required) should be presented separately.
 - **Mature System Assumptions.** The procurement O&S characteristics of a system (reliability, repair rates, test effectiveness, etc.) change over the system's lifetime. When estimating annual O&S costs of deployable units (i.e., annualized costs over the steady-state period), a mature system should be assumed. Systems exhibit mature

performance after they are fully operational; however, the performance results may not be the same as identified in the system specifications.

When developing a time-phased estimate, the expected rate of maturity (e.g., reliability growth) should be considered, as well as the rate at which the new system will be added to the force. Different rates of maturity are particularly significant when comparing alternatives that differ markedly in their use of common subsystems. Differences in maturity rates are also important considerations in determining support strategies for the early years of a system's deployment. Clear documentation of the system characteristics assumed in each phase is essential.

- **Continuity.** The O&S cost estimates presented must be traceable to the prior estimate, and to the cost element structure submitted for the previous milestone. Significant changes in the program, assumptions, logistics support concept, and cost-driving parameters as well as cost growth should be explained.

4. COST ELEMENT STRUCTURE

4.1 INTRODUCTION

This chapter discusses the cost element structures (CESs) used in producing O&S estimates. The elements included in each structure define the O&S functions and resource categories associated with particular categories of defense systems. The discussion begins by reviewing the basic CES framework for O&S estimates. It then identifies significant cost and non-cost elements to include in the estimates as well as some cost elements that may be excluded.

4.2 O&S COST ELEMENT STRUCTURE

The CAIG is tasked by DoDD 5000.4 to establish substantive guidance on the preparation and presentation of cost estimates. This responsibility encompasses the development and definition of standard elements for O&S cost estimates. A standard cost element structure promotes consistency in preparing and displaying estimates, and enables the CAIG to focus on high-cost/high-risk areas that have the greatest bearing on future O&S costs.

A generic cost element structure is presented in Exhibit 4-1. Cost element definitions are provided in Appendix B. Cost element structures and definitions for major categories of weapon systems are presented in Appendices C through G. The CES for each weapon system category is designed to meet the needs of most CAIG reviews. However, the basic structure may have to be modified to accommodate the special features of some weapon systems. If a change is required in the standard CES for a program requiring DAB review,

**GENERIC OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS
 - 1.2 MAINTENANCE
 - 1.3 OTHER MISSION PERSONNEL
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 POL/ENERGY CONSUMPTION
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 2.3 DEPOT-LEVEL REPARABLES
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES
 - 2.5 OTHER
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)**
 - 3.1 MAINTENANCE
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 3.3 OTHER
- 4.0 DEPOT MAINTENANCE**
 - 4.1 OVERHAUL/REWORK
 - 4.2 OTHER
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 INTERIM CONTRACTOR SUPPORT
 - 5.2 CONTRACTOR LOGISTICS SUPPORT
 - 5.3 OTHER
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT
 - 6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION
 - 6.3 OTHER RECURRING INVESTMENT
 - 6.4 SUSTAINING ENGINEERING SUPPORT
 - 6.5 SOFTWARE MAINTENANCE SUPPORT
 - 6.6 SIMULATOR OPERATIONS
 - 6.7 OTHER
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT
 - 7.2 INSTALLATION SUPPORT

Exhibit 4-1. GENERIC O&S COST ELEMENT STRUCTURE

the DoD component preparing the estimate should work with the CAIG to determine what cost elements to include. The CAIG must approve any changes to the standard CES structure before the costing work begins.¹

Depending on the system being investigated, the summary elements in the CES may need to be expanded to lower levels of indenture to provide an audit trail of the estimate for each element and to show the composition of the cost element roll-up subtotals. This indenture (where required) and the accompanying documentation make it easier for the estimate to be replicated by a third party. For example, under Mission Personnel, elements 1.1 (Operations) and 1.2 (Maintenance) might be indentured in the documentation as follows:

- 1.0 Mission Personnel
 - 1.1 Operations
 - 1.1.1 Officer
 - 1.1.2 Enlisted
 - 1.2 Maintenance
 - 1.2.1 Officer
 - 1.2.2 Enlisted
 - 1.2.3 Civilian

Several of the categories in the standard CES include an element labeled "Other." This element should be used to list costs that are not captured elsewhere. Since the cost structures of different systems may vary, this element may be tailored to the cost attributes

¹DoDD 5000.4, "OSD Cost Analysis Improvement Group" (revised edition forthcoming).

of the system in question. For example, under the Unit-Level Consumption category, element 2.5 (Other) might be indentured to show such costs as:

- 2.5 Other

- 2.5.1. Purchased Services

- 2.5.1.1 Communications Leases/Charges

- 2.5.1.2 Purchased Equipment Maintenance

- 2.5.1.3 Purchased Utilities

- 2.5.2 Transportation

- 2.5.2.1 Unit Training Transportation

- 2.5.2.2 Other Second-Destination Transportation

- 2.5.3 TAD/TDY

The levels of indenture for each element will depend on the operating and support requirements of the system and on the amount of data available at the time the estimate is prepared.

4.3 SIGNIFICANT COST ELEMENTS

When developing an estimate, the greatest amount of effort should be expended on those cost elements that:

- Account for a significant portion of total O&S costs;
- Can be affected by program decisions; or
- Assist in distinguishing among alternatives.

For example, in estimating the O&S costs of weapon systems, the most significant elements are typically unit personnel, fuel, depot maintenance, reparable, and software. The category of software maintenance demands special mention. The increased use of

software in primary operating systems and support equipment has resulted in significant costs for maintaining, modifying, and updating system and support software. All of the elements listed above are cost drivers in most weapons estimates and warrant detailed analysis. A potentially significant element that is specifically addressed at Milestone IV is the impact of a major upgrade or modification. Elements that may be potential cost drivers should not be estimated using planning factors when more appropriate or more accurate means are available. Indirect cost elements (such as base operating support) that may not be pertinent to distinguishing between alternatives can usually be addressed using planning factors.

4.4 SIGNIFICANT NON-COST DATA ELEMENTS

In addition to presenting calculated costs (e.g., personnel costs), most O&S estimates include non-cost data elements (e.g., numbers of authorized personnel) as well as identify the assumptions used in deriving the estimated costs. Examples of potentially significant non-cost elements are listed below:

- **Authorized Personnel.** Personnel data should be broken into military and civilian categories. Include in this element any unique considerations that may contribute to support costs.
 - **Officers.** The average number and grade of officers authorized to a unit. The personnel should be identified by functional specialty.
 - **Enlisted.** The average number and grade of enlisted personnel authorized to a unit. The personnel should be identified by functional specialty.
 - **Civilian.** The average number and grade of civilian personnel authorized to a unit. The personnel should be identified by functional specialty.
 - **Unique Considerations.** Unique personnel needs such as special skills, training, or manpower in critical occupations should be identified.

- **Operating Rates (Optempo).** The projected annual operating rate of a weapon system (operating hours, flying hours, miles driven, etc.).
- **Fuel Consumed.** The projected fuel consumption rate of a weapon system (gallons per operating/flying hour).
- **Reliability and Maintainability Data.** The reliability and maintainability values that correspond to the O&S costs presented. Typical elements include maintenance manhours per operating hour, mean time between failures, and mean time between removal. Values should be given for the total system and for major subsystems.

4.5 COST ELEMENTS TO EXCLUDE

A number of costs that are incurred over a system's life cycle are not typically included in O&S estimates. Potential cost categories to exclude are:

- **Research and Development.** This category includes costs incurred in designing new defense systems, components, and support equipment. Also included are the costs associated with developing and testing new systems (including prototype and test vehicle costs) through the end of engineering and manufacturing development. All of these costs should be excluded from O&S estimates.
- **Investment.** All initial procurement costs for a primary system, support equipment, and training equipment are excluded from O&S estimates, as are the costs of system modifications that add new capability. Major facility modification and construction costs also are excluded. Procurement costs that are included in O&S estimates are the sustaining investment costs incurred during the O&S period for modification kit procurement and installation (for safety, deficiency correction, or cost reduction purposes), training munitions, support equipment replacement, and other recurring procurement costs that result from operating the new system.
- **Disposal.** This category includes salvage values and disposal costs incurred during the phase-out period. These costs are not included in O&S estimates. Disposal costs are considered a separate category of total life-cycle cost. Disposal costs typically represent only a small fraction of a system's total life-cycle cost and so are excluded from most life-cycle cost estimates. The main exceptions (for which estimates must be provided) are the disposal of nuclear waste, solid propellant fuels, or other materials requiring detoxification, extended waste storage, or demilitarization. The decision as to whether to

include disposal costs depends on the significance of those costs as a share of total system life-cycle cost.

Those resources that can be related directly to a system, such as personnel requirements identified in the Manpower Estimate Report (MER), should be included in O&S estimates. DoDI 5000.2 and supplemental manpower reporting guidance define the scope of the manpower to be reported in the MER. MER data should be used in cost estimates beginning with Milestone II. For example, personnel to be reported in the MER should be identified for those units and organizations that will receive a new system, or that will be responsible for maintaining, supporting, or providing training for the system.

Indirect support costs are addressed on a case-by-case basis. Certain types of units and manpower associated with defense systems fall outside the scope of MER reporting requirements and so are excluded from O&S estimates. Primary examples include infrastructure costs that cannot be directly related to the addition or operation of a new system. Examples of such costs are given below:

- **Base Headquarters and Services.** This category includes the costs of base personnel and material that are not a direct function of the type and number of weapon systems located on a base. These costs pertain to the:
 - Operation, maintenance, and protection of base support facilities, road repair, fire and police protection, trash disposal, and utility services;
 - Operation and maintenance of base living quarters, commissaries, exchanges, religious facilities, and entertainment facilities; and
 - Supervision of the above activities.
- **Central Support Overhead.** This category includes the pay of personnel assigned to headquarters organizations that administer depot maintenance facilities, support depots, recruiting, operator and technical training, float equipment storage, and the upkeep of

headquarters facilities. If these costs are included in the surcharge used to reimburse the Defense Business Operations Fund, they will be included in the O&S estimate as well.

- **Command Structure Overhead.** This category includes the pay of personnel assigned to operating headquarters and staffs at or above the Numbered Army, Numbered Air Force, Naval Air Wing, and Fleet Marine Force level. It also includes the upkeep costs of these headquarters. Collectively, these headquarters supervise the operation of combat units and oversee policy formulation and administration for their respective Services.
- **Training Infrastructure.** This category includes the pay of personnel assigned to Service academies, reserve officer training corps at colleges and universities, professional military education schools, recruiting centers, and basic training schools. These organizations are part of the military training infrastructure, which provides basic accession training and advanced education to personnel regardless of the specialty training requirements of particular weapon systems.
- **Test and Evaluation.** This category includes personnel stationed at prime contractor sites who provide quality assurance and testing support. The category also encompasses the permanent employees of organizations involved in developmental and operational testing and evaluation.

5. O&S DOCUMENTATION REQUIREMENTS

5.1 INTRODUCTION

This chapter discusses the documentation requirements for O&S cost estimates. The detailed documentation provided with each cost estimate serves as an audit trail for that estimate and as a primary source of the information presented to the CAIG at the summary-level briefing by the program sponsor. The following sections identify a basic cost documentation format and describe the specific types of information that must be provided.

5.2 DOCUMENTATION APPROACH

This section presents a standard format for documenting O&S estimates reviewed by the CAIG. The stand-alone structure and data elements described represent the minimum information requirements. The guidelines presented for each section are not restrictive and should not limit good judgment in presenting any additional cost details relevant to an estimate. In adapting the basic structure (e.g., in determining the level of indenture or the cost element categories to include), the analyst should ensure that costs are allocated consistently within the CES and that the allocation criteria are explicitly identified in the documentation (to preclude double counting).

The cost documentation should provide a concise, results-oriented presentation of key points in a manner that directs attention to the effects on O&S costs of the decisions under consideration. Exhibit 5-1 provides a standard framework for structuring this material. The format may be used regardless of the acquisition phase or estimating approach employed. It has been designed to permit a detailed review of the ground rules and

assumptions, cost-estimating methods, data sources, and supporting rationale for estimates of O&S costs.

- I. EXECUTIVE SUMMARY
 - A. PURPOSE/SCOPE
 - B. BACKGROUND
 - C. SUMMARY
- II. PROGRAM OVERVIEW
 - A. PURPOSE/SCOPE
 - B. TASKING/TEAM COMPOSITION
 - C. PROGRAM SUMMARY
 - D. GROUND RULES AND ASSUMPTIONS
- III. ESTIMATE DOCUMENTATION
 - A. PRIMARY METHODOLOGY/MODELS
 - B. COST ELEMENT DOCUMENTATION
 - C. UNCERTAINTY ASSESSMENT
 - D. PROGRAM COST DRIVERS
 - E. SENSITIVITY RESULTS
- IV. SUMMARY
 - A. PRESENTATION FORMATS
 - B. COMPARISON TRACK

Exhibit 5-1. DOCUMENTATION STRUCTURE

5.3 EXECUTIVE SUMMARY

This section of the documentation provides a clear and concise summary of the purpose, background, and results of the O&S estimate. It should be brief (no more than four or five pages), yet provide the reviewer sufficient information about the program and its cost to make an informed decision. The executive summary consists of four subsections:

- **Purpose/Scope.** Identifies the purpose of the estimate, the limitations of the study (if any), and the acquisition phase at which the program is being assessed.
- **Background.** Provides a brief description of the program, the key assumptions made, the alternatives being reviewed, the reference system used, the operating and support concepts, and relevant technical information.

- **Summary.** Provides a summary (reduced key cost formats acceptable) of the results of the cost estimate. Presents highlights of the comparisons of the alternative(s) with the reference system. Discusses cost-drivers and high-risk areas that could affect program decisions.

5.4 PROGRAM OVERVIEW

The program overview describes the purpose of the estimate, the background of the program, the characteristics of the system, and the operating and support philosophy. Comparisons between the proposed system and a reference system should be drawn. Ground rules and assumptions must be identified to prevent misinterpretation of the estimate. The program overview section consists of the following subsections:

- **Purpose/Scope.** Identifies the purpose of the estimate, any limitations of the study, the acquisition phase at which the program is being reviewed, and the level of detail of the estimate.
- **Tasking/Team Composition.** Provides a summary of the O&S cost tasking, and identifies the team chief, team members, organization/office symbol, and areas of responsibility.
- **Program Summary.** Provides background information on the program and a technical summary of the system whose costs are being estimated. Identifies the reference system and compares its characteristics, operating concepts, maintenance and support concepts, mission, and logistics system and subsystem factors with those of the proposed system and any other alternatives being evaluated. Identifies the deployment schedule and describes the initial and follow-on support philosophy (interim contractor support, contractor logistics support, in-house maintenance, etc.) and the proposed training philosophy.

Much of the information in the program summary can be found in other program documents prepared for DAB or DoD component acquisition reviews. A primary source of much of this information is the Cost Analysis Requirements Document (CARD), prepared by the DoD component responsible for the program. Appendix A lists the major documents prepared for DAB reviews and provides a brief description of each. Supporting

documentation should be referenced to provide an audit trail and to ensure that the data used in the estimate are consistent with current program documents.

- **Ground Rules and Assumptions.** The program documents identify how a system will be operated, maintained, and supported. The ground rules and assumptions are developed from this information. The ground rules should address the O&S period, base year of dollars, type of dollars (constant, then-year, base-year), and inflation indices. Costs to be included or excluded, and elements that differ from the standard CES, should also be identified. The documented ground rules provide the information needed to interpret cost estimates properly. They should be compatible with the information provided in the program summary and in the program documents listed in Appendix A. Assumptions, which are basically informed judgments concerning future conditions, clarify and limit the scope of an estimate in relation to the acquisition milestone and program phase.

5.5 ESTIMATE DOCUMENTATION

The documentation should be tailored to the scope and level of detail of the estimate. Supporting data and other information too complex for inclusion in the body of the estimate should be indexed and presented in appendices. The documentation should provide enough detail for the estimate to be replicated by another analyst. The documentation section consists of the following subsections:

- **Primary Methodology/Models.** Identifies the methodology and models used to develop the O&S estimate. The basis for selecting a particular estimating methodology or model also is described. CERs, or factors developed for the estimate, must be fully documented. The process used to validate newly created CERs and models must also be described. All models used, along with complete details regarding any parametric input or output and any calibration or adjustment, must be described. Applications and limitations must be identified. If possible, a copy of the cost model and data input should be provided on a disk with the cost estimate.
- **Cost Element Documentation.** Each cost element should be fully documented, so that it can be replicated by a competent analyst using the same assumptions, methods, and data. The detail must include or reference the data bases used to support parametric and analogous

estimates, and must state how judgments were made for parametric inputs and describe the analogy complexity or scaling factors used in the calculations. Clear documentation and access to the data bases is essential. The cost estimate should be tied to the data bases, and the data bases used should be qualified with respect to the type of data represented (i.e., actual, budget estimates, or development test data). The documentation for each cost element should include the following:

- A definition of the cost element, if it differs from the definition contained in the CES appendix;
 - A description of how the cost for each element was derived;
 - A list of the CERs used and an explanation of each (including applicable range for independent variables);
 - A definition of each input variable;
 - A list of the values assigned to the input variables;
 - The mathematical computation used in deriving the estimate;
 - An identification of significant factors that drive costs within each element (such as average manning, grade, special skills or training, operating hours, and material consumption); and
 - An identification of each data source, the specific data obtained, and any adjustments made to the data.
- **Uncertainty Assessment.** Cost uncertainty is inherent in any estimate. It results from the potential for unplanned system changes, technical problems, performance deficiencies, and estimating errors, etc. The purpose of the uncertainty analysis is to "bound the estimate." A point estimate cannot reflect the uncertainties inherent in a calculation, as it implies a precise cost; a range of costs should therefore be provided to allow for cost-estimating uncertainty. The range can be derived objectively through statistical analysis, or subjectively through the use of expert opinion. The use of an arbitrary "plus-minus" (+/-) percentage to qualify the total estimate is not an adequate uncertainty analysis.
 - **Program Cost Drivers.** The level of confidence in any O&S estimate is a function of the sensitivity of the input factors to potential change.

Key cost drivers should be identified in order to determine the cost impact of changes in performance characteristics, reliability, maintainability, and operating tempo. Each potential change should be tested independently. The operating and support policy for the system should also be reviewed to determine if it is a prime cost driver (i.e., if a system requires 24-hour manning, improvements in reliability will do little to reduce manning requirements).

- **Sensitivity Analysis.** Sensitivity analysis of suspected cost drivers places the uncertainty associated with an estimate in the proper perspective. It permits decisions influencing the design, reliability, manning policy, and operating tempo of a weapon system to focus on those elements having the greatest impact on cost. The sensitivity of costs to changes in operating parameters (such as activity rates and performance characteristics) should be examined, with the parameters varied individually. The use of an arbitrary (+/-) percentage to qualify the total estimate does not constitute an adequate sensitivity analysis. The results of the sensitivity analysis may be presented in the format shown in Exhibit 6-3. Where quantification of uncertainties proves impractical, a qualitative assessment of the variation should be made.

5.6 SUMMARY

The results of the estimate should be summarized and presented at the end of the documentation. They should be portrayed in a manner that focuses attention on the impact of O&S costs for each element and for the total system. The summary may compare the O&S costs of each alternative with those of one or more reference systems, identify cost drivers, discuss the sensitivity of key variables to change, and identify major differences from the previous estimate. Presentation formats are discussed in Chapter 6. Although not all of the formats may be used in any given assessment, they are provided to assist the analyst in capturing, comparing, analyzing, and documenting O&S costs. As discussed in Chapter 6, certain formats are recommended for use in DAB briefings. Other formats are intended for use in documenting the estimate. The cost estimate provided for each element must track to the cost element documentation discussed in section 5.5. The cost estimate should

be summarized in constant dollars of the present budget year and in then-year dollars (if required) for each fiscal year and appropriation category.

- **Presentation Formats.** The presentation formats described in Chapter 6 provide a standard framework for portraying the results of O&S estimates. They promote consistency among estimates with respect to level of detail, and they minimize the variations in format that characterize some cost submissions. The formats also promote consistency in the evaluation process and facilitate the comparison of estimates submitted at various milestones.
- **Comparison Track.** The documentation should identify the amount and reasons for any significant cost changes between the current and prior estimate. If a number of alternatives are being compared, a summary and explanation of the differences in their costs should be provided. The comparison and documentation of differences should be accomplished in conjunction with the preparation of each applicable format.

6. PRESENTATION REQUIREMENTS

6.1 INTRODUCTION

The presentation formats described in this section provide both the analyst and the CAIG a standard framework for displaying, documenting, and reviewing O&S estimates. Although the formats establish uniform procedures for presenting costs, they should not preclude good judgment in providing additional cost information that may be pertinent to the program being evaluated. Furthermore, depending on the reference system used, the number of alternatives considered, and the purpose of the review, not all of the formats may be applicable. The analyst must select and/or modify those formats that are most appropriate for presenting the estimate results.

6.2 PRESENTATION FORMATS

The formats provided at the end of this section (Exhibits 6-1 through 6-6) are designed to assist the analyst in presenting and documenting the results of O&S estimates. Although Exhibits 6-1, 6-2, and 6-3 are recommended for use in the O&S briefings for DAB reviews, the actual exhibits used should be discussed with the CAIG representative at the pre-CAIG planning meetings. The other formats may be used as necessary to provide further documentation of the results of an estimate. The formats cover four types of presentations:

- **Annualized Steady-State Estimate.** This format presents annualized costs for a typical deployable unit or single operational system. Data are presented by cost element for the reference system and the alternative(s). In addition, a detailed cost matrix portrays the costs of the elements and associated subelements. (Exhibit 6-1)

- **Life-Cycle O&S Estimate.** These formats show life-cycle costs by alternative. They compare the current program office estimate (POE) with the independent cost estimate (ICE) or with the prior POE estimate. (Exhibits 6-2 and 6-5)
- **Cost Driver Analysis.** This format identifies program cost drivers and shows how changes in them affect life-cycle costs. (Exhibit 6-3)
- **Time-Phased O&S Estimate.** These formats show costs over time relative to the deployment schedule and operating concept. (Exhibits 6-4 and 6-6)

Cost presentations for the CAIG should be developed in accordance with DoDD 5000.4. Exhibits 6-1 through 6-6 show the recommended formats and information requirements for each. The generic O&S cost element structure (Appendix B) is used in exhibits for illustrative purposes only. The CES for the weapons category in question (Appendices C through G) should be substituted in the materials presented to the CAIG. All costs should be expressed in constant dollars of the present fiscal year unless otherwise specified.

- **Annualized Steady-State Deployable Unit O&S Cost (Exhibit 6-1)**
 - **General:** Compares typical deployable unit (or single operational system) annual recurring O&S costs for the reference system and proposed alternative(s). If more than one alternative is being considered, a separate format should be prepared for each alternative. (NOTE: Revise the title of the proposed alternative column accordingly.)
 - **Columns:** Reference System and Proposed Alternative. A Delta column shows the differences in cost between the alternative and the reference system. The Note column provides reference numbers for tracking explanations of differences.
 - **Rows:** The section labeled Deployable Unit Data shows system quantities, mission personnel, and operating hours per system per year. The Cost Elements section gives

annualized steady-state costs by cost element for the reference system and the proposed alternative.

- **Life-Cycle O&S Cost Comparison: POE and ICE (Exhibit 6-2)**

- General: Compares the results of the POE and the ICE. If the preferred alternative has not been selected, this format should be completed for each alternative under study.
- Columns: POE, ICE, Delta, and Note Ref. #. The Delta column identifies cost differences between the estimates. The Note column provides reference numbers for tracking explanations of differences.
- Rows: Provide breakouts, by cost element, of the POE and the ICE. Differences are identified by cost element. Reference numbers in the Note column identify those differences that warrant further explanation.

- **Life-Cycle O&S Cost Driver Analysis (Exhibit 6-3)**

- General: Identifies the main cost drivers of the proposed system. (The specific cost drivers will vary depending on the weapon system.) The sensitivity of costs to changes in cost-driver parameters is calculated as a percentage change (+/-) in the expected life-cycle O&S cost. If the preferred alternative has not been selected, this format should be completed for each alternative under study.
- Columns: O&S Cost columns for High, Expected, and Low total life-cycle O&S cost estimates. Non-Cost Parameter columns for High, Expected, and Low non-cost-driver data by element and a corresponding column for Percentage (+/-) of Expected Life-Cycle O&S Cost.
- Rows: Enter the high, expected and low total life-cycle O&S cost in the first row. The remaining rows identify specific elements that drive system costs. Enter high, expected, and low uncertainty range non-cost values for each element. Show the percentage change (+/-) from the expected life-cycle O&S cost produced by the high/low range values.

- **Time-Phased Life-Cycle O&S Costs (Exhibit 6-4)**

- General: Presents prior fiscal year costs; time-phased O&S costs for the deployment, steady-state, and phase-out periods; total life-cycle O&S costs; and annualized steady-state recurring costs. If the preferred alternative has not been selected, a separate format should be completed for each alternative.
- The annualized steady-state recurring cost represents average annual operating costs over the cumulative steady-state period. A steady-state period does not necessarily mean that O&S costs will be identical each year. Programmed depot maintenance overhaul cycles, modifications, a change in failure rates, and cyclic sustaining investment costs may produce differences in annual O&S costs. To document these differences, an expanded time-phased exhibit may also be prepared, identifying the costs for each fiscal year in the O&S period.
- Columns: FY__ & Prior, Deployment Period FY__, FY__,... (by fiscal year), Cumulative Steady-State FY__ to FY__, Phase-Out Period FY__, FY__,... (by fiscal year), Total Life-Cycle O&S Costs, and Annualized Steady-State Recurring Cost.
- Rows: Schedule of cumulative systems deployed by fiscal year and average number of operating hours per system per year. O&S costs by cost element for each time period.

- **Life-Cycle O&S Cost Comparison: Prior POE and Current POE (Exhibit 6-5)**

- General: Compares the Prior POE and Current POE. At Milestone I, these estimates are usually identical. For subsequent milestones, the Prior POE is the service-approved POE submitted (with approved DAB changes) for the previous milestone. If the preferred alternative has not been selected, this format should be completed for each alternative under study.
- Columns: Prior POE, Current POE, Delta, and Note Ref. #. The Delta column shows differences between the Prior POE and Current POE. The Note column

provides reference numbers for tracking explanations of differences.

- Rows: Provide breakouts, by cost element, of the Prior POE and Current POE. Differences are identified by cost element. Reference numbers in the Note column identify cost differences that warrant further explanation.

- **Time-Phased Life-Cycle O&S Costs by Appropriation Category (Exhibit 6-6)**

- General: Presents prior fiscal year costs and time-phased O&S costs over the FYDP period and for the remainder of the system's life (the "To Complete" period). If the preferred alternative has not been selected, a separate format should be completed for each alternative. Costs should be expressed in both constant and then-year dollars.
- Columns: FY___ & Prior, FYDP Period Requirements (by fiscal year), and To Complete FY___ to FY___.
- Rows: Estimated O&S costs by fiscal year (or fiscal year period) and appropriation category in constant and then-year dollars.

ANNUALIZED STEADY-STATE
DEPLOYABLE UNIT O&S COST
UNIT (SQUADRON, COMPANY, SHIP, ETC.)^a

DATE:
WEAPON SYSTEM:
CONSTANT FY __ \$ (000)

REFERENCE
SYSTEM^b
(TITLE)^b

PROPOSED
ALTERNATIVE
(TITLE)^d

DELTA
(PROP ALT
& REF SYS)

NOTE
REF. #^c

DEPLOYABLE UNIT DATA

UNIT EQUIPMENT (QTY)^f
MISSION PERSONNEL
OPERATING HOURS/SYSTEM/YR

COST ELEMENTS

- 1.0 MISSION PERSONNEL
 - 1.1 OPERATIONS
 - 1.2 MAINTENANCE
 - 1.3 OTHER MISSION PERSONNEL
- 2.0 UNIT-LEVEL CONSUMPTION
 - 2.1 POL/ENERGY CONSUMPTION
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 2.3 DEPOT-LEVEL REPARABLES
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES
 - 2.5 OTHER
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)
 - 3.1 MAINTENANCE
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 3.3 OTHER
- 4.0 DEPOT MAINTENANCE
 - 4.1 OVERHAUL/REWORK
 - 4.2 OTHER
- 5.0 CONTRACTOR SUPPORT
 - 5.1 INTERIM CONTRACTOR SUPPORT
 - 5.2 CONTRACTOR LOGISTICS SUPPORT
 - 5.3 OTHER

Exhibit 6-1. ANNUALIZED STEADY-STATE DEPLOYABLE UNIT O&S COST

		REFERENCE SYSTEM (TITLE) ^b	PROPOSED ALTERNATIVE (TITLE) ^d	DELTA (PROP ALT & REF SYS)	NOTE REF. # ^e
6.0	SUSTAINING SUPPORT				
6.1	SUPPORT EQUIPMENT REPLACEMENT				
6.2	MODIFICATION KIT PROCUREMENT/INSTALLATION				
6.3	OTHER RECURRING INVESTMENT				
6.4	SUSTAINING ENGINEERING SUPPORT				
6.5	SOFTWARE MAINTENANCE SUPPORT				
6.6	SIMULATOR OPERATIONS				
6.7	OTHER				
7.0	INDIRECT SUPPORT				
7.1	PERSONNEL SUPPORT				
7.2	INSTALLATION SUPPORT				
	GRAND TOTAL				

NOTE: REFLECTS GENERIC COST ELEMENT STRUCTURE. SUBSTITUTE CES APPROPRIATE FOR SYSTEM BEING ESTIMATED.

- IDENTIFY APPLICABLE DEPLOYABLE UNIT TYPE (SQUADRON, COMPANY, COMPOSITE ORGANIZATION, ETC.), OR CONVERT TOTAL SYSTEM STEADY-STATE COSTS TO COST PER OPERATIONAL SYSTEM AND REVISE TITLE TO READ: "ANNUALIZED STEADY-STATE O&S COST PER OPERATIONAL SYSTEM."
- IDENTIFY THE TITLE (TYPE/MODEL/SERIES) OF THE REFERENCE SYSTEM IN THE COLUMN HEADER.
- ENTER DESCRIPTION (TITLE) OF THE PROPOSED ALTERNATIVE.
- IF OTHER ALTERNATIVES ARE BEING REVIEWED, A SEPARATE FORMAT SHOULD BE COMPLETED FOR EACH. REVISE THE TITLE OF THE "PROPOSED ALTERNATIVE" COLUMN ACCORDINGLY.
- IDENTIFY REFERENCE NUMBERS IN "NOTE REF. #" COLUMN AND PROVIDE SEPARATE EXPLANATIONS OF COST DIFFERENCES AT BOTTOM OF TABLE.
- FOR UNIT EQUIPMENT, IDENTIFY THE WEAPON SYSTEM QUANTITY FOR THE TYPICAL DEPLOYABLE UNIT (OR PER SYSTEM QUANTITY OF 1).

Exhibit 6-1. ANNUALIZED STEADY-STATE DEPLOYABLE UNIT O&S COST (CONT'D)

LIFE-CYCLE O&S COST COMPARISON:
POE AND ICE
ALTERNATIVE: _____^a

DATE:
WEAPON SYSTEM:
CONSTANT FY ___ \$ (000)

NOTE
REF. #^b

DELTA

ICE
(AS OF: _____)

POE
(AS OF: _____)

COST ELEMENTS

- 1.0 MISSION PERSONNEL
 - 1.1 OPERATIONS
 - 1.2 MAINTENANCE
 - 1.3 OTHER MISSION PERSONNEL
- 2.0 UNIT-LEVEL CONSUMPTION
 - 2.1 POL/ENERGY CONSUMPTION
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 2.3 DEPOT-LEVEL REPARABLES
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES
 - 2.5 OTHER
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)
 - 3.1 MAINTENANCE
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS
 - 3.3 OTHER
- 4.0 DEPOT MAINTENANCE
 - 4.1 OVERHAUL/REWORK
 - 4.2 OTHER
- 5.0 CONTRACTOR SUPPORT
 - 5.1 INTERIM CONTRACTOR SUPPORT
 - 5.2 CONTRACTOR LOGISTICS SUPPORT
 - 5.3 OTHER

Exhibit 6-2. LIFE-CYCLE O&S COST COMPARISON: POE AND ICE

NOTE
REF: # b

DELTA

ICE
(AS OF:)

POE
(AS OF:)

6.0	SUSTAINING SUPPORT			
6.1	SUPPORT EQUIPMENT REPLACEMENT			
6.2	MODIFICATION KIT PROCUREMENT/INSTALLATION			
6.3	OTHER RECURRING INVESTMENT			
6.4	SUSTAINING ENGINEERING SUPPORT			
6.5	SOFTWARE MAINTENANCE SUPPORT			
6.6	SIMULATOR OPERATIONS			
6.7	OTHER			
7.0	INDIRECT SUPPORT			
7.1	PERSONNEL SUPPORT			
7.2	INSTALLATION SUPPORT			
	GRAND TOTAL			

NOTE: REFLECTS GENERIC COST ELEMENT STRUCTURE. SUBSTITUTE CES APPROPRIATE FOR SYSTEM BEING ESTIMATED.

- a. ENTER DESCRIPTION (TITLE) OF PROPOSED ALTERNATIVE.
- b. IDENTIFY REFERENCE NUMBER IN "NOTE REF. #" COLUMN AND SEPARATELY EXPLAIN COST DELTAS.

LIFE-CYCLE O&S COST DRIVER ANALYSIS

DATE:
WEAPON SYSTEM:
CONSTANT FY \$ (000)

<u>COST</u>	<u>O&S COST^a</u>		<u>PERCENT (+/-) OF EXPECTED LIFE-CYCLE O&S</u>	
	<u>HIGH</u>	<u>EXPECTED</u>	<u>LOW</u>	<u>HIGH</u>
TOTAL LIFE-CYCLE O&S COST	\$	\$	\$	--
<u>COST DRIVER^{bc}</u>	<u>NON-COST PARAMETERS^d</u>		<u>HIGH^e</u>	<u>LOW^e</u>
	<u>HIGH</u>	<u>EXPECTED</u>	<u>LOW</u>	

MISSION PERSONNEL
OPERATIONS
MAINTENANCE
OTHER MISSION

OPTEMPO^f

OVERHAUL INTERVAL

FUEL CONSUMPTION

SYSTEM MTBR

OTHER

NOTES:

- ENTER ESTIMATED TOTAL LIFE-CYCLE "HIGH/EXPECTED/LOW" O&S COST.
- IN LEFT COLUMN, IDENTIFY COST DRIVERS APPLICABLE TO THE SYSTEM BEING ESTIMATED.
- SPECIFY NON-COST-PARAMETER UNIT OF MEASURE FOR EACH COST DRIVER (E.G., PER UNIT, SYSTEM, YEAR, FLYING HOUR, OPERATING HOUR, ETC).
- ENTER "HIGH/EXPECTED/LOW" NON-COST PARAMETERS FOR EACH APPLICABLE COST DRIVER (E.G., HIGH, EXPECTED, LOW OPTEMPO PER YEAR, ETC).
- FOR EACH COST DRIVER, ENTER THE "HIGH/LOW" PERCENTAGE IMPACT ON THE TOTAL EXPECTED LIFE-CYCLE O&S COST.
- OPTEMPO IDENTIFIES THE PER SYSTEM LEVEL OF ACTIVITY, EXPRESSED IN ANNUAL FLYING HOURS, OPERATING HOURS, MILES, ETC.

Exhibit 6-3. LIFE-CYCLE O&S COST DRIVER ANALYSIS

TIME-PHASED LIFE-CYCLE
O&S COSTS

ALTERNATIVE: _____^a

DATE:
WEAPON SYSTEM:
CONSTANT FY __ \$ (000)

	FY __ & PRIOR	DEPLOYMENT PERIOD FY __ FY __ ^b	CUMULATIVE STEADY-STATE FY __ TO FY __	PHASE-OUT PERIOD FY __ FY __ ^b	TOTAL LIFE CYCLE O&S	ANNUALIZED STEADY-STATE RECURRING
--	------------------	--	--	---	----------------------------	---

SYSTEMS DEPLOYED (CUM)/YR
OPTEMPO HRS/SYSTEM/YR^c

- | | |
|-----|---|
| 1.0 | MISSION PERSONNEL |
| 1.1 | OPERATIONS |
| 1.2 | MAINTENANCE |
| 1.3 | OTHER MISSION PERSONNEL |
| 2.0 | UNIT-LEVEL CONSUMPTION |
| 2.1 | POL/ENERGY CONSUMPTION |
| 2.2 | CONSUMABLE MATERIAL/REPAIR PARTS |
| 2.3 | DEPOT-LEVEL REPARABLES |
| 2.4 | TRAINING MUNITIONS/EXPENDABLE STORES |
| 2.5 | OTHER |
| 3.0 | INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT) |
| 3.1 | MAINTENANCE |
| 3.2 | CONSUMABLE MATERIAL/REPAIR PARTS |
| 3.3 | OTHER |
| 4.0 | DEPOT MAINTENANCE |
| 4.1 | OVERHAUL/REWORK |
| 4.2 | OTHER |
| 5.0 | CONTRACTOR SUPPORT |
| 5.1 | INTERIM CONTRACTOR SUPPORT |
| 5.2 | CONTRACTOR LOGISTICS SUPPORT |
| 5.3 | OTHER |

FY ____	DEPLOYMENT PERIOD & PRIOR	CUMULATIVE STEADY-STATE FY ____ FY ____ ^b	PHASE-OUT PERIOD FY ____ TO FY ____	TOTAL LIFE CYCLE FY ____ FY ____ ^b	ANNUALIZED STEADY-STATE O&S	RECURRING
6.0	SUSTAINING SUPPORT					
6.1	SUPPORT EQUIPMENT REPLACEMENT					
6.2	MODIFICATION KIT PROCUREMENT/INSTALLATION					
6.3	OTHER RECURRING INVESTMENT					
6.4	SUSTAINING ENGINEERING SUPPORT					
6.5	SOFTWARE MAINTENANCE SUPPORT					
6.6	SIMULATOR OPERATIONS					
6.7	OTHER					
7.0	INDIRECT SUPPORT					
7.1	PERSONNEL SUPPORT					
7.2	INSTALLATION SUPPORT					
	GRAND TOTAL					

NOTES: REFLECTS GENERIC COST ELEMENT STRUCTURE. SUBSTITUTE CES APPROPRIATE FOR SYSTEM BEING ESTIMATED. DETAILED DOCUMENTATION (BY CES NUMBER AND YEAR) SHOULD SUPPORT THE DERIVATION OF THESE ESTIMATES.

- a. IDENTIFY TITLE OF PROPOSED ALTERNATIVE (OR OF OTHER ALTERNATIVES, WHERE APPLICABLE). A SEPARATE FORMAT MUST BE COMPLETED FOR EACH ALTERNATIVE.
- b. INSERT ADDITIONAL FY COLUMNS FOR DEPLOYMENT AND PHASE-OUT PERIODS AS REQUIRED.
- c. OPTEMPO MAY BE EXPRESSED IN TERMS OF OPERATING HOURS, FLYING HOURS, MILES DRIVEN, ETC.

Exhibit 6-4. TIME-PHASED LIFE-CYCLE O&S COST (CONT'D)

LIFE-CYCLE O&S COST COMPARISON:
PRIOR POE AND CURRENT POE
ALTERNATIVE: _____^a

DATE:
WEAPON SYSTEM:
CONSTANT FY __\$ (000)

		PRIOR POE (AS OF: __) ^b	CURRENT POE (AS OF: __)	DELTA	NOTE REF. # ^c
1.0	MISSION PERSONNEL				
1.1	OPERATIONS				
1.2	MAINTENANCE				
1.3	OTHER MISSION PERSONNEL				
2.0	UNIT-LEVEL CONSUMPTION				
2.1	POL/ENERGY CONSUMPTION				
2.2	CONSUMABLE MATERIAL/REPAIR PARTS				
2.3	DEPOT-LEVEL REPARABLES				
2.4	TRAINING MUNITIONS/EXPENDABLE STORES				
2.5	OTHER				
3.0	INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)				
3.1	MAINTENANCE				
3.2	CONSUMABLE MATERIAL/REPAIR PARTS				
3.3	OTHER				
4.0	DEPOT MAINTENANCE				
4.1	OVERHAUL/REWORK				
4.2	OTHER				
5.0	CONTRACTOR SUPPORT				
5.1	INTERIM CONTRACTOR SUPPORT				
5.2	CONTRACTOR LOGISTICS SUPPORT				
5.3	OTHER				

Exhibit 6-5. LIFE-CYCLE O&S COST COMPARISON: PRIOR POE AND CURRENT POE

NOTE
REF. # ^c

DELTA

CURRENT POE
(AS OF:) ^b

PRIOR POE
(AS OF:) ^b

6.0	SUSTAINING SUPPORT			
6.1	SUPPORT EQUIPMENT REPLACEMENT			
6.2	MODIFICATION KIT PROCUREMENT/INSTALLATION			
6.3	OTHER RECURRING INVESTMENT			
6.4	SUSTAINING ENGINEERING SUPPORT			
6.5	SOFTWARE MAINTENANCE SUPPORT			
6.6	SIMULATOR OPERATIONS			
6.7	OTHER			
7.0	INDIRECT SUPPORT			
7.1	PERSONNEL SUPPORT			
7.2	INSTALLATION SUPPORT			
	GRAND TOTAL			

SYSTEM COST DRIVERS ^d

PROCUREMENT QUANTITY
OPERATIONAL QUANTITY
OPTEMPO
FUEL CONSUMPTION
MILPERS AUTHORIZATIONS

NOTE: REFLECTS GENERIC COST ELEMENT STRUCTURE. SUBSTITUTE CES APPROPRIATE FOR SYSTEM BEING ESTIMATED.

- IDENTIFY TITLE OF PROPOSED ALTERNATIVE (OR OF OTHER ALTERNATIVES, WHERE APPLICABLE). A SEPARATE FORMAT MUST BE COMPLETED FOR EACH ALTERNATIVE.
- AT MILESTONE 1, PRIOR POE AND CURRENT POE WILL NORMALLY MATCH. FOR SUBSEQUENT PERIODS, PRIOR POE WILL REFLECT THE POE COMPLETED AND APPROVED FOR THE PRIOR MILESTONE.
- IDENTIFY REFERENCE NUMBER IN "NOTE REF. #" COLUMN AND SEPARATELY EXPLAIN COST DIFFERENCES.
- IDENTIFY THE PARAMETERS FOR SIGNIFICANT COST DRIVERS WHICH MAY HAVE CHANGED SINCE THE LAST ESTIMATE. TAILOR THE LIST AS APPROPRIATE.

Exhibit 6-5. LIFE-CYCLE O&S COST COMPARISON: PRIOR POE AND CURRENT POE (CONT'D)

TIME-PHASED LIFE-CYCLE
O&S COSTS BY APPROPRIATION CATEGORY
ALTERNATIVE: _____^a

DATE: _____
WEAPON SYSTEM: _____
CONSTANT FY ____ \$ (000)^b

FY ____ & PRIOR FY ____ FY ____ FY ____ FY ____ TO COMPLETE
FY ____ TO FY ____^c

APPROPRIATION^d

MILITARY PERSONNEL

OPERATIONS & MAINTENANCE

PROCUREMENT

GRAND TOTAL

NOTES:

- a. IDENTIFY TITLE OF PROPOSED ALTERNATIVE (OR OF OTHER ALTERNATIVES, WHERE APPLICABLE). A SEPARATE FORMAT MUST BE COMPLETED FOR EACH ALTERNATIVE.
- b. PREPARE EXHIBIT IN CONSTANT AND THEN-YEAR DOLLARS. REVISE HEADER TO INDICATE TYPE OF DOLLARS USED.
- c. "TO COMPLETE FY ____ TO FY ____" COLUMN COVERS REMAINING O&S LIFE-CYCLE PERIOD.
- d. ENTER ADDITIONAL APPROPRIATION TITLES IF REQUIRED.

APPENDIX A
PROGRAM REFERENCE DOCUMENTS

**MILESTONE
REQUIRED**

DOCUMENT

MS 0

MISSION NEED STATEMENT (MNS): The MNS is a non-system-specific statement of operational capability needs. It discusses nonmaterial alternatives, potential material alternatives, infrastructure support constraints, operational environments, and desired mission capability.

MS 0-IV

ACQUISITION DECISION MEMORANDUM (ADM): The ADM is a memorandum to the Secretary of Defense from the Defense Acquisition Executive, documenting the Secretary's milestone and other decisions (including approval of the Integrated Program Summary and acquisition strategy) on a DAB program.

MS I-IV

OPERATIONAL REQUIREMENTS DOCUMENT (ORD): The ORD identifies performance and related operational parameters for a proposed concept or system. It describes the overall mission area, type of system proposed, and anticipated operational and support concepts in sufficient detail to support program and logistics planning.

MS I-IV

SYSTEM THREAT ASSESSMENT REPORT (STAR): The STAR is prepared by the cognizant intelligence office of the implementing command and is validated by the Defense Intelligence Agency or the appropriate Service Assistant Chief of Staff for Intelligence. It describes the projected future operational threat environment, the system-specific threat, and any reactive threats that could affect program decisions.

MS I-IV

INTEGRATED PROGRAM SUMMARY (IPS): The IPS comprises several documents that highlight the status of critical areas and describe plans for future phases. It replaces the System Concept Paper and the Decision Coordinating Paper. The following documents are included in the IPS:

- Program Structure
- Program Life-Cycle Cost Estimate Summary
- Acquisition Strategy Report
- Risk Assessment
- Environmental Analysis
- Affordability Assessment
- Cooperative Opportunities Document

MS I-IV

INTEGRATED PROGRAM ASSESSMENT (IPA): The IPA is prepared by the DAB or designated Service Acquisition Executive (SAE). It summarizes the DAB's or SAE's assessment of a program. It is presented in the same format as the IPS, and identifies critical areas, issues, and recommendations.

**MILESTONE
REQUIRED**

DOCUMENT

MS I-IV	COST ANALYSIS REQUIREMENTS DESCRIPTION (CARD): The CARD is prepared by the DoD Component responsible for a program. It provides the program office and the team preparing the independent estimate a detailed statement of the scope of the estimates to be made for each alternative.
MS I-IV	PROGRAM LIFE-CYCLE COST ESTIMATE: Documents the Program Manager's estimate of life-cycle costs. Used by the milestone decision authority, along with the Independent Cost Estimate (on ACAT I and II programs), to develop the program baseline and assess program affordability.
MS I-IV	ACQUISITION PROGRAM BASELINE (APB): This document is a formal agreement among the DAE, SAE, PEO, and PM identifying a program's functional specifications, cost, schedule, and operational effectiveness and suitability requirements, and other factors critical to the program's success. The MNS serves as the program baseline at Milestone 0. A concept baseline is developed at Milestone I. A development baseline is established at Milestone II, and a production baseline is established at Milestone III.
MS II, III	MANPOWER ESTIMATE REPORT (MER): The MER is an estimate of the total number of military, civilian, and contractor personnel required to operate, maintain, support, and provide training for a defense system when fully deployed. This document is submitted to the Secretary of Defense at Milestones II and III.
MS I-IV	TEST AND EVALUATION MASTER PLAN (TEMP): The TEMP provides a framework for developing detailed test and evaluation plans and for determining the schedule and resource implications of the test and evaluation program. It identifies and integrates the test objectives, responsibilities, resources, and schedules that must be accomplished prior to future milestone decision points.
MS I-IV	INDEPENDENT COST ESTIMATE (ICE): An ICE on the life-cycle cost of a system is prepared and documented by an organization outside the program office. For all major defense acquisition programs, the OSD CAIG reviews the life-cycle cost estimates developed by both the program office and the independent cost-estimating team.

**MILESTONE
REQUIRED**

DOCUMENT

MS I-IV

COST AND OPERATIONAL EFFECTIVENESS ANALYSIS (COEA):
COEAs are conducted at Milestones I and II (and as required at Milestones III and IV) to assess the operational effectiveness and suitability of proposed concepts. The cost-effectiveness of the recommended approach and of alternative approaches is considered.

MS III

OPERATIONAL TEST & EVALUATION (OT&E) REPORT: The OT&E Report presents the results of the initial tests of a system.

MS III

BEYOND-LOW-RATE INITIAL PRODUCTION (LRIP) REPORT:
This report assesses the adequacy of OT&E and the operational effectiveness and suitability of a weapon system, subsystem, or component. It is prepared by the Director, Operational Test and Evaluation.

APPENDIX B

**GENERIC
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**GENERIC
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS**
 - 1.2 MAINTENANCE**
 - 1.3 OTHER MISSION PERSONNEL**
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 POL/ENERGY CONSUMPTION**
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 2.3 DEPOT-LEVEL REPARABLES**
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES**
 - 2.5 OTHER**
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)**
 - 3.1 MAINTENANCE**
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 3.3 OTHER**
- 4.0 DEPOT MAINTENANCE**
 - 4.1 OVERHAUL/REWORK**
 - 4.2 OTHER**
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 INTERIM CONTRACTOR SUPPORT**
 - 5.2 CONTRACTOR LOGISTICS SUPPORT**
 - 5.3 OTHER**
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT**
 - 6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION**
 - 6.3 OTHER RECURRING INVESTMENT**
 - 6.4 SUSTAINING ENGINEERING SUPPORT**
 - 6.5 SOFTWARE MAINTENANCE SUPPORT**
 - 6.6 SIMULATOR OPERATIONS**
 - 6.7 OTHER**
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT**
 - 7.2 INSTALLATION SUPPORT**

**GENERIC
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE DEFINITIONS**

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances of officer, enlisted, and civilian personnel required to operate, maintain, and support a discrete operational system or deployable unit. This includes the personnel necessary to meet combat readiness, unit training, and administrative requirements. For units that operate more than one type of defense system, personnel requirements will be allocated on a relative workload basis. Personnel costs will be based on manning levels and skill categories.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

Pay and allowances for civilian personnel should be based on the standard composite rate, which includes the following elements: basic pay, additional variable payments for overtime, holiday pay, night differentials, cost-of-living allowances, and the government contribution to employee benefits, insurance, retirement, and the Federal Insurance Contribution Act.

1.1 OPERATIONS. The pay and allowances for the crew or full complement of personnel required to operate a system. System operators will normally include officers, enlisted personnel, or a combination of both.

1.2 MAINTENANCE. The pay and allowances of military and civilian personnel who support and perform maintenance on a primary system, associated support equipment, and unit-level training devices. Depending on the maintenance concept and organizational structure, this element will include maintenance personnel at the organizational level and possibly the intermediate-level¹. Organizational maintenance personnel normally perform on-equipment maintenance; intermediate maintenance personnel perform off-equipment

¹ For example, in a typical deployable Air Force unit, intermediate-level maintenance personnel are normally assigned to the same wing as the organizational maintenance personnel. Depending upon the weapon system, the other DoD components may integrate required intermediate-level maintenance personnel into a composite deployable unit according to the number of systems to be deployed.

maintenance. If intermediate-level maintenance is provided by a separate support organization (e.g., a centralized intermediate maintenance support activity) the costs should be reported in element 3.0, Intermediate Maintenance (External to Unit).

1.3 OTHER MISSION PERSONNEL. The pay and allowances of military and civilian personnel who perform unit staff, security, or other mission support functions. The number and type of personnel included in this category will depend on the requirements of the particular system. These billets exist only to support the system whose costs are being estimated. Some examples are:

- **Unit Staff.** Personnel required for unit command, administration, supervision, operations control, planning, scheduling, safety, quality control, etc.
- **Security.** Personnel required for system security. Duties may include entry control, close and distant boundary support, and security alert operations.
- **Other Support.** Personnel required for staff information, logistics, ground safety, fuel and munitions handling, and simulator operations as well as for special mission support functions, such as intelligence, photo interpretation, etc.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level reparable; operational munitions expended in training; transportation in support of deployed unit training; temporary additional duty/temporary duty (TAD/TDY) pay; and other unit-level consumption costs, such as purchased services (e.g., equipment leases and service contracts).

2.1 POL/ENERGY CONSUMPTION. The unit-level cost of petroleum, oil, and lubricants (POL); propulsion fuel; and fuel additives. May also include field-generated electricity and commercial electricity necessary to support the operation of a system.

2.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of material consumed in the operation, maintenance, and support of a primary system and associated support equipment at the unit level. Depending on the maintenance concept or organizational structure, maintenance consumption at the intermediate level should be reported either in this element or in element 3.0, Intermediate Maintenance (External to Unit). Costs need not be

identified at the level of detail shown below; the descriptions are intended merely to illustrate the types of materials encompassed in this element.

- Maintenance Material. The cost of material expended during maintenance. Examples include consumables and repair parts such as transistors, capacitors, gaskets, fuses, and other bit-and-piece material.
- Operational Material. The cost of non-maintenance material consumed in operating a system and support equipment. Examples include coolants, deicing fluids, tires, filters, batteries, paper, diskettes, ribbons, charts, and maps.
- Mission Support Supplies. The cost of supplies and equipment expended in support of mission personnel. Examples include items relating to administration, housekeeping, health, and safety.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 TRAINING MUNITIONS/EXPENDABLE STORES. The cost of expendable stores consumed in unit-level training. Includes the cost of live and inert ammunition, bombs, rockets, training missiles, sonobuoys, and pyrotechnics expended in noncombat operations (such as firepower demonstrations) and training exercises.

2.5 OTHER. Include in this element any significant unit-level consumption costs not otherwise accounted for. The costs identified must be related to the system whose operating and support requirements are being assessed. Possible examples might be:

- Purchased Services. The cost of special support equipment, communication circuits, and vehicles, including service contracts for custodial services, computers, and administrative equipment.

- **Transportation.** The deployed unit cost of transporting primary mission and support equipment, repair parts, secondary items, POL, and ammunition to and from training areas. May also include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparable acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other purposes, such as crew rotations, deployments, or follow-on tests and evaluation. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)

Intermediate maintenance performed external to a unit includes the cost of labor and materials and other costs expended by designated activities/units (third and fourth echelon) in support of a primary system and associated support equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE. The pay and allowances of military and civilian personnel who perform intermediate maintenance on a primary system, associated support equipment, and unit-level training devices.

3.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of repair parts, assemblies, subassemblies, and material consumed in the maintenance and repair of a primary system, associated support equipment, and unit-level training devices.

3.3 OTHER. Include in this element any significant intermediate maintenance costs not otherwise accounted for. For example, this could include the cost of transporting subsystems or major end items to a base or depot facility.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, and overhead incurred in performing major overhauls or maintenance on a defense system, its components, and associated support equipment at centralized repair depots, contractor repair facilities, or on site by depot teams. Some depot maintenance activities occur at intervals ranging from

several months to several years. As a result, the most useful method of portraying these costs is on an annual basis (e.g., cost per defense system per year) or an operating-hour basis.

Note: The cost of depot-level reparables (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 OVERHAUL/REWORK. The labor, material, and overhead costs of regularly scheduled overhaul or rework of a system and associated support equipment. Costs for major subsystems that have different overhaul cycles should be reported separately within this element.

4.2 OTHER. Include in this element any significant depot maintenance activities not otherwise accounted for. For example, this could include component repair costs for reparables not managed by the DBOF, second-destination transportation costs for weapons systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support to a weapon system, subsystem, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS), where the services are provided temporarily (usually in the initial phases of a system's operation), or contractor logistics support (CLS), where the support extends over the operational life of the system. Other contractor support may be purchased for engineering and technical services.

5.1 INTERIM CONTRACTOR SUPPORT. Interim contractor support (ICS) includes the burdened cost of contract labor, material, and assets used in providing temporary logistics support to a weapon system, subsystem, and associated support equipment. The purpose of ICS is to provide total or partial logistics support until a government maintenance capability is developed.

5.2 CONTRACTOR LOGISTICS SUPPORT. Contractor logistics support (CLS) includes the burdened cost of contract labor, material, and assets used in providing support to a weapon system, subsystem, and associated support equipment. CLS funding covers depot maintenance and, as negotiated with the operating command, necessary organizational and intermediate maintenance activities. If CLS is selected as the primary means of support, all functional areas included in the CLS cost should be identified.

5.3 OTHER. Include in this element any contractor support costs not otherwise accounted for. For example, if significant, the burdened cost of contract labor for contractor engineering and technical services should be reported here.

Note: Contractor support during the pre-operational phase of a system is typically funded as a system development or investment cost. However, post-operational contractor support is an O&S cost and should be reported in this element.

After the ICS period, the government assumes responsibility for supporting a weapon system. However, contractor support may still be provided in specific functional areas, such as sustaining engineering, software maintenance, simulator operations, and selected depot maintenance functions. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the cost of replacement support equipment, modification kits, sustaining engineering, software maintenance support, and simulator operations provided for a defense system. War readiness materiel is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The costs incurred to replace equipment that is needed to operate or support a primary system, subsystems, training systems, and other support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the system or it may be common to a number of systems, in which case the costs must be allocated among the respective systems.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION. The costs of procuring and installing modification kits and modification kit initial spares (after production and deployment) required for a defense system and related support and training equipment. Include only those modification kits needed to achieve acceptable safety levels, overcome

mission capability deficiencies, improve reliability, or reduce maintenance costs. Exclude modifications undertaken to provide additional operational capability not called for in the original design or performance specifications.

6.3 OTHER RECURRING INVESTMENT. Include in this element any significant recurring investment costs not otherwise accounted for.

6.4 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a system, to maintain operational reliability, to approve design changes, and to ensure conformance with established specifications and standards. Costs reported in this category may include (but are not limited to) government and/or contract engineering services, technical advice, and training for component or system installation, operation, maintenance, and support.

6.5 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred after deployment by depot-level maintenance activities, government software centers, laboratories, or contractors in supporting the update, maintenance and modification, integration, and configuration management of software. Includes operational, maintenance, and diagnostic software programs for the primary system, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be included. Not included are the costs of major redesigns, new development of large interfacing software, or modifications that change functionality.

6.6 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for a weapon system, subsystem, or related equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.7 OTHER. Include in this element any significant sustaining support costs not otherwise accounted for. Examples might include the costs of follow-on operational tests and evaluation, such as range costs, test support, data reduction, and test reporting.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services, such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs, and the cost of medical care. Each of these costs should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training (non-investment funded) and specialty training for military personnel who are replacing individuals lost through attrition. Replacement specialty training costs should be calculated for those personnel associated with the system being investigated. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service-conducted school-house specialty training, are O&S costs and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being investigated, then the costs should be reported in this element.

- **Permanent Change of Station (PCS).** The cost of moving replacement personnel to and from overseas theaters and within the continental United States.
- **Medical Support.** The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2 INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those personnel and costs that are directly affected by a change in the number of weapon systems and associated mission personnel. Functions performed by installation support personnel include:

- **Base Operating Support.** The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.
- **Real Property Maintenance.** The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.

APPENDIX C

**AIRCRAFT
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**AIRCRAFT
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS**
 - 1.2 MAINTENANCE**
 - 1.3 OTHER MISSION PERSONNEL**
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 POL/ENERGY CONSUMPTION**
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 2.3 DEPOT-LEVEL REPARABLES**
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES**
 - 2.5 OTHER**
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)**
 - 3.1 MAINTENANCE**
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 3.3 OTHER**
- 4.0 DEPOT MAINTENANCE**
 - 4.1 OVERHAUL/REWORK**
 - 4.2 OTHER**
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 INTERIM CONTRACTOR SUPPORT**
 - 5.2 CONTRACTOR LOGISTICS SUPPORT**
 - 5.3 OTHER**
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT**
 - 6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION**
 - 6.3 OTHER RECURRING INVESTMENT**
 - 6.4 SUSTAINING ENGINEERING SUPPORT**
 - 6.5 SOFTWARE MAINTENANCE SUPPORT**
 - 6.6 SIMULATOR OPERATIONS**
 - 6.7 OTHER**
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT**
 - 7.2 INSTALLATION SUPPORT**

**AIRCRAFT
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE DEFINITIONS**

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances of officer, enlisted, and civilian personnel required to operate, maintain, and support a discrete operational system or deployable unit. This includes the personnel necessary to meet combat readiness, unit training, and administrative requirements. For units that operate more than one type of aircraft system, personnel requirements will be allocated on a relative workload basis. The personnel costs will be based on manning levels and skill categories.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

Pay and allowances for civilian personnel should be based on the standard composite rate, which includes the following elements: basic pay, additional variable payments for overtime, holiday pay, night differentials, cost-of-living allowances, and the government contribution to employee benefits, insurance, retirement, and the Federal Insurance Contribution Act.

1.1 OPERATIONS. The pay and allowances for the full complement of aircrew personnel required to operate a system. Aircrew composition includes the officers and enlisted personnel (pilot, non-pilot, and crew technicians) required to operate the aircraft of a deployable unit.

1.2 MAINTENANCE. The pay and allowances of military and civilian personnel who perform maintenance on and provide ordnance support to assigned aircraft, associated support equipment, and unit-level training devices. Depending on the maintenance concept and organizational structure, this element will include maintenance personnel at the

organizational level and possibly the intermediate level¹. A brief description of these maintenance categories is shown below:

- Organizational Maintenance. Personnel who perform on-equipment maintenance for unit aircraft.
- Intermediate Maintenance. Personnel who perform off-equipment maintenance for unit aircraft. If intermediate-level maintenance is provided by a separate support organization (e.g., a centralized intermediate maintenance support activity) the costs should be reported in element 3.0, Intermediate Maintenance (External to Unit).
- Ordnance Maintenance. Personnel performing maintenance and service functions for aircraft munitions, missiles, and related systems. Also includes personnel needed for loading, unloading, arming, and dearming of unit munitions; inspecting, testing, and maintaining of aircraft weapons and release systems; activation and deactivation of aircraft gun systems; and maintenance and handling of the munitions stockpile authorized by the war reserve material plan.
- Other Maintenance Personnel. Personnel not covered above. Includes those personnel that support equipment maintenance, simulator maintenance, and Chief of Maintenance functions related to the system whose costs are being estimated.

1.3 OTHER MISSION PERSONNEL. The pay and allowances of military and civilian personnel who perform unit staff, security, and other mission support activities. The number and type of personnel in this category will vary depending on the requirements of the particular system. These billets exist only to support the system whose costs are being estimated. Some examples are:

- Unit Staff. Personnel required for unit command, administration, flying supervision, operations control, planning, scheduling, flight safety, aircrew quality control, etc.
- Security. Personnel required for system security. Duties may include entry control, close and distant boundary support, and security alert operations.

¹ For example, in a typical deployable Air Force unit, intermediate-level maintenance personnel are normally assigned to the same wing as the organizational maintenance personnel. Depending upon the weapon system, the other DoD components may integrate required intermediate-level maintenance personnel into a composite deployable unit according to the number of systems to be deployed.

- Other Support. Personnel required for staff information, logistics, ground safety, fuel and munitions handling, and simulator operations as well as for special mission support functions such as intelligence, photo interpretation, etc.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level reparable; operational munitions expended in training; transportation in support of deployed unit training; temporary additional duty/temporary duty (TAD/TDY) pay; and other unit-level consumption costs, such as purchased services for equipment leases and service contracts.

2.1 POL/ENERGY CONSUMPTION. The unit-level cost of petroleum, oil, and lubricants (POL), propulsion fuel, and fuel additives required for peacetime flight operations. Includes in-flight and ground consumption, and an allowance for POL distribution, storage, evaporation, and spillage. May also include field-generated electricity and commercial electricity if necessary to support the operation of the system.

2.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of material consumed in the operation, maintenance, and support of an aircraft system and associated support equipment at the unit level. Depending on the maintenance concept or organizational structure, consumption at the intermediate level should be reported either in this element or in element 3.0, Intermediate Maintenance (External to Unit). Costs need not be identified at the level of detail shown below; the descriptions are intended merely to illustrate the various types of materials encompassed in this element:

- Maintenance Material. The cost of material expended during maintenance. Examples include consumables and repair parts such as transistors, capacitors, gaskets, fuses, and other bit-and-piece material.
- Operational Material. The cost of non-maintenance material consumed in operating a system and support equipment. Examples include coolants, deicing fluids, tires, filters, batteries, paper, diskettes, ribbons, charts, and maps.
- Mission Support Supplies. The cost of supplies and equipment expended in support of mission personnel. Examples include items relating to administration, housekeeping, health, and safety.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 TRAINING MUNITIONS/EXPENDABLE STORES. The cost of expendable stores consumed in unit-level training. Includes the cost of live and inert ammunition, bombs, rockets, training missiles, sonobuoys, and pyrotechnics expended in noncombat operations (such as firepower demonstrations) and training exercises.

2.5 OTHER. Include in this element any significant unit-level consumption costs not otherwise accounted for. The costs identified must be related to the system whose operating and support requirements are being assessed. Possible examples are:

- **Purchased Services.** The cost of special support equipment, communication circuits, and vehicles, including service contracts for custodial services, computers, and administrative equipment.
- **Transportation.** The deployed unit transportation cost of moving primary mission and support equipment, repair parts, secondary items, POL, and ammunition to and from training areas. May also include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparable items acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other purposes such as crew rotations, deployments, or follow-on tests and evaluation. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)

Intermediate maintenance performed external to a unit includes the cost of labor and material and other costs expended by designated activities/units (third and fourth echelon) in support of an aircraft system and associated support equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE. The pay and allowances of military and civilian personnel who perform intermediate maintenance on an aircraft system, associated support equipment, and unit-level training devices.

3.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of repair parts, assemblies, subassemblies, and material consumed in the maintenance and repair of aircraft, associated support equipment, and unit-level training devices.

3.3 OTHER. Include in this element any significant intermediate maintenance costs not otherwise accounted for. For example, this could include the cost of transporting subsystems or major end items to a base or depot facility.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, and overhead incurred in performing major overhauls or maintenance on aircraft, their components, and associated support equipment at centralized repair depots, contractor repair facilities, or on site by depot teams. Some depot maintenance activities occur at intervals ranging from several months to several years. As a result, the most useful method of portraying these costs is on an annual basis (e.g., cost per aircraft system per year) or an operating-hour basis.

Note: The cost of depot-level reparable (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 OVERHAUL/REWORK. The labor, material, and overhead costs for overhaul or rework of aircraft returned to a centralized depot facility. Includes programmed depot maintenance, analytic condition inspections, and unscheduled depot maintenance. Costs of major aircraft subsystems that have different overhaul cycles (i.e., airframe, engine, avionics, armament, support equipment) should be identified separately within this element.

4.2 OTHER. Include in this element any significant depot maintenance activities not otherwise accounted for. For example, this could include component repair costs for reparable not managed by the DBOF, second-destination transportation costs for weapons systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support required by an aircraft system, subsystem, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS) if the services are provided on a temporary basis or contractor logistics support (CLS) if the support extends over the operational life of a system. Other contractor support may be purchased for engineering and technical services.

5.1 INTERIM CONTRACTOR SUPPORT. Interim contractor support (ICS) includes the burdened cost of contract labor, material, and assets used in providing temporary logistics support to a weapon system, subsystem, and associated support equipment. The purpose of ICS is to provide total or partial logistics support until a government maintenance capability is developed.

5.2 CONTRACTOR LOGISTICS SUPPORT. Contractor logistics support (CLS) includes the burdened cost of contract labor, material, and assets used in providing support to an aircraft system, subsystem, and associated support equipment. CLS funding covers depot maintenance and, as negotiated with the operating command, necessary organizational and intermediate maintenance activities. If CLS is selected as the primary means of support, all functional areas included in the CLS cost should be identified.

5.3 OTHER. Include in this element any contractor support costs not otherwise accounted for. For example, if significant, the burdened cost of contract labor for contractor engineering and technical services should be reported here.

Note: Contractor support during the pre-operational phase of a system is typically funded as a system development or investment cost. However, post-operational contractor support is an O&S cost and should be addressed in this element.

After the ICS period, the government assumes responsibility for supporting a weapon system. However, contractor support may still be employed in specific functional areas, such as sustaining engineering, software maintenance, simulator operations, and selected depot maintenance functions. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the cost of replacement support equipment, modification kits, sustaining engineering, software maintenance support, and simulator operations provided for an aircraft system. War readiness material is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The costs incurred to replace equipment that is needed to operate or support an aircraft, aircraft subsystems, training systems, and other associated support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the aircraft or it may be common to a number of aircraft systems, in which case the costs must be allocated among the respective systems.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION. The costs of procuring and installing modification kits and modification kit initial spares (after production and deployment) required for an aircraft and associated support and training equipment. Includes only those modification kits needed to achieve acceptable safety levels, overcome mission capability deficiencies, improve reliability, or reduce maintenance costs. Excludes modifications undertaken to provide additional operational capability not called for in the original design or performance specifications.

6.3 OTHER RECURRING INVESTMENT. Include in this element any significant recurring investment costs not otherwise accounted for.

6.4 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a system, to maintain operational reliability, to approve design changes, and to ensure system conformance with established specifications and standards. Costs in this category may include (but are not limited to) government and/or contract engineering services, technical advice, and training for component or system installation, operation, maintenance, and support.

6.5 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred after deployment by depot-level maintenance activities, government software centers, laboratories, or contractors for supporting the update, maintenance and modification, integration, and configuration management of software. Includes operational, maintenance, and diagnostic software programs for the primary system, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be included. Not included are the costs of major redesigns, new development of large interfacing software, and modifications that change functionality.

6.6 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for an aircraft system, subsystem, or related equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.7 OTHER. Include in this element any significant sustaining support costs not otherwise accounted for. Examples might include the costs of follow-on operational tests and evaluation, such as range costs, test support, data reduction, and test reporting.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services, such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs, and the cost of medical care. Each of these elements should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training (non-investment funded) and specialty training for military personnel who are replacing individuals lost through attrition. For example, specialty training costs may include undergraduate pilot training, non-pilot aircrew training,

non-aircrew officer training, and enlisted specialty training. Replacement specialty training costs should be calculated for those personnel associated with the system being investigated. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service conducted school-house specialty training, are O&S costs and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being assessed, then these costs should be addressed.

- Permanent Change of Station (PCS). The cost of moving replacement personnel to and from overseas theaters and within the continental United States.
- Medical Support. The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2. INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those personnel and costs that are directly affected by a change in the number of aircraft and associated mission personnel. Functions performed by installation support personnel include:

- Base Operating Support. The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.
- Real Property Maintenance. The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.

APPENDIX D

**SHIP
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**SHIP
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 SHIP PERSONNEL**
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 SHIP POL**
 - 2.2 REPAIR PARTS/SUPPLIES**
 - 2.3 DEPOT-LEVEL REPARABLES**
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES**
 - 2.5 PURCHASED SERVICES**
 - 2.6 OTHER**
- 3.0 INTERMEDIATE MAINTENANCE**
 - 3.1 MAINTENANCE AFLOAT**
 - 3.2 MAINTENANCE ASHORE**
 - 3.3 REPAIR PARTS/SUPPLIES**
 - 3.4 COMMERCIAL INDUSTRIAL SERVICES**
 - 3.5 OTHER**
- 4.0 DEPOT MAINTENANCE**
 - 4.1 SCHEDULED SHIP OVERHAUL**
 - 4.2 NONSCHEDULED SHIP REPAIR**
 - 4.3 FLEET MODERNIZATION**
 - 4.4 EQUIPMENT REWORK**
 - 4.5 NAVAL AVIATION DEPOT**
 - 4.6 OTHER DEPOT**
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 CONTRACTOR SUPPORT SERVICES**
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT**
 - 6.2 CENTRALLY PROVIDED MATERIAL**
 - 6.3 SUSTAINING ENGINEERING SUPPORT**
 - 6.4 SOFTWARE MAINTENANCE SUPPORT**
 - 6.5 SIMULATOR OPERATIONS**
 - 6.6 OTHER**
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT**
 - 7.2 INSTALLATION SUPPORT**

**SHIP
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE DEFINITIONS**

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances for officer and enlisted ship personnel required to perform operation, maintenance, and support duties.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

1.1 SHIP PERSONNEL. The pay and allowances for the full complement of officer and enlisted ship personnel required to perform operation, maintenance, and support duties.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level repair parts and reparable; munitions expended in training; temporary additional duty/temporary duty (TAD/TDY) pay; and purchased services. Purchased services include equipment service contracts, rents, utilities, and communications support for ships. In the case of ships with embarked aircraft, aircraft-related fuel use and other expenses should be estimated separately and not included here.

2.1 POL/ENERGY CONSUMPTION. Represents the cost of petroleum, oil and lubricants (POL), fossil fuel, and fuel additives consumed by a ship for operations and maintenance while underway and not underway. Includes the cost of lubricants, hydraulic oils, and fuel consumed by ship support equipment. Excludes the cost of nuclear fuel usage and fuel usage by embarked aviation units.

2.2 REPAIR PARTS/SUPPLIES. The costs of repair parts and supplies consumed in the operation, maintenance, and support of a ship and installed equipment. Also includes non-maintenance supplies and equipment used by the ship and the ship's crew. Examples include items relating to the health, safety, and welfare of the crew, such as medical and dental supplies, radiation badges, fire protection suits, charts, maps, clocks, etc. Costs need not be identified at the level of detail shown below; the descriptions are offered for illustrative purposes only:

- **Equipment/Equipage.** The cost of all stock account items that are not classified as consumables or repair parts. Specifically included are items of equipment/equipage that require management control afloat due to high unit cost, vulnerability to pilferage, and/or essentiality to a ship's mission. Examples include binoculars, electronic test equipment, etc.
- **Consumables.** The cost of supplies that are charged to a ship and are not specifically addressed in other elements. Includes administrative and housekeeping items; medical and dental supplies; and routine maintenance tools not specifically related to, but which may be used in the repair of, equipment, equipage, and general purpose hardware.
- **Ships Force Material.** The cost of non-maintenance material consumed by the ship's force during ship overhaul.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 TRAINING MUNITIONS/EXPENDABLE STORES. The cost associated with replacing or increasing the stock of expendable stores consumed in training. Includes the cost of live and inert ammunition, training missiles, and pyrotechnics expended by a ship in noncombat operations (such as firepower demonstrations) and training exercises. Also includes submarine-launched strategic missile training firings and expended sonobuoys.

2.5 PURCHASED SERVICES. Includes the cost of printing, computer rental and service, heat, light, power, water, gas, electricity, communications (telephone/teletype), postal services (postage/box rental), laundry services, and rental of boats and port services.

2.6 OTHER. Include in this element any unit-level costs not otherwise accounted for. For example:

- **Transportation.** May include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparables acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other mission-related purposes such as homeport travel entitlement, special aircraft charter, crew rotation, deployment, and temporary shore patrol. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE

Intermediate maintenance includes the cost of labor and material expended by a tender repair ship, or equivalent ashore or afloat Intermediate Maintenance Activity (IMA) in the repair and alteration of ship and associated equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE AFLOAT. The pay and allowances of military personnel who perform intermediate maintenance from a tender, repair ship, or equivalent afloat Intermediate Maintenance Activity for the repair and alteration of a ship and associated equipment.

3.2 MAINTENANCE ASHORE. The pay and allowances of military personnel who perform intermediate maintenance from a Shore Intermediate Maintenance Activity (SIMA) for the repair and alteration of a ship and associated equipment.

3.3 REPAIR PARTS/SUPPLIES. The costs of repair parts, assemblies, subassemblies, and material consumed by afloat and ashore Intermediate Maintenance Activities (IMAs) in the repair or alteration of a ship and associated equipment.

3.4 COMMERCIAL INDUSTRIAL SERVICES. The burdened costs of accomplishing afloat and ashore intermediate maintenance activities by private contract due to workload limitations at IMAs.

3.5 OTHER. Include in this element any significant intermediate maintenance costs not otherwise accounted for. Examples could include shipping costs (not previously captured) for materials, repair parts, subassemblies, or assemblies.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, and overhead incurred in performing major overhauls or maintenance on a ship and associated equipment at centralized repair depots, contractor repair facilities, or on site by depot field teams. Some depot maintenance actions occur at intervals ranging from several months to several years. As a result, the most useful method of portraying these costs is on an annual basis (e.g., cost per ship per year) or an operating (steaming) hour basis.

Note: The cost of depot-level reparable (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 SCHEDULED SHIP OVERHAUL. The labor, material, and ship repair facility overhead costs of scheduled depot maintenance for ships in the operating forces. Includes regular overhaul (ROH) and selected restricted availability (SRA) costs incurred at both public and private facilities.

Note: The ship overhaul element includes labor and material costs (excluding core acquisition) incurred in recoring nuclear-powered ships. The disposition of the replaced core constitutes a separate but significant cost whose impact should be estimated and presented separately as a system disposal cost.

4.2 NONSCHEDULED SHIP REPAIR. The labor, material, and ship repair facility overhead costs of nonscheduled depot maintenance necessitated by casualty, voyage damage, or other unforeseeable occurrences. Covers work that is beyond the repair capability of the ships force. Includes costs incurred under Restricted Availability (RAV) and Technical Availability (TAV) at both public and private facilities.

4.3 FLEET MODERNIZATION. The labor, expendable material, and overhead costs of altering or modifying a ship, or installing equipment to improve the ship's safety, maintainability, or technical characteristics. Includes costs incurred at both public and private facilities. Also includes modifications incorporated by depot field teams. The cost of centrally provided material, modification kits, and modification spares is specifically excluded, as these items are covered in element 6.2 (Centrally Provided Material).

Note: Any changes, alterations, modifications, or other improvements to enhance performance or improve mission capability should be excluded. However, if it is not feasible to distinguish among modifications, then installation costs for all modifications should be included and documented appropriately.

4.4 EQUIPMENT REWORK. The labor, material, and overhead costs of overhaul, rework, or repair of: (1) major ordnance equipment (including fire control equipment, gun mounts, torpedo tubes, missile launchers, and other miscellaneous equipment); (2) hull, mechanical,

and electrical (HM&E) equipment (including communications equipment, navigation items, depth detectors, and auxiliary and electrical items); and (3) electronic equipment.

4.5 NAVAL AVIATION DEPOT MAINTENANCE. The labor, material, and overhead costs of depot maintenance performed by the Naval Aviation Depot (NADEP) on catapults, arresting gears, and visual landing aids, and rework on gas turbine engines.

4.6 OTHER DEPOT. Include in this element any significant depot maintenance activities not otherwise accounted for. For example, this could include component repair costs for reparable items not managed by the DBOF, second-destination transportation costs for weapons systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support to a ship, subsystems, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS), where the services are provided temporarily (usually in the initial phases of a system's operation), or contractor logistics support (CLS), where the support extends over the operational life of a vessel. Other contractor support may be purchased for engineering and technical services (CETS).

5.1 CONTRACTOR SUPPORT SERVICES. Includes the burdened cost of contractor labor, material, and assets used in providing contractor support to a ship, installed equipment, or related support equipment. Depending upon the maintenance concept, the type of contractor support required (e.g., ICS/CLS/CETS) may differ. If CLS is selected as a primary means of support, all functional areas included in the CLS cost should be identified in the cost element documentation.

Note: After the ICS period, the government assumes responsibility for supporting a weapon system. However, contractor support may still be employed in specific functional areas, such as for sustaining engineering, software maintenance, simulator operations, and selected depot maintenance functions. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the

contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the costs of procuring replacement support equipment, centrally provided material, modification kits, sustaining engineering, software maintenance support, and simulator operations. War readiness materiel is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The costs incurred to replace equipment that is needed to operate or support a ship, installed equipment, or other support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the vessel in question or it may be common to a number of vessels, in which case the costs must be allocated among the respective vessels.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 CENTRALLY PROVIDED MATERIAL. The cost of centrally provided material and end items required for modifying a ship, installed equipment, related support equipment, and training equipment. Also includes the costs of spares and other material (after production and deployment) required as a result of modifications accomplished as part of a fleet modernization or as a result of equipage changes. The material costs included are those needed to achieve acceptable safety levels, overcome mission capability deficiencies, improve reliability, or reduce maintenance costs. The cost of installation labor is captured in element 4.3, Fleet Modernization.

Note: If not feasible to distinguish between modernization or safety modification installations in element 4.3, all modernization and modification materials and end-item costs should be identified and included in this element.

6.3 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a system, to maintain operational reliability, to approve design changes and to ensure system conformance with established specifications and standards. Costs reported in this category may include (but are not limited to) government and/or contract engineering services, technical advice, and training for component or system installation, operation, maintenance, and support.

6.4 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred by depot-level maintenance activities, government software centers, laboratories, or contractors for supporting the update, maintenance and modification, integration, and

configuration management of software. Includes operational, maintenance, and diagnostic software programs for the ship, installed equipment, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be included. Not included are the costs of major redesigns, new development of large interfacing software, and modifications that change functionality.

6.5 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for a ship, subsystem, or associated support equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.6 OTHER. Include in this element any sustaining support costs not otherwise accounted for. Examples might include the cost of replenishment publications ordered by the ship and the cost of ammunition-handling functions involving onloading/offloading by coastal handling stations and their annexes.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs, and the cost of medical care. Each of these cost elements should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training (non-investment funded) and specialty training for military personnel who are replacing individuals lost through attrition. Replacement specialty training should be calculated for those personnel associated with the system whose costs are being estimated. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and

allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service-conducted schoolhouse specialty training, are O&S costs and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being assessed, then these costs should be addressed.

- Permanent Change of Station (PCS). The cost of moving replacement personnel to and from overseas theaters and within the continental United States.
- Medical Support. The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2 INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those additive personnel and other costs that are directly affected by a change in the number of weapon systems and associated mission personnel. Functions performed by installation support personnel include:

- Base Operating Support. The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.
- Real Property Maintenance. The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.

APPENDIX E

**MISSILE
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**MISSILE
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS**
 - 1.2 MAINTENANCE**
 - 1.3 OTHER MISSION PERSONNEL**
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 POL/ENERGY CONSUMPTION**
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 2.3 DEPOT-LEVEL REPARABLES**
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES**
 - 2.5 OTHER**
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)**
 - 3.1 MAINTENANCE**
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 3.3 OTHER**
- 4.0 DEPOT MAINTENANCE**
 - 4.1 OVERHAUL/REWORK**
 - 4.2 OTHER**
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 INTERIM CONTRACTOR SUPPORT**
 - 5.2 CONTRACTOR LOGISTICS SUPPORT**
 - 5.3 OTHER**
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT**
 - 6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION**
 - 6.3 OTHER RECURRING INVESTMENT**
 - 6.4 SUSTAINING ENGINEERING SUPPORT**
 - 6.5 SOFTWARE MAINTENANCE SUPPORT**
 - 6.6 SIMULATOR OPERATIONS**
 - 6.7 AIR SUPPORT**
 - 6.8 OTHER**
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT**
 - 7.2 INSTALLATION SUPPORT**

MISSILE OPERATING AND SUPPORT COST ELEMENT STRUCTURE DEFINITIONS

The cost element structure for missiles encompasses those weapon systems that employ missiles in an operational environment to produce a destructive effect on selected targets. (Examples of such systems include Trident, Peacekeeper, Tomahawk, Maverick, Sidewinder, etc.) The missile system category includes weapons designed for use in land-based defense, air defense, land warfare, strategic bombardment, air and sea combat, or as drones. Operating and support costs of missile systems should address those elements required to operate and support the missile air vehicle (propulsion, payload, airframe, reentry and boost systems, guidance and control, ordnance initiation set, test and training equipment) and the command and launch equipment (launch and guidance control, applications/systems software, communications, launcher equipment, and auxiliary equipment).

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances for officer, enlisted, and civilian personnel required to operate, maintain, and support a discrete missile system. This includes the personnel necessary to meet combat readiness, unit training, and administrative requirements. For personnel who operate, maintain, or support more than one type of defense system, personnel requirements will be allocated on a relative workload basis. Personnel costs will be based on manning levels and skill categories.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

Pay and allowances for civilian personnel should be based on the standard composite rate, which includes the following elements: basic pay, additional variable payments for overtime, holiday pay, night differentials, cost-of-living allowances, and the government contribution to employee benefits, insurance, retirement, and the Federal Insurance Contribution Act.

1.1 OPERATIONS. The pay and allowances of the crew or full complement of personnel required to operate a missile system. System operators will normally include officers, enlisted personnel, or a combination of both.

1.2 MAINTENANCE. The pay and allowances of military and civilian personnel who perform maintenance on or provide ordnance support to a missile system, associated support equipment, and unit-level training devices. Depending on the maintenance concept and organizational structure, this element may include costs from all or some of the following categories:

- **Organizational Maintenance.** Personnel who perform on-equipment missile system maintenance.
- **Intermediate Maintenance.** Personnel who perform off-equipment missile system maintenance. If intermediate-level maintenance is provided by a separate support organization (e.g., a centralized intermediate maintenance support activity), the costs should be reported in element 3.0, Intermediate Maintenance (External to Unit).
- **Ordnance Maintenance.** Personnel who perform maintenance and service functions involving missile munitions—most notably, nuclear armaments. Includes personnel needed for loading, unloading, arming, and dearming of munitions; inspection, testing, and maintenance of missile weapon release systems; and maintenance and handling of the munitions and missile stockpile authorized by the war reserve materiel plan.
- **Other Maintenance Personnel.** Personnel not covered above. Includes personnel who support equipment maintenance, simulator maintenance, and Chief of Maintenance functions related to the system whose costs are being estimated.

1.3 OTHER MISSION PERSONNEL. The pay and allowances of military and civilian personnel who perform unit staff, security, and other mission support activities. The number and type of personnel in this category will vary depending on the requirements of the particular system. These billets exist only to support the system whose costs are being estimated. Some examples are:

- **Unit Staff.** Personnel required for unit command, administration, supervision, operations control, planning, scheduling, safety, quality control, etc.
- **Security.** Personnel required for system security. Duties may include entry control, close and distant boundary support, and security alert operations.
- **Other Support.** Personnel required for staff information, communications, logistics, ground safety, fuel and munitions handling, and simulator operations as well as for special mission support functions, such as intelligence, photo interpretation, etc.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level reparable; operational munitions expended in training; transportation in support of operational training; temporary additional duty/temporary duty (TAD/TDY) pay; and other unit-level consumption costs, such as purchased services for equipment lease and service contracts.

2.1 POL/ENERGY CONSUMPTION. Represents the unit-level cost of petroleum, oil, and lubricants (POL); propulsion fuel; and fuel additives. May also include batteries, field-generated electricity, and commercial electricity necessary to support the operation of a missile system.

Note: In developing estimates for this element, care should be taken to avoid double counting. For example, prime mission aircraft POL costs do not have to be estimated for air-launched missile systems. However, missile system fuel should be addressed if not counted as part of the missile system procurement cost.

2.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of material consumed in the operation, maintenance, and support of a missile system and associated support equipment. Depending on the maintenance concept or organizational structure, consumption at the intermediate level should be reported either in this element or in element 3.0, Intermediate Maintenance (External to Unit). Costs need not be identified at the level of detail shown below; the descriptions are intended merely to illustrate the various categories of materials encompassed in this element.

- **Maintenance Material.** The cost of material expended during maintenance. Examples include consumables and repair parts such as transistors, capacitors, gaskets, fuses, and other bit-and-piece material.
- **Operational Material.** The cost of non-maintenance material consumed in operating a missile system and support equipment. Examples of operational material for launch and support equipment include coolants, deicing fluids, tires, filters, paper, diskettes, ribbons, charts, and maps.
- **Mission Support Supplies.** The cost of supplies and equipment expended in support of mission personnel. Examples include items relating to administration, housekeeping, health, and safety.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or

subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 TRAINING MUNITIONS/EXPENDABLE STORES. The cost associated with expendable stores consumed in unit-level training. Includes the cost of live round and inert training missiles, drones, and pyrotechnics expended in noncombat operational firings (such as firepower demonstrations) and training exercises.

2.5 OTHER. Include in this element any unit-level consumption costs not otherwise accounted for. The costs identified must be related to the system whose operating and support requirements are being assessed. Examples might include:

- **Purchased Services.** The cost of special support equipment, communication circuits, and vehicles, including service contracts for custodial services, computers, and administrative equipment. Also may include lease costs of special facilities (or land) for the storage of warheads and missiles.
- **Transportation.** The deployed unit transportation cost of moving missile systems and support equipment, repair parts, secondary items, and POL to and from a test range or training area. May also include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparables acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other purposes, such as crew rotations, deployments, or follow-on tests and evaluation. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)

Intermediate maintenance performed external to the unit includes the cost of labor and materials and other costs expended by designated activities/units (third and fourth

echelon) in support of a missile system and associated support equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE. The pay and allowances of military and civilian personnel who perform intermediate maintenance on a missile system, associated support equipment, and unit-level training devices.

3.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of repair parts, assemblies, subassemblies, and material consumed in the maintenance and repair of a missile system, associated support equipment, and unit-level training devices.

3.3 OTHER. Include in this element any significant intermediate maintenance costs not otherwise accounted for. For example, this could include the cost of transporting subsystems or major end items to a base or depot facility.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, overhead support, and depot-purchased maintenance required to perform major overhaul and maintenance of a missile system, its components, and associated support equipment at centralized repair depots, contractor repair facilities, or on site by depot teams. Some depot maintenance actions occur at intervals ranging from several months to several years. As a result, the most useful method of portraying these costs is on an annual basis (e.g., cost per missile system per year).

Note: The cost of depot-level reparable (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 OVERHAUL/REWORK. The labor, material, and overhead costs of regularly scheduled overhaul/rework of a missile system. Missiles or missile sections and associated support equipment may be returned to a centralized depot facility, or depot field teams may perform on-site maintenance. Costs for major missile subsystems and supporting command and launch equipment that have different overhaul cycles should be reported separately within this element. For example, separate overhaul/rework costs may be presented for guidance, engine, airframe, and missile subsystems and for individual categories of command and launch equipment, such as launchers, mobile vehicle platforms, and command and control equipment, etc.

4.2 OTHER. Include in this element any significant depot maintenance activities not otherwise accounted for. For example, this could include component repair costs for reparable not managed by the DBOF, second-destination transportation costs for weapons systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support required by a missile system, subsystem, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS) if the services are provided on a temporary basis or contractor logistics support (CLS) if the support extends over the operational life of a system. Other contractor support may be purchased for engineering and technical services.

5.1 INTERIM CONTRACTOR SUPPORT. Interim contractor support (ICS) includes the burdened cost of contract labor, material, and assets used in providing temporary logistics support to a missile system, subsystems, and associated support equipment. The purpose of ICS is to provide total or partial logistics support until a government maintenance capability is developed.

5.2 CONTRACTOR LOGISTICS SUPPORT. Contractor logistics support (CLS) includes the burdened cost of contract labor, material, and assets used in providing support to a missile system, subsystems, and associated support equipment. CLS funding covers depot maintenance and, as negotiated with the operating command, necessary organizational and intermediate maintenance activities. If CLS is selected as the primary means of support, all functional areas included in the CLS cost should be identified in the cost element documentation.

5.3 OTHER. Include in this element any contractor support costs not otherwise accounted for. For example, if significant, the burdened cost of contract labor for contractor engineering and technical services should be separately identified and included here.

Note: Contractor support during the pre-operational phase of a system is typically funded as a system development or investment cost. However, post-operational contractor support is an O&S cost and should be addressed in this element.

After the ICS period, the government assumes responsibility for supporting a weapon system. However, contractor support may still be employed in specific functional areas, such as sustaining engineering, software maintenance, simulator operations, and selected depot maintenance functions. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the cost of replacement support equipment, modification kits, sustaining engineering, software maintenance support, simulator operations, and air support provided for a missile system. War readiness materiel is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The cost of replacing equipment that is needed to operate or support a missile system, subsystems, training systems, and other support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the system or it may be common to a number of systems, in which case the costs must be allocated among the respective systems.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION. The cost of procuring and installing modification kits and modification kit initial spares (after production and deployment) required for a missile system and related support and training equipment. Includes only those modification kits needed to achieve acceptable safety levels, overcome mission capability deficiencies, improve reliability, or reduce maintenance costs. Excludes modifications undertaken to provide additional operational capability not called for in the original design or performance specifications.

6.3 OTHER RECURRING INVESTMENT. Include in this element any recurring investments not otherwise accounted for.

6.4 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a missile system, to maintain operational reliability, to approve design changes, and to ensure system conformance with established specifications and standards. Costs reported in this category may include (but are not limited to) government and/or contract engineering services, technical advice, and training for component or system installation, operation, maintenance, and support.

6.5 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred after deployment by depot-level maintenance activities, government software centers, laboratories, or contractors for supporting the update, maintenance and modification, integration, and configuration management of software. Includes operational, maintenance, and diagnostic software programs for the primary system, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be included. Not included are the costs of major redesigns, new development of large interfacing software, and modifications that change functionality.

6.6 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for a weapon system, subsystem, or related equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.7 AIR SUPPORT. Use this element to report the costs of any fixed-wing or helicopter support required at a remote fixed missile site. Air support includes the operating and support costs of helicopter or fixed-wing aircraft that provide air surveillance, routine transportation, or emergency transportation between the host base, launch site, and launch control facility. Fixed-wing or helicopter operating and support costs include those contained in the aircraft CES.

6.8 OTHER. Include in this element any sustaining support costs not otherwise accounted for. Examples might include the costs of supporting the live fire of missiles for follow-on test and evaluation, and operational training such as range operation, drone recovery, test support, post-flight analysis, and test reporting.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services, such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs, and the cost of medical care. Each of these elements should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training (non-investment funded) and specialty training for military personnel who are replacing individuals lost through attrition. Replacement specialty training costs should be calculated for those personnel associated with the system being assessed. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service-conducted school-house specialty training, are O&S costs and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being assessed, then these costs should be addressed.

- **Permanent Change of Station (PCS).** The cost of moving replacement personnel to and from overseas theaters and within the continental United States.
- **Medical Support.** The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2 INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those personnel and other costs that are directly affected by a change in the number of weapon systems and associated mission personnel. Functions performed by installation support personnel include:

- **Base Operating Support.** The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.

- Real Property Maintenance. The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.

APPENDIX F

**COMBAT VEHICLE
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**COMBAT VEHICLE
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS**
 - 1.2 MAINTENANCE**
 - 1.3 OTHER MISSION PERSONNEL**
- 2.0 UNIT-LEVEL CONSUMPTION**
 - 2.1 POL/ENERGY CONSUMPTION**
 - 2.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 2.3 DEPOT-LEVEL REPARABLES**
 - 2.4 TRAINING MUNITIONS/EXPENDABLE STORES**
 - 2.5 OTHER**
- 3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)**
 - 3.1 MAINTENANCE**
 - 3.2 CONSUMABLE MATERIAL/REPAIR PARTS**
 - 3.3 OTHER**
- 4.0 DEPOT MAINTENANCE**
 - 4.1 OVERHAUL/REWORK**
 - 4.2 OTHER**
- 5.0 CONTRACTOR SUPPORT**
 - 5.1 INTERIM CONTRACTOR SUPPORT**
 - 5.2 CONTRACTOR LOGISTICS SUPPORT**
 - 5.3 OTHER**
- 6.0 SUSTAINING SUPPORT**
 - 6.1 SUPPORT EQUIPMENT REPLACEMENT**
 - 6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION**
 - 6.3 OTHER RECURRING INVESTMENT**
 - 6.4 SUSTAINING ENGINEERING SUPPORT**
 - 6.5 SOFTWARE MAINTENANCE SUPPORT**
 - 6.6 SIMULATOR OPERATIONS**
 - 6.7 OTHER**
- 7.0 INDIRECT SUPPORT**
 - 7.1 PERSONNEL SUPPORT**
 - 7.2 INSTALLATION SUPPORT**

COMBAT VEHICLE OPERATING AND SUPPORT COST ELEMENT STRUCTURE DEFINITIONS

The cost element structure for combat vehicles encompasses those defense materiel programs that employ specialized vehicle systems with the capability to navigate over various types of terrain. These systems include combat vehicles serving as armored weapons platforms, reconnaissance vehicles, or amphibians.

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances for officer, enlisted, and civilian personnel required to operate, maintain, and support a discrete combat vehicle system. This includes the personnel necessary to meet combat readiness, unit training, and administrative requirements. For personnel who operate, maintain, or support more than one type of defense system, personnel requirements will be allocated on a relative workload basis. Personnel costs will be based on manning levels and skill categories.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

Pay and allowances for civilian personnel should be based on the standard composite rate, which includes the following elements: basic pay, additional variable payments for overtime, holiday pay, night differentials, cost-of-living allowances, and the government contribution to employee benefits, insurance, retirement, and the Federal Insurance Contribution Act.

1.1 OPERATIONS. The pay and allowances of the crew or full complement of personnel required to operate a combat vehicle system. Combat vehicle crews will normally include enlisted personnel or a combination of both officer and enlisted personnel.

1.2 MAINTENANCE. The pay and allowances of military and civilian personnel who perform maintenance on and provide ordnance support to assigned combat vehicles, associated support equipment, and unit-level training devices. Depending on the maintenance concept and organizational structure, this element may include costs from some or all of the following categories:

- **Organizational Maintenance.** Personnel who perform on-equipment combat vehicle maintenance.

- Intermediate Maintenance. Personnel who perform off-equipment combat vehicle maintenance. If the intermediate-level personnel are integral to the mission unit, their costs should be reported in this element. If intermediate-level maintenance is provided by a separate support organization (e.g., a centralized intermediate maintenance support activity), the costs should be reported in element 3.0, Intermediate Maintenance (External to Unit).
- Ordnance Maintenance. Personnel who perform maintenance and service functions for combat vehicle munitions, missiles, and related systems. Includes personnel needed for loading, unloading, arming, and dearming of munitions and missiles; inspection, testing, and maintenance of combat vehicle weapon release systems; activation and deactivation of gun systems; and maintenance and handling of the munitions and missile stockpile authorized by the war reserve materiel plan.
- Other Maintenance Personnel. Personnel not covered above. Includes personnel who support equipment maintenance, simulator maintenance, and Chief of Maintenance functions related to the system whose costs are being estimated.

1.3 OTHER MISSION PERSONNEL. The pay and allowances of military and civilian personnel who perform unit staff, security, and other mission support activities. The number and type of personnel in this category will vary depending on the requirements of the particular system. The costs should address personnel in units (battalions, companies, or attached platoons) that exist only because of the system being assessed. Some examples are:

- Unit Staff. Personnel required for unit command, administration, supervision, operations control, planning, scheduling, safety, and quality control on crew training and operational proficiency, etc.
- Security. Personnel required for system security. Duties may include entry control, close and distant boundary support, and security alert operations.
- Other Support. Personnel required for logistics, mobile communications, food service, safety, fuel and munitions handling, and simulator operations as well as for special mission support functions, such as intelligence, photo interpretation, etc.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level reparable; operational munitions expended in training; transportation in support of deployed unit training; temporary additional duty/temporary duty (TAD/TDY) pay; and other unit-level consumption costs, such as purchased services for equipment lease and service contracts.

2.1 POL/ENERGY CONSUMPTION. Represents the unit-level cost of petroleum, oil, and lubricants (POL) and of fuel additives. May also include field-generated electricity and commercial electricity necessary to support the operation of a combat vehicle system.

2.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of material consumed in the operation, maintenance, and support of a combat vehicle and associated support equipment. Depending on the maintenance concept or organizational structure, consumption at the intermediate level should be reported either in this element or in element 3.0, Intermediate Maintenance (External to Unit). Costs need not be identified at the level of detail shown below; the descriptions are intended merely to illustrate the various types of materials encompassed in this element.

- **Maintenance Material.** The cost of material expended during maintenance. Examples include consumables and repair parts such as transistors, capacitors, gaskets, fuses, and other bit-and-piece material.
- **Operational Material.** The cost of non-maintenance material consumed in operating a combat vehicle system and support equipment. Examples include coolants, deicing fluids, tires, filters, batteries, paper, diskettes, ribbons, charts, and maps.
- **Mission Support Supplies.** The cost of supplies and equipment expended in support of mission personnel. Examples include items relating to administration, housekeeping, health, and safety.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted

by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 TRAINING MUNITIONS/EXPENDABLE STORES. The cost of munitions consumed in unit-level training. Includes the cost of live and inert ammunition, rockets, and missiles expended in noncombat operations (such as firepower demonstrations) and training exercises.

2.5 OTHER. Include in this element any unit-level consumption costs not otherwise accounted for. The costs identified must be related to the system whose operating and support requirements are being assessed. Examples might include:

- **Purchased Services.** The cost of special support equipment, communication circuits, and vehicles, including service contracts for custodial services, computers, and administrative equipment.
- **Transportation.** The deployed unit transportation cost of moving combat vehicles, support equipment, repair parts, secondary items, POL, and ammunition to and from training areas. May also include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparable acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other purposes, such as crew rotations, deployments, or follow-on tests and evaluation. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)

Intermediate maintenance performed external to the unit includes the cost of labor and materials and other costs expended by designated activities/units (third and fourth echelon) in support of a combat vehicle system and associated support equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE. The pay and allowances of military and civilian personnel who perform intermediate maintenance on combat vehicles, associated support equipment, and unit-level training devices.

3.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of repair parts, assemblies, subassemblies, and material consumed in the maintenance and repair of combat vehicles, associated support equipment, and unit-level training devices.

3.3 OTHER. Include in this element any intermediate maintenance costs not otherwise accounted for. For example, this could include the cost of transporting subsystems or major end items to a base or depot facility.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, and overhead incurred in performing major overhauls and maintenance on a combat vehicle, its components, and associated support equipment at centralized repair depots, contractor repair facilities, or on site by depot teams. Some depot maintenance actions occur at intervals ranging from several months to several years. As a result, the most useful method of portraying these costs is on an annual basis (e.g., cost per combat vehicle per year) or an operating-hour basis.

Note: The cost of depot-level reparable (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 OVERHAUL/REWORK. The labor, material, and overhead cost for overhaul/rework of combat vehicles returned to a centralized depot facility. Includes programmed depot maintenance, analytic condition inspections, and unscheduled depot maintenance. Costs of major combat vehicle subsystems that have different overhaul cycles (i.e., hull/frame, power package/drive train, fire control system, armaments, etc.) should be reported separately within this element.

4.2 OTHER. Include in this element any significant depot maintenance activities not otherwise accounted for. Examples might include component repair costs for reparable not managed by the DBOF, second-destination transportation costs for weapons systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support required by a combat vehicle, subsystem, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS) if the services are provided on a temporary basis or contractor logistics support (CLS) if the support extends over the operational life of a system. Other contractor support may be purchased for engineering and technical services.

5.1 INTERIM CONTRACTOR SUPPORT. Interim contractor support (ICS) includes the burdened cost of contract labor, material, and assets used in providing temporary logistics support to a combat vehicle, subsystem, or associated support equipment. The purpose of ICS is to provide total or partial logistics support until a government maintenance capability is developed.

5.2 CONTRACTOR LOGISTICS SUPPORT. Contractor logistics support (CLS) includes the burdened cost of contract labor, material, and assets used in providing support to a combat vehicle, subsystem, or associated support equipment. CLS funding covers depot maintenance and, as negotiated with the operating command, necessary organizational and intermediate maintenance activities. If CLS is selected as the primary means of support, all functional areas included in the CLS cost should be identified in the cost element documentation.

5.3 OTHER. Include in this element any contractor support costs not otherwise accounted for. For example, if significant, the burdened cost of contract labor for contractor engineering and technical services should be separately identified and included here.

Note: Contractor support during the pre-operational phase of a system is typically funded as a system development or investment cost. However, post-operational contractor support is an O&S cost and should be addressed in this element.

After the ICS period, the government assumes responsibility for supporting a weapon system. However, contractor support may still be employed in specific functional areas, such as sustaining engineering, software maintenance, simulator operations, and selected depot maintenance functions. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the cost of replacement support equipment, modification kits, sustaining engineering, software maintenance support, and simulator operations provided for a combat vehicle system. War readiness materiel is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The cost of replacing equipment that is needed to operate or support a combat vehicle system, subsystems, training systems, and other support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the system or it may be common to a number of systems, in which case the costs must be allocated among the respective systems.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION. The cost of procuring and installing modification kits and modification kit initial spares (after production and deployment) required for a combat vehicle and associated support and training equipment. Includes only those modification kits needed to achieve acceptable safety levels, overcome mission capability deficiencies, improve reliability, or reduce maintenance costs. Excludes modifications undertaken to provide additional operational capability not called for in the original design or performance specifications.

6.3 OTHER RECURRING INVESTMENT. Include in this element the cost of any recurring investments not otherwise accounted for.

6.4 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a system, to maintain operational reliability, to approve design changes, and to ensure system conformance with established specifications and standards. Costs reported in this category may include (but are not limited to) government and/or contract engineering services, technical advice, and training for component or system installation, operation, maintenance, and support.

6.5 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred after deployment by depot-level maintenance activities, government software centers, laboratories, or contractors for supporting the update, maintenance and modification, integration, and configuration management of software. Includes operational, maintenance, and diagnostic software programs for the primary system, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be

included. Not included are the costs of major redesigns, new development of large interfacing software, and modifications that change functionality.

6.6 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for a combat vehicle system, subsystem, or related equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.7 OTHER. Include in this element any sustaining support costs not otherwise accounted for. Examples might include the costs of follow-on operational tests and evaluation, such as range costs, test support, data reduction, and test reporting.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services, such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs and the cost of medical care. Each of these elements should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training and specialty training for military personnel who are replacing individuals lost through attrition. Replacement specialty training costs should be calculated for those personnel associated with the system being assessed. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service-conducted school-house specialty training, is an O&S cost and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being assessed, then these costs should be addressed.

- Permanent Change of Station (PCS). The cost of moving replacement personnel to and from overseas theaters and within the continental United States.
- Medical Support. The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2 INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those personnel and costs that are directly affected by a change in the number of weapon systems and associated mission personnel. Functions performed by installation support personnel include:

- Base Operating Support. The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.
- Real Property Maintenance. The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.

APPENDIX G

**ELECTRONIC SYSTEMS
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

**ELECTRONIC SYSTEMS
OPERATING AND SUPPORT
COST ELEMENT STRUCTURE**

- 1.0 MISSION PERSONNEL**
 - 1.1 OPERATIONS**
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ELECTRONIC SYSTEMS OPERATING AND SUPPORT COST ELEMENT STRUCTURE DEFINITIONS

The cost element structure for electronic systems encompasses defense materiel programs that employ electronics capabilities as their primary function. Examples include command and control systems, radar systems, communication systems, information systems, sensor systems, navigation/guidance systems, and electronic warfare systems. Some electronic systems are embedded in other primary defense systems; others are discretely identifiable as defense systems in their own right. When an electronic system is unique or is used as a building block for several systems but is not accounted for in those systems, it will be included in the electronic systems category.

1.0 MISSION PERSONNEL

The mission personnel element includes the cost of pay and allowances for officer, enlisted, and civilian personnel required to operate, maintain, and support a discrete electronic system. This includes the personnel necessary to meet combat readiness, unit training, and administrative requirements. For personnel who operate, maintain, or support more than one type of defense system, personnel requirements will be allocated on a relative workload basis. Personnel costs will be based on manning levels and skill categories.

Note: Pay and allowances for officer and enlisted personnel should be based on the standard composite rate, which includes the following elements: basic pay, retired pay accrual, incentive pay, special pay, basic allowance for quarters, variable housing allowance, basic allowance for subsistence, hazardous duty pay, reenlistment bonuses, clothing allowances, overseas station allowances, uniform allowances, family separation allowances, separation payments, and social security contributions.

Pay and allowances for civilian personnel should be based on the standard composite rate, which includes the following elements: basic pay, additional variable payments for overtime, holiday pay, night differentials, cost-of-living allowances, and the government contribution to employee benefits, insurance, retirement, and the Federal Insurance Contribution Act.

1.1 OPERATIONS. The pay and allowances of the crew or full complement of personnel required to operate an electronic system. System operators may include officers, enlisted, or civilian personnel, or a combination of all three. In some cases, the equipment may be operated without a crew in an unattended mode.

1.2 MAINTENANCE. The pay and allowances of military and civilian personnel who support or perform maintenance on an electronic system, associated support equipment, and unit-level training devices. Depending on the system and the maintenance concept and

organizational structure, this element will include maintenance personnel at the organizational level and possibly the intermediate level. Organizational maintenance personnel normally perform on-equipment maintenance; intermediate maintenance personnel perform off-equipment maintenance. If intermediate-level maintenance is provided by a separate support organization (e.g., a centralized intermediate maintenance support activity), the costs should be reported in element 3.0, Intermediate Maintenance (External to Unit).

1.3 OTHER MISSION PERSONNEL. The pay and allowances of military and civilian personnel who perform unit staff, security, and other mission support activities. The number and type of personnel will vary depending on the requirements of the particular system. These billets exist only to support the system whose costs are being estimated. Some examples are:

- **Unit Staff.** Personnel required for unit command, administration, supervision, operations control, planning, scheduling, safety, and quality control, etc.
- **Security.** Personnel required for system security. Duties may include entry control, close and distant boundary support, and security alert operations.
- **Other Support.** Personnel required for staff information, logistics, ground safety, and simulator operations as well as for special mission support functions, such as intelligence, photo interpretation, etc.

Note: The operation and maintenance of electronic systems at remote sites may in some cases require air (fixed wing/helicopter) support. The associated air support personnel and operating and support costs should be reported in element 6.0, Sustaining Support.

2.0 UNIT-LEVEL CONSUMPTION

Unit-level consumption includes the cost of fuel and energy resources; operations, maintenance, and support materials consumed at the unit level; stock fund reimbursements for depot-level reparable; transportation in support of system operation and maintenance; temporary additional duty/temporary duty (TAD/TDY) pay; and other unit-level consumption costs, such as purchased services for equipment lease and service contracts.

2.1 ENERGY CONSUMPTION. Represents the unit-level cost of power required for the operation of an electronic system. May include battery, field-generated electricity, and commercial electricity necessary to support the operation of the system.

2.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of material consumed in the operation, maintenance, and support of an electronic system and associated support equipment. Depending on the maintenance concept or organizational structure, consumption at the intermediate level should be reported either in this element or in element 3.0, Intermediate Maintenance (External to Unit). Costs need not be identified at the level of detail shown below; the descriptions are intended merely to illustrate the various categories of materials encompassed in this element.

- Maintenance Material. The cost of material expended during maintenance. Examples include consumables and repair parts such as transistors, capacitors, gaskets, fuses, and other bit-and-piece material.
- Operational Material. The cost of non-maintenance material consumed in operating an electronic system and support equipment. Examples include paper, diskettes, ribbons, charts, and maps.
- Mission Support Supplies. The cost of supplies and equipment expended in support of mission personnel. Examples include items relating to administration, housekeeping, health, and safety.

2.3 DEPOT-LEVEL REPARABLES. The unit-level cost of reimbursing the stock fund for purchases of depot-level reparable (DLR) spares (also referred to as exchangeables) used to replace initial stocks. DLRs may include repairable individual parts, assemblies, or subassemblies that are required on a recurring basis for the repair of major end items of equipment.

Note: Defense Management Report Decisions (DMRDs) 901 and 904 of November 1989 proposed the establishment of a Defense Business Operations Fund (DBOF) under which DLRs would be consolidated under stock fund management. The cost of DLRs, previously a free issue to the consumer, must now be funded and budgeted by the resource user. A surcharge is added to the price of DBOF items to recover the cost of stock fund operations.

2.4 OTHER. Include in this element any significant unit-level consumption costs not otherwise accounted for. The costs identified must be related to the system whose operating and support requirements are being assessed. Examples might include:

- Purchased Services. The leased cost of communications services, including data/voice links, dedicated lines, long-haul lines, microwave channels, etc. Also includes special support equipment, vehicles, and service contracts for custodial services, computers, and administrative equipment.

- **Transportation.** The deployed unit transportation cost of moving mobile electronic systems and support equipment, repair parts, and secondary items to and from training areas. May also include transportation costs for items procured or shipped by the unit. Excluded are transportation costs for reparable acquired through DBOF.
- **TAD/TDY.** Temporary additional duty or temporary duty (TAD/TDY) pay. The cost of unit personnel travel for training, administrative, or other purposes, such as crew rotations, deployments, or follow-on tests and evaluation. Includes commercial transportation charges, rental costs for passenger vehicles, mileage allowances, and subsistence expenses (e.g., per diem allowances and incidental travel expenses).

3.0 INTERMEDIATE MAINTENANCE (EXTERNAL TO UNIT)

Intermediate maintenance performed external to the unit includes the cost of labor and material and other costs expended by designated activities/units (third and fourth echelon) in support of an electronic system and associated support equipment. Intermediate maintenance activities include calibration, repair, and replacement of parts, components, or assemblies, and technical assistance.

3.1 MAINTENANCE. The pay and allowances of military and civilian personnel who perform intermediate maintenance on an electronic system, associated support equipment, and unit-level training devices.

3.2 CONSUMABLE MATERIAL/REPAIR PARTS. The costs of repair parts, assemblies, subassemblies, and material consumed in the maintenance and repair of an electronic system, associated support equipment, and unit-level training devices.

3.3 OTHER. Include in this element any significant intermediate maintenance costs not otherwise accounted for. For example, this could include the cost of transporting subsystems or major end items to a base or depot facility.

4.0 DEPOT MAINTENANCE

Depot maintenance includes the cost of labor, material, and overhead incurred in performing major overhauls or maintenance on an electronic system, its components, and associated support equipment at centralized repair depots, contractor repair facilities, or on site by depot teams. Some depot maintenance actions occur at intervals ranging from several months to several years. As a result, the most useful method of portraying these

costs is on an annual basis (e.g., cost per electronic system per year) or an operating-hour basis.

Note: The cost of depot-level reparable (DLRs) or exchangeables acquired through DBOF should be reported in element 2.0, Unit-Level Consumption.

4.1 OVERHAUL/REWORK. The labor, material, and overhead cost of regularly scheduled overhaul/rework of an electronic system and associated support equipment. The system may be returned to a centralized depot facility for maintenance, or depot field teams may do the work at the installation (e.g., satellite or radar station). Costs for major subsystems that have different overhaul cycles should be identified separately within this element.

4.2 OTHER. Include in this element any significant depot maintenance activities not otherwise accounted for. For example, this could include component repair costs for reparable not managed by the DBOF, second-destination transportation costs for weapon systems or subsystems requiring major overhaul or rework, or contracted unit-level support.

Note: Not all reparable items are acquired through DBOF. Centrally funded accounts may continue to finance items such as classified program DLRs, conventional and nuclear munitions items, and certain cryptologic electronics and telecommunication items.

5.0 CONTRACTOR SUPPORT

Contractor support includes the cost of contractor labor, materials, and overhead incurred in providing all or part of the logistics support required by an electronic system, subsystem, or associated support equipment. Contract maintenance is performed by commercial organizations using contractor personnel, material, equipment, and facilities or government-furnished material, equipment, and facilities. Contractor support may be dedicated to one or multiple levels of maintenance and may take the form of interim contractor support (ICS) if the services are provided temporarily or contractor logistics support (CLS), where the support extends over the operational life of the system. Other contractor support may be purchased for engineering and technical services.

5.1 INTERIM CONTRACTOR SUPPORT. Interim contractor support (ICS) includes the burdened cost of contract labor, material, and assets used in providing temporary logistics support to an electronic system, subsystem, and associated support equipment. The purpose of ICS is to provide total or partial logistics support until a government maintenance capability is developed.

5.2 CONTRACTOR LOGISTICS SUPPORT. Contractor logistics support (CLS) includes the burdened cost of contract labor, material, and assets used in providing support to an

electronic system, subsystem, and associated support equipment. CLS funding covers depot maintenance and, as negotiated with the operating command, necessary organizational and intermediate maintenance activities. If CLS is selected as the primary means of support, all functional areas included in the CLS cost should be identified in the cost element documentation.

5.3 OTHER. Include in this element any contractor support costs not otherwise accounted for. For example, if significant, the burdened cost of contract labor for contractor engineering and technical services should be separately identified and included here.

Note: Contractor support during the pre-operational phase of a system is typically funded as a system development or investment cost. However, post-operational contractor support is an O&S cost and should be addressed in this element.

After the ICS period, the government assumes responsibility for supporting an electronic system. However, contractor support may still be employed in specific functional areas, such as sustaining engineering, software maintenance, simulator operations, and selected depot maintenance. Applicable contractor costs should be reported against these elements in the CES. To avoid double counting, the contractor support element should be annotated to identify any contractor costs that are reported in other elements.

6.0 SUSTAINING SUPPORT

Sustaining support includes the cost of replacement support equipment, modification kits, sustaining engineering, software maintenance support, simulator operations, and possibly air support for an electronic system. War readiness materiel is specifically excluded.

6.1 SUPPORT EQUIPMENT REPLACEMENT. The cost of replacing equipment that is needed to operate or support an electronic system, subsystems, training systems, and other support equipment. The support equipment being replaced (e.g., tools and test sets) may be unique to the system or it may be common to a number of systems, in which case the costs must be allocated among the respective systems.

Note: This element addresses replacement equipment only. The costs of initial support equipment are specifically excluded.

6.2 MODIFICATION KIT PROCUREMENT/INSTALLATION. The cost of procuring and installing modification kits and modification kit initial spares (after production and deployment) required for an electronic system and associated support and training equipment. Includes only those modification kits needed to achieve acceptable safety levels, overcome mission capability deficiencies, improve reliability, or reduce maintenance costs.

Excludes modifications undertaken to provide additional operational capability not called for in the original design or performance specifications.

6.3 OTHER RECURRING INVESTMENT. Include in this element any significant recurring investment not otherwise accounted for.

6.4 SUSTAINING ENGINEERING SUPPORT. The labor, material, and overhead costs incurred in providing continued systems engineering and program management oversight to determine the integrity of a system, to maintain operational reliability, to approve design changes, and to ensure system conformance with established specifications and standards. Specific costs in this category may include (but are not limited to) government and/or contract engineering services, technical advice and training for component or system installation, operation, maintenance, and support.

6.5 SOFTWARE MAINTENANCE SUPPORT. The labor, material, and overhead costs incurred after deployment by depot-level maintenance activities, government software centers, laboratories, or contractors for supporting the update, maintenance and modification, integration, and configuration management of software. Includes operational, maintenance, and diagnostic software programs for the primary system, support equipment, and training equipment. The respective costs of operating and maintaining the associated computer and peripheral equipment in the software maintenance activity should also be included. Not included are the costs of major redesigns, new development of large interfacing software, and modifications that change functionality.

6.6 SIMULATOR OPERATIONS. The costs incurred to provide, operate, and maintain on-site or centralized simulator training devices for a weapon system, subsystem, or related equipment. This may include the labor, material, and overhead costs of simulator operations by military and/or civilian personnel, or by private contractors.

Note: On-site simulator operations and maintenance that are an integral part of unit manning and unit consumption should be reported as unit-level mission costs for the system in question. However, the costs of all contract-funded simulator operations and all centralized government simulator operations should be reported in this element.

6.7 AIR SUPPORT. Use this element to report the costs of any fixed-wing or helicopter support required at a remote electronic system site. Air support includes the operating and support costs of helicopter or fixed-wing aircraft that provide air surveillance, routine transportation, or emergency transportation between the host base, maintenance control facility, and remote site. Fixed-wing or helicopter operating and support costs include those contained in the aircraft CES.

6.8 OTHER. Include in this element any significant sustaining support costs not otherwise accounted for. Examples might include the costs of follow-on operational tests and evaluation, such as test support, data reduction, and test reporting.

7.0 INDIRECT SUPPORT

Indirect support includes the costs of personnel support for specialty training, permanent changes of station, and medical care. Indirect support also includes the costs of relevant host installation services, such as base operating support and real property maintenance.

7.1 PERSONNEL SUPPORT. Personnel support includes the cost of system-specific and related specialty training for military personnel who are replacing individuals lost through attrition. Also included in this element are permanent change of station costs, and the cost of medical care. Each of these elements should be addressed separately. Descriptions are provided below:

- **Specialty Training.** The cost of system-specific training and specialty training for military personnel who are replacing individuals lost through attrition. Replacement specialty training costs should be calculated for those personnel associated with the system whose O&S requirements are being assessed. Training costs should include government non-pay-related training costs (course support costs, materials, per diem, travel, etc.) as well as the cost of pay and allowances for trainees, instructors, and training support personnel. Excluded are recruiting, accession, basic military training, and separation costs.

Note: The cost of initial course development and training of Service instructors at contractor facilities is normally categorized as a system investment cost. However, the follow-on training costs of military and civilian personnel attending factory schools, as well as the cost of attending Service-conducted school-house specialty training, are O&S costs and should be reported in this element.

Normally, the costs of acquisition for recruiting, accession, and basic military training will not be included. However, if a significant change in Service recruiting and training objectives is required in order to support the system being assessed, then these costs should be addressed.

- **Permanent Change of Station (PCS).** The cost of moving replacement personnel to and from overseas theaters and within the continental United States.

- **Medical Support.** The cost of personnel pay and allowances and material needed to provide medical support to system-specific mission and related military support personnel.

7.2 INSTALLATION SUPPORT. Consists of personnel normally assigned to the host installation who are required for the unit to perform its mission in peacetime. Include only those personnel and costs that are directly affected by a change in the number of systems and associated mission personnel. Functions performed by installation support personnel include:

- **Base Operating Support.** The cost of personnel pay and allowances and material necessary to provide support to system-specific mission-related personnel. Base operating support activities may include functions such as communications, supply operations, personnel services, installation security, base transportation, etc.
- **Real Property Maintenance.** The cost of personnel pay and allowances, material, and utilities needed for the maintenance and operation of system-specific mission-related real property and for civil engineering support and services.