DOD 5000.4-M

DEPARTMENT OF DEFENSE

COST ANALYSIS GUIDANCE AND PROCEDURES

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ASSISTANT SECRETARY OF DEFENSE
(PROGRAM ANALYSIS AND EVALUATION)

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301-1800

PROGRAM ANALYSIS
AND EVALUATION

December 11, 1992

FOREWORD

This Manual is issued under the authority of DoD Directive 5000.4, "OSD Cost Analysis Improvement Group (CAIG)," November 24, 1992. This Manual establishes:

1. Guidance on the preparation of the "Cost Analysis Requirements Document (CARD)". The CARD is to be prepared by the program office (or an office designated by the sponsoring DoD Component if the program office does not exist) describing the complete program and will be used as the basis on which the program office and DoD Component cost analysis teams prepare the program life-cycle cost estimates.

2. Guidance on the scope of the cost analysis, the analytical methods to be used in preparing cost estimates, and the procedures and presentation of the estimates to the Cost Analysis Improvement Group.

3. Definitions for seven cost terms and provides an understanding as to how they relate to life-cycle cost categories, work breakdown structure elements, and appropriations.

4. The requirements, objectives, uses, and administration of the "Visibility and Management of Operating and Support Costs (VAMOSC) Program."

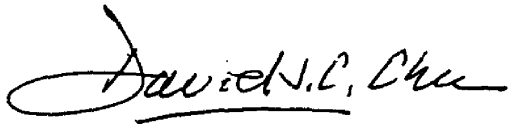
This Manual applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Chairman of the Joint Chiefs of Staff and the Joint Staff, and the Defense Agencies (hereafter referred to collectively as "the DoD Components").

Send recommended changes to the Manual through proper channels to:

Chairman, Cost Analysis Improvement Group
Office of the Secretary of Defense
Room 2E-314, The Pentagon
Washington, DC 20301-1800

This Manual is effective three months after the date of publication, and is for use by all the DoD Components. There shall be no supplementation by the DoD Components. Implementation necessary to establish the internal management process required to comply with this Manual is permitted. The DoD Component Heads shall distribute this Manual to program managers and cost analysis organizations within 60 days of receipt.

The DoD Components may obtain copies of this Manual through their own publication channels. Other Federal Agencies and the public may obtain copies from the U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.



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REFERENCES

(a) DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," February 23, 1991
(b) DoD 5000.2-M, "Defense Acquisition Management Documentation and Reports," February 1991
(c) MIL-STD-1472D, "Human Engineering Design Criteria for Military Systems, Equipment and Facilities," March 20, 1991
(d) MIL-STD-882B, "System Safety Program Requirements," July 1, 1987
(e) MIL-STD-454M, "General Requirements for Electronic Equipment," June 3, 1991
(f) Cost Analysis Improvement Group, "Operating and Support Cost-Estimating Guide," February 25, 1992
(g) DoD Directive 3405.1, "Computer Programming Language Policy," April 2, 1987
(h) ANSI/MIL-STD-1815A, "Ada Programming Language," January 22, 1983
(i) ANSI X3.9-1978 (FIPS 69-1), December 24, 1985
(j) MIL-STD-1589C, "Jovial (J73)," July 6, 1984
(k) DoD Directive 5000.4, "OSD Cost Analysis Improvement Group (CAIG)," November 24, 1992
(l) NAVMAT P-5241, AMCP 715-8, AFLCP/AFSCP 800-15, "Contractor Cost Data Reporting (CCDR) System Pamphlet," November 5, 1973
(m) DoD 7110.1-M, "Department of Defense Budget Guidance Manual," May 1990
(n) DoD Instruction 7045.7, "Implementation of the Planning, Programming, and Budgeting System (PPBS)," May 23, 1984
(o) Section 2341 of title 10, United States Code
(p) Military Standard 881A, "Work Breakdown Structure for Defense Materiel Items," April 25, 1975

AL1. ABBREVIATIONS AND/OR ACRONYMS

AL1.1.	APB	Acquisition Program Baseline
AL1.2.	CAIG	Cost Analysis Improvement Group
AL1.3.	CARD	Cost Analysis Requirements Description
AL1.4.	CCDR	Contractor Cost Data Reporting
AL1.5.	CER	Cost Estimating Relationship
AL1.6.	COEA	Cost and Operational Effectiveness Analyses
AL1.7.	CONUS	Continental United States
AL1.8.	COTS	Commercial Off-the-Shelf
AL1.9.	DAB	Defense Acquisition Board
AL1.10.	DoD CCA	Department of Defense Component Cost Analysis
AL1.11.	DEM/VAL	Demonstration and Validation
AL1.12.	EMD	Engineering and Manufacturing Development
AL1.13.	ILSP	Integrated Logistics Support Plan
AL1.14.	MIL-STD	Military Standard
AL1.15.	MNS	Mission Needs Statement
AL1.16.	NDI	Non-Developmental Items
AL1.17.	OSD	Office of the Secretary of Defense
AL1.18.	O&S	Operating and Support
AL1.19.	ORD	Operational Requirements Document
AL1.20.	POE	Program Office Estimate
AL1.21.	P^3I	Pre-Planned Product Improvement
AL1.22.	RAM	Reliability, Availability and Maintainability
AL1.23.	R&D	Research and Development
AL1.24.	STAR	System Threat Assessment Report
AL1.25.	TEMP	Test and Evaluation Master Plan
AL1.26.	TSTP	Total System Training Plan
AL1.27.	VAMOSC	Visibility and Management of Operating and Support Costs
AL1.28.	WBS	Work Breakdown Structure

C1. CHAPTER 1

GUIDELINES FOR THE PREPARATION AND MAINTENANCE OF A COST ANALYSIS REQUIREMENTS DESCRIPTION (CARD)

C1.1. PURPOSE

This Manual gives guidance for preparing and updating a Cost Analysis Requirements Description.

C1.2. BACKGROUND

DoD Instruction 5000.2 and DoD 5000.2-M (references (a) and (b)) require that both a program office estimate (POE) and a DoD Component cost analysis (CCA) estimate be prepared in support of acquisition milestone reviews. As part of this requirement, reference (b) specifies that the DoD Component sponsoring an acquisition program establish, as a basis for cost-estimating, a description of the salient features of the program and of the system being acquired. This information is presented in a Cost Analysis Requirements Description (CARD). Chapter 2 of this Manual provides more explicit instructions regarding CARD submission schedules, but it does not provide guidance on the content of CARDS. That guidance is provided here.

C1.3. GENERAL PROCEDURES FOR PREPARING AND SUBMITTING CARDS

Reference (b) and Chapter 2 of this Manual establish the following guidelines for the preparation and distribution of CARDS:

C1.3.1. The CARD is to be prepared by the program office (or an organization specified by the sponsoring DoD Component if a program office does not exit), and approved by the DoD Component's Program Executive Officer. The CARD is provided to the teams preparing the POE and DoD CCA estimates, and is included as a separate section of the documentation for those estimates.

C1.3.2. For joint programs, the CARD should include the common program agreed to by all participating DoD Components as well as all unique program requirements of the participating Components.

C1.3.3. The CARD is to be provided in draft form to the Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG) at the planning meeting held

at least 180 days before a Defense Acquisition Board (DAB) review (166 days prior to a DAB Committee review) (see Part 13, section A. of reference (a)).

C1.3.4. The final CARD is to be provided to the CAIG 45 days prior to a DAB Committee review.

C1.3.5. Unless waived by the CAIG Chair, a separate CARD shall be prepared for each alternative (i.e., each system concept, contractor, etc.) that the sponsoring DoD Component considered for the decision at hand (at a minimum, those that were considered in the cost and operational effectiveness analysis). When appropriate, CARDs can be prepared as excursions to the preferred alternative(s) or one of the other alternatives. It can be expected that the number of alternatives to be considered (and, therefore, CARDs to be prepared) will be significantly reduced as the program moves from concept exploration and definition to production.

C1.4. SPECIAL CONSIDERATIONS

A CARD should be regarded as a "living" document that is updated in preparation for DAB and program reviews, if not annually. The updates reflect any changes that have occurred, or new data that have become available, since the previous DAB and/or program review.

C1.4.1. Each CARD should be comprehensive enough to facilitate identification of any area or issue that could have a significant effect on life-cycle costs and therefore must be addressed in the cost analysis. It also must be flexible enough to accommodate the use of various estimation methodologies. In some sections of the CARD, it may be possible to convey the information pertinent to cost estimation in a few sentences or a single matrix and/or table. In other sections, more detailed information may be required. The input options available to CARD preparers are identified in enclosure 1. Note that if a source document is referenced in the CARD, the full document (or pertinent extracts from it) must be included as an attachment to the CARD. MIL-STDs and other widely available references need not be attached; however, the exact location where the widely available information may be found shall be referenced, i.e., title of document, author(s), document number, and physical location.

C1.4.2. The level of detail of the information presented in a CARD will vary depending upon the maturity of the program. Understandably, programs at Milestone I, and possibly at Milestone II, are less well-defined than programs at Milestone III. Accordingly, the CARD for a Milestone I or II program may define ranges of potential Ioutcomes. It is essential that any assumptions made in preparing a CARD for Milestone I or II programs be identified in the appropriate sections of the document.

C1.4.3. Finally, the analysts who will be responsible for estimating system costs should review the CARD before it is submitted to the OSD CAIG. The purpose of this review is to ensure that the CARD is complete and that it contains all of the information that will be needed to prepare the cost estimates. The cost analysts should not prepare the CARD, however.

C1.5. CONTENTS OF A CARD

CARDs are divided into a number of sections, each focusing on a particular aspect of the program being assessed. The remainder of this Chapter outlines the basic structure of a CARD and describes the type of information presented in each section.

OUTLINE OF CARD BASIC STRUCTURE

1.0 **System Overview**

1.1 **System Characterization**. This section discusses the basic attributes of the system -- its configuration, the missions it will perform and threats it will counter, its relationship to other systems, and the major factors that will influence its cost. The presentation should be structured as follows:

1.1.1 **System Description**. This paragraph provides a general description of the system, including the functions it will perform and key performance parameters. The parameters should be those most often used by cost estimators to predict system cost. Examples of key system characteristics and performance parameters are provided in enclosure 2. A diagram or picture of the system, with the major parts and subsystems appropriately labeled, should be included.

1.1.2. **System Functional Relationships**. This paragraph describes the "top-level" functional and physical relationships among the subsystems within the system as well as the system's relationship to other systems.

1.1.3 **System Configuration**. This section identifies the equipment (hardware and software) work breakdown structure (WBS) for the system. If there is an approved CCDR Plan for the system, the WBS in the Plan should be the basis for the WBS presented here. If the CCDR Plan has not yet been approved, then the WBS contained in the CCDR Plan submitted to the OSD CAIG (or, if the program is an ACAT II, Ill, or IV program, the designated Service CCDR focal point) should be the basis for the WBS included here. Any differences between the WBS presented in this section and the WBS in the CCDR Plan should be identified and explained.

1.1.4 **Government-Furnished Equipment and Property**. This paragraph identifies the subsystems that will be furnished by the Government and included in the life-cycle cost estimates for the system. Any Government-furnished commercial off-the-shelf (COTS) software should be addressed in the discussion. Where Government-furnished equipment or property is common to other weapon systems, the text should identify how the costs will be accounted for.

1.2 **1.2. System Characteristics**. This section provides a technical description of the hardware, software, and human characteristics of the system. It is divided into the following subelements:

1.2.1 **Technical and Physical Description**. This set of paragraphs describes the physical design parameters of the system. A separate discussion is provided for each equipment (hardware and software) work breakdown structure (WBS) item. Physical design parameters should include performance, operational (including system design life), and material (weight and material composition) characteristics. The planned sequence of changes in weight, performance, or operational characteristics that are expected to occur or have historically occurred as the program progresses through the acquisition and operating phases -- demonstration and validation (DEM/VAL), engineering and manufacturing development (EMD), production, and operation and support (O&S) -- should be noted here. These parameters should be reconciled with the system requirements in the Operational Requirements Document (ORD) (reference (b)) to show that the system is being consistently and realistically defined. A tabular format is suggested.

1.2.1.x (..x..) **Subsystem Description**. This series of paragraphs (repeated for each subsystem) describes the major equipment (hardware/software) WBS components of the system. The discussion should identify which items are off-the-shelf. The technical and risk issues associated with development and production of individual subsystems also must be addressed.

1.2.1.x.1 **Functional and Performance Description**. This subparagraph identifies the function(s) the (..x..) subsystem is to perform. In addition, it describes the associated performance characteristics and lists any firmware to be developed for data processing equipment.

1.2.1.x.2 **Environmental Conditions**. This subparagraph identifies the environmental conditions expected to be encountered during development, production, transportation, storage, and operation of the subsystem. It also identifies any hazardous, toxic, or radiological materials that may be encountered or generated during the subsystem's development, manufacture, transportation, storage, operation, and disposal. The quantities of each hazardous material used or generated over the subsystem's lifetime should be estimated based on the most current operations and maintenance concepts. The discussion should also describe the evaluation methodology for environmentally acceptable alternatives as well as the rationale for selection of alternatives. Finally, the alternatives considered, and reasons for rejection, must be identified.

1.2.1.x.3 **Material, Processes, and Parts**. This subparagraph describes the materials and processes entailed in the development and fabrication of the subsystem. The discussion should identify the respective amount of each material to be used (e.g., aluminum, steel, etc.). In addition, any standard or commercial parts, or parts for which qualified products lists have been established, should be identified.

1.2.1.x.4 **Workmanship**. This subparagraph describes any specific workmanship-related manufacturing or production techniques pertaining to the subsystem.

1.2.1.x.5 **Commonality**. Equipment that is analogous or interchangeable among sub-systems should be identified here. Commonality with subsystems of other weapon systems, or with variants of the basic system, should be identified. Breakouts, by weight, of common and system-specific components should be provided, if applicable.

1.2.2 **Software Description**. This paragraph describes the software resources associated with the system. It should distinguish among operational, application, and support software and identify which items must be developed and which can be acquired off-the-shelf. The paragraph applies to all systems that use computer and software resources. A DoD Form 2630 should be attached to the CARD submission providing more information on the factors that will influence software development and maintenance costs. Use of this form is not mandatory if the same information can be

provided in another format, such as a matrix or table. Additionally, this information should be tailored to satisfy specific software model requirements. Definitions of the terms used in DD Form 2630 are in enclosure 4.

1.2.2.x (..x..) **Software Sub-elements**. This set of paragraphs (repeated for each software subelement) describes the design and intended uses of system software.

1.2.2.x.1 **Host Computer Hardware Description**. This subparagraph describes the host computer system on which the software subelement will be operating. This host system should be readily identifiable in the WBS given in paragraph 1.1.3., above.

1.2.2.x.2 **Programming Description**. This subparagraph identifies programming requirements that will influence the development and cost of the software subelement. The discussion should address the programming language and programming support environment (including standard tools and modem programming practices) and the compiler(s) and/or assembler(s) to be used.

1.2.2.x.3 **Design and Coding Constraints**. This subparagraph describes the design and coding constraints under which the software will be developed (i.e., protocols, standards, etc.).

1.2.2.x.4 **Commonality**. This subparagraph identifies software that is analogous or interchangeable among subelements.

1.2.3 **Human Performance Engineering**. This paragraph references applicable documents (i.e., MIL-STD-1472D (reference (c))) and identifies any special or unique human performance and engineering characteristics (i.e., constraints on allocation of functions to personnel and communication, and personnel, and equipment interactions). This paragraph should also reference or extract appropriate sections from the Human Systems Integration (HSI) Plan (required by Part 7, section B. of DoD Instruction 5000.2 (reference (a)), which concern cost or address cost risks, if available.

1.2.4 **System Safety**. This paragraph references applicable documents (e.g., MIL-STD-882B (reference (d)), MIL-STD-454M (reference (e)), etc.) and identifies any special or unique system safety considerations (e.g., "fail safe" design, automatic safety, explosive safety needs, etc.).

1.2.5 **System Survivability**. This paragraph discusses the survivability capabilities and features of the system. It describes the environments (e.g., nuclear, chemical, biological, fire, etc.) in which the system will be expected to operate, and

identifies any unique materials incorporated in the system's design that contribute to its survivability.

1.3 **System Quality Factors**. This section identifies key system quality characteristics. System operational availability (Ao) and the flowdown of reliability, availability and maintainability (RAM) requirements should be addressed as follows:

1.3.1 **Reliability**. This paragraph defines system reliability goals in quantitative terms, and defines the conditions under which the goals are to be met.

1.3.2 **Maintainability**. This paragraph focuses on maintainability characteristics. It describes the planned maintenance and support concept in the following quantitative terms:

a. System maintenance man-hours per operating hour, maintenance man-hours per operating hour by major component part of the system, operational ready rate, and frequency of preventative maintenance;

b. Maintenance man-hours per overhaul;

c. System mean and maximum down time, reaction time, turnaround time, mean and maximum time to repair, and mean time between maintenance actions;

d. Number of people required and the associated skill levels at the unit maintenance level;

e. Maximum effort required to locate and fix a failure; and

f. Specialized support equipment requirements.

1.3.3 **Availability**. This paragraph defines, in quantitative terms, the availability goals for specific missions of the system. It should identify the percentage of the systems expected to be operable both at the start of a mission and at unspecified (random) points in time.

1.3.4 **Portability and Transportability**. This paragraph discusses the portability and transportability features of the system (equipment and software) and describes how they affect employment, deployment, and logistic support requirements. Any subsystems whose operational or functional characteristics make them unsuitable for transportation by normal methods should be identified.

1.3.5 **Additional Quality Factors**. This paragraph describes any quality features not addressed in the preceding paragraphs (i.e., interoperability, integrity, and efficiency features of the system).

1.4 **Embedded Security**. If there is embedded security in the system, the software and hardware requirements should be fully identified in paragraph 1.1.3., above, and described here.

1.5 **Predecessor and/or Reference System**. This section describes the predecessor and/or reference system. A predecessor and/or reference system is a currently operational or pre-existing system with a mission similar to that of the proposed system. It is often the system being replaced or augmented by the new acquisition. The discussion should identify key system-level characteristics of both the predecessor and/or reference system and the new or proposed system. (Use the table in enclosure 3 as a guide for formatting this information.) Any problems associated with the predecessor system should be discussed, along with any significant differences between the predecessor system and the proposed system. The narrative should also describe how the predecessor system is to be replaced with the proposed system (e.g., one-for-one replacements, etc.). Information on the planned disposition of the replaced systems should be provided so that disposal costs and benefits can be considered in the cost estimate. The above information should also be provided on analogous subsystem and components that can be used to scope or estimate the new system.

2.0 **Risk**. This section identifies the program manager's assessment of the program and the measures being taken or planned to reduce those risks. Relevant sources of risk include: design concept, technology development, test requirements, schedule, acquisition strategy, funding availability, contract stability, or any other aspect that might cause a significant deviation from the planned program. Any related external technology programs (planned or on-going) should be identified, their potential contribution to the program described, and their funding prospects and potential for success assessed. This section should identify these risks for each acquisition phase (DEM/VAL, EMD, production and deployment, and O&S).

3.0 **System Operational Concept**

3.1 **Organizational Structure**. This section identifies the force structure elements associated with the operation of the system. A unit manpower document should be provided, along with supporting text describing the functions and relationships of the organizational elements. In some cases, unit manpower documents may not be available for a system until after Milestone II. In those instances, notional unit

manpower documents showing the relationship to the unit manpower documents for the predecessor system should be provided.

3.2 **Basing and Deployment Description**. This paragraph describes the peacetime basing and wartime deployment plans for the system. It identifies the number and location of peacetime bases both in the continental United States (CONUS) and overseas, and describes any new bases or facilities that will be required. The paragraph should also describe the anticipated deployment method of the system in terms of number of sites and operating locations.

3.3 **Security**. This paragraph describes the system's physical security, information security, and operations security features. Hardware and software aspects of communications and computer security should also be addressed.

3.4 **Logistics**. This paragraph summarizes key elements of the Integrated Logistics Support Plan (ILSP). The information is divided into the following subparagraphs:

3.4.1 **Support Concept**. These subparagraphs describe the hardware and software support concepts.

3.4.1.1 **Hardware Support Concept**. This subparagraph describes the hardware support concept, taking into account:

a. Service (organic) versus contractor support requirements.

b. Interim support (fielding) plans.

c. Scheduled maintenance intervals and major overhaul points.

d. Maintenance levels and repair responsibilities.

e. Repair versus replacement criteria.

f. Standard support equipment to be used.

g. Specialized repair activities (SRAs).

h. Hardness assurance, maintenance, and surveillance plans for systems with critical survivability characteristics (e.g., hardness to high altitude electronmagnetic pulse).

i. Other requirements not previously mentioned.

3.4.1.2 **Software Support Concept**. This subparagraph describes the software support concept, including methods planned for upgrades and technology insertions. The discussion should also address post-development software support requirements.

3.4.2 **Supply**. This paragraph should identify the following:

a. Provisioning strategy.

b. Location of system stocks and the methods of resupply.

c. Other effects of the weapon system on the supply system.

3.4.3 **Training**. This paragraph summarizes the training plans for system operators, maintenance personnel, and support personnel. This paragraph should reference or extract appropriate sections from the Total System Training Plan (TSTP) required by Part 7, section B. of DoD Instruction 5000.2 (reference (a)), if available. In the absence of a firm plan, it identifies the following:

a. The training that needs to be accomplished and the organizations that will conduct the training;

b. The number of systems that must be acquired solely for training purposes;

c. The need for auxiliary training devices, the skills to be developed by those devices, and computer simulation requirements;

d. Training times and locations;

e. Source materials and other training aids;

f. Other training requirements not previously mentioned.

4.0 **Quantity Requirements**. This section consists of a matrix identifying the quantities of the system to be developed, tested, produced, and deployed by acquisition phase and year. The quantities identified should be sufficient for maintenance and readiness floats as well as for peacetime attrition requirements. For complete system end-items such as whole engines, the quantities allocated for initial spares and replacement spares should be separately identified.

5.0 **System Manpower Requirements**. This section describes the manpower needed to support the system. The requirements identified should be consistent with the appropriate cost element structures in appendices B through G of the Operating and Support Cost-Estimating Guide (reference (f)) and with the projections given in the Manpower Estimate Report (Part 6 of DoD 5000.2-M (reference (b))).

6.0 **System Activity Rates**. This section defines the activity rates (e.g., number of operating hours per year, flight hours per month or year, operating shifts per day, etc.) for each system or subsystem.

7.0 **System Milestone Schedule**. This section describes the acquisition schedule for the system. Both hardware and software schedules should be discussed. A Gantt chart showing the major milestones of the program by phase (e.g., design reviews, first flights or builder's trials, significant test events, system light-offs (for ships), Defense Acquisition Board (DAB) and DoD Component-unique milestone reviews, initial deployment data, and final operational capability) should be provided. A more detailed program master schedule should be included as a reference or appendix. Specific element schedules, if known, should be presented with the descriptions of those elements.

8.0 **Acquisition Plan and/or Strategy**. This section describes the acquisition plan for the system. It addresses the following:

8.1 **Contractors**. This paragraph identifies the number of prime contractors expected to compete during each acquisition phase. The specific contractors and subcontractors involved in each phase should be identified, if known. If this information is source selection sensitive, special labelling of the overall CARD may be required.

8.2 **Contract Type**. This paragraph describes the type of contracts to be awarded in each phase of the program. The status of any existing contracts should be discussed.

9.0 **System Development Plan**

9.1 **Development Phases**. This paragraph summarizes the DEM/VAL and EMD plans for the system. Software reuse from the DEM/VAL phase in the EMD phase should be discussed.

9.2 **Development Test and Evaluation**. This paragraph describes all testing to be accomplished during the development program. The number, type, location, and expected duration of tests (for both hardware. and software) should be identified, along with the organizations that will conduct the test programs. Examples of tests to include are contractor flight tests, static and fatigue testing, logistic testing to evaluate the achievement of supportablity goals, Contractor and Government-conducted tests should be separately identified.

9.3 **Operational Test and Evaluation**. This paragraph describes all testing to be conducted by Agencies other than the developing command to assess the system's military utility, operational effectiveness, operational suitability, logistics supportability, etc. The number, type, location, and expected duration of tests (for both hardware and software) should be identified, along with organizations that will conduct the test programs.

10.0 **Element Facilities Requirements**

10.1 **Test and Production Facilities**. This paragraph describes the type and number of hardware and software test and production facilities (both contractor and Government owed) required during all phases of program acquisition. Separately identify those funded as part of the acquisition prime contract, those separately funded by the program office, and those provided by other activities -- such as a Government test organization or facility. Existing facilities that can be modified and/or utilized should be noted. The discussion should describe the size and design characteristics of the respective facilities, along with any land acquisition requirements. The impacts of hazardous, toxic, or radiological materials used or generated during system tests or production should be assessed.

10.2 **Operational Support Facilities**. This paragraph describes the type and number of hardware and software facilities required for system deployment, operation and support (including training, personnel, depot maintenance, etc.). Existing facilities that can be modified and/or utilized should be noted. The discussion should describe the size and design characteristics of the respective facilities, along with any land acquisition requirements. The impacts of hazardous, toxic, or radiological materials consumed or generated by the system should be assessed.

10.3 **Facilities Commonality**. This paragraph identifies the facilities and equipment that are common to this and other programs. The discussion should specify how these items will be accounted for in the cost estimates.

10.4 **Environmental Impact Analysis**. This paragraph identifies how environmental impact analysis requirements (including impacts on land, personnel, and facilities) will be accomplished for operational, depot, and training locations, and how the results will be incorporated into the program.

11.0 **Track to Prior CARD**. This section summarizes changes from the previous CARD. The discussion should address changes in system design and program schedule, as well as in program direction.

12.0 **Contractor Cost Data Reporting (CCDR) Plan**. This section contains a copy of the CCDR Plan approved for the program. If the Plan has not yet been approved, include a copy of the proposed CCDR Plan as submitted to the OSD CAIG (or the designated Service CCDR focal point, if the program is an ACAT II, III, or IV program).

Enclosures - 4

E1. Input Options Available to CARD Preparers
E2. Examples of Key System Characteristics and Performance Parameters
E3. Predecessor and/or Reference System Description
E4. Software Glossary

E1. ENCLOSURE 1

INPUT OPTIONS AVAILABLE TO CARD PREPARERS

Condition of Data	CARD Input
1. The required data are available.	Provide the data in the appropriate section of the CARD.
2. The data are contained in another document.	Summarize the data pertinent to cost in the appropriate section of the CARD and append the source document (or relevant passages from it) as an attachment.
3. There are no significant cost implications associated with the CARD section.	The CARD section should be identified as Not Relevant (N/R).
4. Sufficiently detailed data are not yet available.	The available data should be provided and the remainder of the information should be identified as "to be determined" (TBD).
5. Uncertainty is associated with this area.	A range of values can be specified as opposed to a discrete value. If a range is used, it should be associated with a base case. Include rationale for the range as well as a discussion of the significance of its variation for other parts of the system. If possible, designate a most likely or design value.

As the system or program evolves and matures, additional data, which will resolve TBDs and uncertainties, will become available and can be incorporated into the CARD.

E2. ENCLOSURE 2

EXAMPLES OF KEY SYSTEM CHARACTERISTICS AND PERFORMANCE PARAMETERS

Examples of Key System Characteristics and Performance Parameters

Aircraft:	Airframe unit weight (AUW); breakdown of AUW by material type; empty weight; structure weight; length; wingspan; wing area; wing loading; combat weight; maximum gross weight; payload weight; internal fuel capacity; useful load; maximum speed (knots at sea level (SL)/maximum altitude); combat ceiling; combat speed; wetted area.
Engines:	Maximum thrust at sea level; specific fuel consumption; dry weight; turbine inlet temperature; (degrees Rankine) at maximum value and maximum continuos value; maximum airflow.
Missiles:	Weight, length, width, height, type propulsion, payload, range, sensor characteristics (e.g., millimeter wavelength(s) for MMW sensors).
Ships:	Length overall (LOA) (ft); maximum beam (ft); displacement (full) (T); draft (full load) (ft) [Note appendages, such as sonar dome]; propulsion type (nuclear, gas turbine, conventional steam, etc.); number of screws; shaft horsepower (SHP) (HP); lift capacity (troops, vehicles, (KSqFt), cargo (KCuFt), bulk fuel, (K Gal), LCAC, AAAV, VTOL L/L and VTOL M/S).
Tanks and Trucks:	Weight, length, width, height, engine horsepower, and payload (i.e., ammunition loads and tonnage ratings).
Data Automation/ADPE:	Type (mainframe, mini, micro); processor (MIPS, MPLOPS, MOPS, SPECMARKS); memory (size in megabytes); architecture (monolithic, distributed).

Examples of Key System Characteristics and Performance Parameters, Continued

Electronics: Weight by Type of System:

TYPE SYSTEM	PERFORMANCE MEASURES	TECHNOLOGY	OTHER
Radar	Output Power Range Resolution Classification Capable Frequency Number Phase Shifters Number of Elements	MIMIC TWT VHSIC Stealth SOS, etc. Software	Phased Array Type Scan Installation Reliability Waveform Quantity
Communications	Frequency Power Number Channels Interoperability LPI Range/LOS/NLOS	MIMIC Antenna Type SOS, etc. Stealth Software	Tactical/Strategic Secure ANTI-Jam User Community Data/Voice
Satellite	Quantity Orbit Number of Users Power Waveform	Size/Weight Launch Vehicle Processors Bus Software	Purpose Coverage Design Life
EW	Classification Capable Active/Passive Automatic/Manual Programmable Power/Frequency	MIMIC/TWT On/Off Board VHSIC Integration Stealth Packaging Software	Purpose Expendable Installation Platforms

E3. ENCLOSURE 3

PREDECESSOR AND/OR REFERENCE SYSTEM DESCRIPTION

	Predecessor System	Proposed System
System Designation and Name		
Manpower Requirements		
Crew Composition		
Performance		
Speed (max)		
Speed (sustained)		
Range		
Payload		
Configuration		
Weight (Airframe Unit)		
Weight (empty)		
Weight (gross)		
Dimensions		
Height		
Weight		
Lenght		
Acquisition		
Unit Cost (Prototype/100thProd. Unit)		
Number of Systems		
Acquire(d)		
Deploy(ed)		
Operating Concept		
No. of Equipped DeployableUnits (sqd/companies)		
Average No. Systems/Unit		
Operating Hours or Miles/Year/System		
Maintenance Concept		
Interim Contractor Support		
Contractor Logistics Support		
In-House Support		
Number of Maintenance Levels		
Performance Goals		
Operational Ready Rate (%)		
System Reliability (Mean Time Between Failures)		
Maintenance Manhours Per Flying/Operating Hour/Miles		
Major Overhaual Point (flying hrs/oper hrs/m/miles)		

Note: The elements under each category should be expanded, deleted, or revised to accommodate the predecessor and/or reference system being described.

E4. ENCLOSURE 4

SOFTWARE GLOSSARY

E4.1.1. The following section lists the software definitions and assumptions to be used in preparing DD Form 2630, "Software Description Annotated Outline."

CATEGORY:	Level of Difficulty For Designing, Producing, or Using Software.
System Software:	Software designed for a specific computer system or family of computer systems to facilitate the operation and maintenance of the computer system and associated programs. For example: operating system, communications, computer system health and status, security and fault tolerance.(most expensive per line of code within a residence).
Application Software:	Software specially produced for the functional use of a computer system. For example: target tracking, fire control, weapon assignment, navigation, and mission resource management (less expensive per line of code within a residence).
Support Software:	Off-line software. For example: development and diagnostic tools, simulation and/or training, maintenance, site support, delivered test software, report generators least expensive per line of code within a residence).
CODE TYPE:	Degree of software code design newness.
New Code:	Newly developed software.
Modified Code:	Predeveloped code that can be incorporated in the software component with a significant amount of effort but less effort than required for a newly developed code (i.e., 30 - 70 percent of code is modified).
Reused Code:	Predeveloped code that can be incorporated in the software component with little or no change (i.e., approximately 10 percent is modified).

SOURCE LINES OF CODE (SLOC):

Until January 15, 1994, either of the following definitions may be used. After that date, only the first will be accepted. Until January 15, 1994, CARDs must specify which definition is used.

Definition 1: Source lines of code are physical source statements: one physical line equals one statement. The delimiter (or, more precisely, the terminator) for physical source statements is usually a special character or character pair such as [newline] or [carriage return]-[Line feed]. If "dead code" (i.e., code that is delivered with a package but is never referenced or used) is excluded, list the methods by which that is done. List all keywords and symbols that are excluded when they appear on lines of their own, such as [begin], [end], [{], [}], and the like. If separate counts are made for different types of statements, such as format statements, declarations, executable statements, and the like, state the rules used for classifying them. List any other rules used in counting.

Definition 2. "Source line of code" denotes any compilable source instruction, including data declaration, type definitions, and assignments. It excludes comments, null/dummy statements, blank lines, continuation lines, prefaces, file boundary statements, and commercial off-the-shelf software (COTS). Selected high-order languages (HOLs) per DoD Directive 3405.1 (reference (g)) are listed below as well as C and Assembly language:

Language	Standard Number	SLOC Counting Criteria
Ada	ANSI/MIL/-STD-1815A-1983 (FIPS 119) reference (h))	Semicolon (:) terminator
FORTRAN	ANSI X3.9-1978 (FIPS 69-1) (reference (l))	Non-comment, non-continuation, non-blank lines
JOVIAL (J73)	MIL-STD-1589C reference (j))	Non-comment dollar sign ($) terminator
C		Non-comment (;) terminator
ASSEMBLY		Non-comment line

INSTANTIATION:	The process of representing an abstraction by a concrete example. In Ada, the instantiation of a generic procedure creates a new subprogram or package that can be used.
KSLOC:	Thousands of source lines of code.
PROGRAM LIBRARY:	An organized repository of reusable code.
RESIDENCE:	The location where the software will be maintained and used.
Space:	Software on an orbiting vehicle and suborbital probes (most expensive per line of code for any given category).
Air:	Software on an aircraft or missile (less expensive per line of code for any given category).
Ground-Mobile:	Ground-based software physically maintained and used on a ground-mobile platform.
Ground-Fixed:	Ground-based software physically maintained and used at a fixed site.
TERMINAL SEMICOLONS:	A statement terminated by a semicolon, including data declarations, and code used to instantiate a reusable component the first time it is instantiated. When multiple semicolons are used with a declaration statement, the terminating semicolon is used to define the termination of the source line of code. Comments, blank lines, and non-deliverable code are not included in the line count.

C2. CHAPTER 2

CRITERIA AND PROCEDURES FOR THE PREPARATION AND PRESENTATION OF COST ANALYSES TO THE OSD CAIG

This implements DoD Instruction 5000.2, Part 10, paragraph A.3.d (reference (a)). In some cases, for the sake of readability, material in Part 10, section A. and Part 13, section C. of DoD Instruction 5000.2, and Part 15 of DoD 5000.2-M (reference (b)) is repeated below.

C2.1. SCOPE OF ANALYSIS

C2.1.1. When there is a preferred alternative, or set of alternatives, that will be briefed to the DAB, or, for delegated programs, to the DoD Component Acquisition Executive, a POE and a DoD CCA should be prepared for each such alternative. A complete description of the alternative(s), the scope of the estimates to be made, and other related assumptions needed for developing the cost estimates will be documented in a CARD (when appropriate, they may be documented as excursions to the preferred alternative(s) or any of the other alternatives briefed), approved by the Program Executive Officer, and used by both the program office (or the office designated by the sponsoring DoD Component if a program office does not exist) and the DoD CCA team. (See Chapter 1 of this Manual.) For joint programs, the common program as agreed to by all participating DoD Components as well as all unique program requirements of the participating DoD Components will be documented in the CARD. The DoD CCA team shall verify the following as they are specified in the CARD:

C2.1.1.1. All resources required (e.g., equipment, software, manpower, facilities) are identified; the complete specifications of these resources (e.g., types, performance and physical characteristics, entire planned program quantities) are included; the full operational and logistic support concepts for the alternative (e.g., deployment plan, activity rates, crew size, crew ratios, stock levels, training, maintenance) are identified; and the requirements for decommissioning and/or de-militarization and clean-up are fully identified.

C2.1.1.2. The schedules planned for design, manufacturing, and testing parts of the development program are consistent with schedules actually achieved by similar programs, and with planned availability of test assets, e.g., items to be tested, test facilities.

C2.1.1.3. Planned production rates during low-rate initial production and during the ramp-up to full production are consistent with experience in similar production programs.

C2.1.1.4. The data used to calibrate any CERs utilized are consistent with the cases at hand.

C2.1.1.5. Any contract prices used to support any parts of the estimates are for present or historical contracts that are consistent with the program at hand; there is evidence that the contract prices used in the estimates are prices of profitable ventures; and it is reasonable to assume that similar prices will be obtained for subsequent contracts.

C2.1.1.6. The program described is consistent with current threat, operational requirements, and technical requirement documents; and with contractual documents, including requests for proposals (see paragraph 4.1.6. of DoD Directive 5000.4 (reference (k))).

Should the DoD CCA team find any deficiencies that prevent it making the required verification, that fact should be submitted to the Program Executive Officer for consideration; an unresolved difference shall be documented and its impact separately estimated. The results of the DoD CCA review of the program assumptions will be documented and provided to the CAIG.

C2.1.2. Unless waived by the CAIG Chair, a POE and a DoD CCA shall be prepared for each alternative (in addition to those to be briefed to the DAB) that the sponsoring DoD Component considered for the decision at hand, following the guidance given in paragraph C2.1.1., above. These estimates may be prepared and documented as excursions to any one of the other alternatives, when appropriate.

C2.1.3. The cost estimates should include all sunk costs and a projection for all categories of the life-cycle costs for the total planned program required to respond to the need as defined in the Mission Needs Statement (MNS), and delineated in the Operational Requirements Document (ORD), System Threat Assessment Report (STAR), Acquisition Program Baseline (APB), and Test and Evaluation Master Plan (TEMP) (DoD 5000.2-M (reference (b))), to include the following:

C2.1.3.1. Research and Development (R&D). The cost of all R&D phases (i.e., Concept Exploration and Definition, Demonstration and Validation, and Engineering and Manufacturing Development) should be estimated beginning with program initiation

through development. Nonrecurring and recurring R&D costs for prototypes, engineering development equipment and/or test hardware (and major components thereof) should be shown separately. Contractor system test and evaluation and Government support to the test program should be fully identified and estimated. Support, such as support equipment, training, data, and military construction should be estimated. The cost of all related R&D (such as redesign and test efforts necessary to install equipment or software into existing platforms) should be included. Appropriate use of Contractor Cost Data Reporting (CCDR) will be made in reflecting actual costs and projecting future costs (see Part 20 of reference (b)).

C2.1.3.2. Investment. The cost of investment (i.e., Low-Rate Production, and Production and Deployment phases) should include the total cost of procuring the prime equipment and its support; e.g., command and launch equipment; support equipment; training; data; initial spares; war reserve spares; preplanned product improvement (P^3I) program; and military construction. The cost of all related procurement (such as, modifications to existing aircraft or ship platforms) should be included. Nonrecurring and recurring costs for the production of prime equipment and major support equipment should be shown separately. Appropriate use of CCDR will be made in reflecting actual costs and projecting future costs (see Part 20 of reference (b)).

C2.1.3.3. Operating and Support (O&S). The cost of O&S (i.e., Operations and Support phase) should include all direct and indirect elements of a defense program. Personnel costs should be based on estimates for officers, enlisted personnel, civilians, and contractors, expressed in terms of the Manpower Estimate Report functional categories (see Part 6 of DoD 5000.2-M (reference (b)) and paragraph C2.3.15., below). The O&S estimate should include unit level consumption (consumables, including expendable training stores, and fuel), depot maintenance, sustaining investment, system and inventory management control, and indirect O&S costs. The length of time and costs associated with defense program phase-in, and the length of time and costs associated with steady state operations should be identified. Appropriate use of Visibility and Management of Operating and Support Costs (VAMOSC). Program data (Chapter 4 of this Manual) will be made in deriving these estimates. These O&S cost elements are defined in Chapter 3 of this Manual, and the Operating and Support Cost-Estimating Guide (reference (f)).

C2.1.4. Cost estimates are to capture all costs of the program, regardless of fund source or management control; they are not to be arbitrarily limited to certain budget accounts or to categories controlled by certain lines of authority.

C2.1.5. Use of existing assets or assets being procured for another purpose must not be treated as free goods. The "opportunity cost" of these assets should be estimated, where appropriate, and considered as part of the program cost. (For a discussion of "opportunity costs," see page 25 of "Cost Considerations in Systems Analysis.")[1]

C2.1.6. Costs of demilitarization, detoxification, or long-term waste storage should be included in the cost estimates when the program will require these functions.

C2.1.7. Program office cost estimates presented to the CAIG should be consistent with estimates used in the Cost and Operational Effectiveness Analyses (COEA). They should also be consistent with estimates used in the Affordability Assessments (IPS, Appendix F of reference (b)). Similarly, personnel estimates supporting O&S cost estimates provided to the CAIG should be consistent with the Manpower Estimate Report (Part 6 of reference (b)). The program office should document and explain any inconsistencies between the cost estimates and the Affordability Assessments, or between the cost estimates and the Manpower Estimate Report.

C2.2. ANALYTICAL METHODS

C2.2.1. Estimating Approaches. The techniques used to develop the cost estimates shall take into account the stage of the acquisition cycle that the program is in when the estimate is made (such as, demonstration and validation, engineering and manufacturing development, or production). Until actual cost data are available, the use of parametric (statistical) costing techniques is the preferred approach for the development of the cost estimates. It is expected that heavy reliance will be placed on parametric, as well as analog and engineering methods, for Milestone I and II reviews, while projections of cost actuals will be predominantly used for preparing estimates for Milestone III and subsequent reviews. A comparison of several cost estimating methods is encouraged.emsp; (See Chapter 6 of "Cost Considerations in Systems Analysis,"[2] and Chapter 1 of "Military Equipment Cost Analysis,"[3] for a discussion of cost estimating methods).

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1 Fisher, Gene H., "Cost Considerations in Systems Analysis," The RAND Corporation, R-490-ASD, December 1970. Also available from American Elsevier Publishing Company, Inc., New York (Library of Congress Card 76-133272), and Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314 (DTIC Accession Number AD 728 481).

2 Fisher, Gene H., op. cit.

3 The RAND Corporation, "Military Equipment Cost Analysis" June 1971. Copies can be obtained fro the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314 (DTIC Accession Number AD 901 477L)

C2.2.2. Statistical Estimates. When cost estimating relationships (CERS) already available or newly developed are used to make the cost estimates, the specific form of the CER, its statistical characteristics, the database used to develop the CER, and the assumptions used in applying the CER are to be provided in the cost estimate documentation. Limitations of the CER shall be discussed. Adjustments for major changes in technology, new production techniques, different procurement strategy, production rate, or business base should be highlighted and explained.

C2.2.3. Engineering and Analogy Estimates. For estimates made by engineering or analogy costing techniques, the rationale and procedures used to prepare such an estimate must be documented. This should include the cost experience used, and the method by which the information was evaluated and adjusted to make the current cost estimate. If an analog estimate is made using complexity factors, the basis for the complexity analysis (including backgrounds of the individuals making the ratings), the factors used (including the ranges of values), and a summary of the technical characteristics and cost driving elements shall be provided.

C2.2.4. Actual Costs. Actual cost experience on prototype units, early engineering development hardware, and early production hardware for the program under consideration should be used to the maximum extent possible from CCDR (see Part 20 of DoD 5000.2-M and the CCDR system pamphlet (references (b) and (l)) and other data sources). If development or production units have been produced, the actual cost information will be provided as part of documentation. Estimates for Milestone III reviews must be based at least in part on actual production cost data for the systems under review.

C2.2.5. Pass-Throughs. The DoD CCA must treat all costs of the program independently from the program office. However, the DoD CCA may adopt the POE value of the costs of commercial off-the-shelf (COTS) items, or non-developmental items (NDI) that do not require DoD CCA must, in these instances, identify the specific elements of cost in question, and verify in a manner described in the documentation of the estimate, that they arise from COTS or NDI. Pass-throughs, furthermore, should be checked for accuracy (e.g., for currency of cost data and correctness of calculations). Requests to pass through other elements of the POE must be made in writing to the CAIG Chair 60 days in advance of the CAIG briefing.

C2.2.6. Sufficiency Review. The sufficiency review method may be used, with the approval of the CAIG Chair, for assessing the adequacy of cost elements in the program cost estimate, which are determined to be low-risk and low-cost based on an independent analysis of the program assumptions. The review shall include an

evaluation of the techniques and data used to develop the POE and, if available, the use of data from alternative sources to verify the POE. The results of the review will be documented and provided to the CAIG. Requests to use the sufficiency review method must be made in writing, preferably at the CAIG kick-off meeting, but in any case not later than 60 days before the CAIG briefing.

C2.2.7. Uncertainty Attributed to Estimating Errors (Cost Estimating Uncertainty). Areas of cost estimating uncertainty will be identified and quantified. Uncertainty will be quantified by the use of probability distributions or ranges of cost. The presentation of this analysis should address cost uncertainty attributable to estimating errors; e.g., uncertainty inherent with estimating costs based on assumed values of independent variables outside database ranges, and uncertainty attributed to other factors, such as performance and weight characteristics, new technology, manufacturing initiatives, inventory objectives, schedules, and financial condition of the contractor. The probability distributions, and assumptions used in preparing all range estimates, shall be documented and provided to the CAIG.

C2.2.8. Contingencies. If contingency allowance is included, an explanation of why it was required, and a presentation of how the amount of the contingency was estimated, shall be provided. This shall include an assessment of the likelihood that the circumstances requiring the contingency will occur.

C2.2.9. Sensitivity Analysis. The sensitivity of projected costs to critical program assumptions shall be examined. Aspects of the program to be subjected to sensitivity analysis shall be identified in the DoD CCA of program assumptions. The analysis shall include factors such as Teaming curve assumptions; technical risk, i.e., the risk of more development and/or production effort, changes in performance characteristics, schedule alterations, and variations in testing requirements; and acquisition strategy (multi-year procurement, dual sourcing, etc.). Use of statistical analysis to describe sensitivity to critical assumptions is encouraged. The results of the analysis will be documented and provided to the CAIG.

C2.2.10. Multinational Acquisitions. Program estimates involving multinational acquisitions will include the impact on costs to the U.S. Government of co-production, license fees, royalties, transportation costs, and expected foreign exchange rates, as appropriate.

C2.3. PRESENTATION OF COST RESULTS TO THE OSD CAIG

C2.3.1. Overview. A brief overview of the program, including a description (e.g., performance, physical characteristics) of the hardware involved, wartime operational employment, logistics support concepts, program status, and acquisition strategy (such as, contracting approach, development and production schedules) shall be presented.

C2.3.2. Alternative Descriptions. A brief description of each alternative to be presented at the DAB, or, if a delegated program, to the DoD Component Acquisition Executive shall be discussed with the preferred alternative, or set of alternatives, highlighted.

C2.3.3. PM Presentation. The Program Manager's designated representative shall present the CAIG with the POE for each alternative under consideration and explain how each was derived. This presentation shall cover the estimates and estimating procedures at the major subcomponent level (e.g., airframe, engine, major avionics subsystem, etc). The presentation should focus on the items that are cost drivers and/or elements of high cost risk. For joint programs, the program manager's representative shall brief the entire acquisition program, and each DoD Component shall present its own O&S estimates.

C2.3.4. Presentation of the DoD Component Cost Analysis. Similarly, the organization preparing the DoD CCA for each alternative under consideration shall present the estimates to the CAIG, with an explanation of how each was derived.

C2.3.5. Present Value of Alternatives. Where the costs of various alternatives have significantly different time profiles, the net present value of each cost stream should be presented.

C2.3.6. Preferred Alternative. For the preferred alternative, or set of alternatives, a comparison by cost category in accordance with paragraph C2.3.8., below, will be made of the DoD CCA, the POE, and the DoD Component cost position (the official DoD Component life-cycle cost estimate for the program), and significant differences explained. The results of analyses to determine the sensitivity of costs to variations in program or cost assumptions and program parameters should be presented.

C2.3.7. Time-Phased Program Estimates. The POE and the DoD CCA shall be shown time phased by fiscal year for all years of the program acquisition (from initiation to completion of the entire program; i.e., unconstrained by the FYDP years) unless otherwise specified by the CAIG. (The time period should respond completely to the threat or need(s) given in the MNS as delineated in the ORD, STAR, APB, and TEMP). R&D quantities of prototypes, engineering test hardware, and flight test

vehicles will be identified separately; procurement quantities will be identified by fiscal year. R&D, investment, and O&S cost estimates shall be shown in constant and current dollars. The POE and the DoD CCA shall be in the same constant year dollars.

C2.3.8. Estimate Detail. The cost category breakout at the summary levels shall be consistent with the examples on Tables C2.T2., C2.T3., and C2.T4. of this Manual. Further breakout shall be in accordance with the approved CCDR Data Plan (Part 20 of DoD 5000.2-M (reference (b))), and the Operating and Support Cost-Estimating Guide (reference (f)).

C2.3.9. Relation to FYDP. Comparison of the time-phased life-cycle cost estimate for each alternative, shall be in current dollars, with the latest Future Year Defense Program (FYDP) shall be shown and differences explained. In addition, comparisons with current planning positions (e.g., Program Objective Memoranda, Program Decision Memoranda, Budget Estimate Submissions, or Program Budget Decisions) shall be presented.

C2.3.10. CER Presentation. When CERs are presented to the CAIG as part of the presentation, the use of graphs to present both the basic data and resulting CER is encouraged.

C2.3.11. CCDR Status. The status of the CCDR Data Plan, or, if implemented, the status of CCDR reporting and the processing of the cost data on the defense program being reviewed shall be presented to the CAIG (see Part 20 of DoD 5000.2-M and the CCDR system pamphlet (references (b) and (l))). If the actual costs of the prototype and development hardware are used as the basis for projections, the supporting cost-quantity curves shall be presented.

C2.3.12. Cost Track. A cost track in constant "base year" dollars will be shown between the DoD Component cost position and the cost estimates approved at previous DAB reviews, with an explanation of major changes.

C2.3.13. Unit Cost Comparisons. In all presentations to the CAIG, unit costs in constant dollars at a given unit number (typically 100^{th} unit for aircraft, 1000^{th} unit for tactical missiles) for similar equipment and/or subsystems shall be compared with the POE and DoD CCA unit cost estimates, and differences explained. Comparisons shall also be made at the summary level of flyaway, rollaway or sailaway, procurement unit, and program acquisition unit as defined in Chapter 3 of this Manual. The unit number for which the comparisons are made will be identified on all presentations.

C2.3.14. Design-to-Cost. The POE, the DoD CCA, and the DoD Component cost position alternative, or set of alternatives, will be compared to approved Design-to-Cost objectives established for the program.

C2.3.15. Personnel Requirements. The total number of personnel (officers, enlisted, civilian, and contractor) expressed in terms of the Manpower Estimate Report functional categories (see Part 6 of DoD 5000.2-M (reference (b))), that are required to operate, maintain, support, and for the major defense program shall be presented. Support includes personnel involved in security and base operations; training includes personnel involved in operations, maintenance, and support of training devices and simulators. Additionally, estimates should address the specific numbers of personnel required for organizational, intermediate, and depot maintenance.

C2.3.16. O&S Comparisons. O&S costs for each alternative shall be compared with one or more existing reference systems -- preferably including the one to be replaced by the new defense program. The following will be addressed in this comparison:

C2.3.16.1. Major elements of O&S costs, such as Petroleum, Oil, and Lubrication (POL) costs per flying hour, fuel consumption in terms of gallons per flying hour, consumable material, reparable cost per operating hour, and depot costs per operating hour;

C2.3.16.2. Personnel components of O&S costs to include crew size, crew ratio, maintenance manhours per operating hour, and manpower requirements in terms of major skill categories;

C2.3.16.3. Annual O&S costs in terms of typical force structure unit -- battalion, squadron operating the system. Assumed quantity of equipment and manpower requirement levels should be addressed; and

C2.3.16.4. Potential significant force structure, employment, or maintenance changes that are not part of the approved program, regardless of the DoD Component's position on funding such changes.

C2.4. PROCEDURES FOR A CAIG PRESENTATION

C2.4.1. CAIG Kick-off Meeting. A CAIG kick-off meeting will be held (see CAIG timetable, Table C2.T1.) no later than 166 days in advance of a planned DAB Committee review (180 days before the DAB review), before the initiation of the

development of the estimates, to discuss the requirements of the review, alternatives to be examined, and the assumptions on which the estimates will be prepared. Points of contact will be established within the program office (or the office designated by the sponsoring DoD Component if a program office does not exist), the DoD CCA office and, for a joint program, the participating DoD Component for the review. At this meeting, if it is proposed to use contractors to prepare or assist in preparing the DoD CCA, the funding sources, and the contractors will be reviewed. The CAIG Chair will decide whether to approve their use (see paragraph 4.2.11. of DoD Directive 5000.4 (reference (k))).

C2.4.2. Cost Analysis Requirements Description. The program office (or DoD Component designated office) responsible for the program shall write a detailed statement of the scope of the estimates to be made for each of the alternatives to be presented. (See section C2.1., above.) This Cost Analysis Requirements Description (CARD) statement shall be used by both the program office (or DoD Component designated office) and the DoD CCA teams in preparing their estimates. A copy of the preliminary CARD, approved by the Program Executive Officer, shall be submitted to the CAIG at the CAIG kick-off meeting. A final copy should be provided to the CAIG no later than 45 days before the scheduled DAB Committee review. (CARD guidance is provided in Chapter 1 of this Manual.)

C2.4.3. Draft Documentation. Draft documentation of the program office (or DoD Component designated office) and DoD CCA life-cycle cost estimates required by Part 13, section C., DoD Instruction 5000.2 (reference (a)) is to be provided to the CAIG no later than 45 calendar days prior to a DAB Committee review or, for delegated programs, no later than 45 calendar days prior to a DoD Component Milestone II or III review. "To Be Determined (TBD)" entries are unacceptable. The documentation should be sufficiently complete and sufficiently well organized that a cost professional could reconstruct the estimate, given the documentation. The documentation should explain why the choices of methods and data sets for the estimate were good ones. The documentation should discuss all significant choices made in developing the estimate in the context of the present state of practice of cost analysis. The balance of advantages and disadvantages supporting the use of each method selected, in light of the alternatives, should be concisely described. Choices among alternative sets of data should be dealt with similarly. At the documentation review meeting held no later than 30 calendar days before a DAB Committee review, the CAIG action officer will review and discuss deficiencies in the documentation. Documentation must contain the:

C2.4.3.1. Latest DoD CCA and POE cost estimates, and, if available, the DoD Component cost position (see paragraph C2.3.6., above).

C2.4.3.2. Proposed funding for each alternative.

C2.4.3.3. Analyses to support the estimates, including the specific assumptions, calculations, and supporting analyses in sufficient detail to allow the CAIG staff to replicate the cost estimates.

C2.4.3.4. Escalation indices (also known as inflation rates) -- include both the weighted and raw inflation rates, and annual outlay rates, for all appropriations, and for all base years used in the estimate.

C2.4.3.5. Reconciliation of each of the major cost element variances between the DoD CCA estimate and the POE estimate, including an explanation of all changes to the DoD CCA during and subsequent to reconciliation with the POE.

C2.4.3.6. Results of the DoD CCA analyses of the program assumptions, and any resulting risk or sensitivity analyses.

C2.4.3.7. Copies of the planned CAIG agenda and briefing charts, back-up charts, and the briefing text (if one is used).

C2.4.4. Final DoD Component Documentation. The final documentation that updates the draft life-cycle POE and the DoD CCA, and the DoD Component cost position shall be provided to the DAB Executive Secretary for admission to the CAIG no later than 10 calendar days before a scheduled DAB Committee review.

C2.4.5. Staff Working Relationship. Staffs of DoD Components preparing the cost analyses should maintain a close liaison with the CAIG staff during the review process to ensure full understanding of the DoD Component estimates, and to ensure CAIG staff feedback to the DoD Components during CAIG presentation preparation.

C2.4.6. CAIG Meeting. The DoD Component shall present the POE and the DoD CCA estimates to the CAIG at least 21 calendar days prior to the DAB Committee review, or, for delegated programs, DoD Component acquisition Milestone II and III reviews, as required by DoD Instruction 5000.2 (reference (a)). The DoD Component cost position also should be presented at the CAIG meeting. It must, in any case, be provided, together with an explanation, of how it was developed, no later than 10 calendar days before a DAB Committee review.

C2.4.7. CAIG Member Suggestions. CAIG members who wish to suggest improvements to the methods used in preparing particular cost estimates presented to the CAIG should submit a critique to the CAIG Chair for distribution to the CAIG

members, within 2 weeks following the CAIG meeting at which the estimates were presented.

C2.4.8. CAIG Report. The CAIG's final report will be delivered to the DAB Committee Chair 3 days before its review and made available to the appropriate DoD Component immediately thereafter. The CAIG staff will be available to discuss its analysis and conclusions at that time.

C2.4.9. After-Action Meetings. Regular "after-action" meetings will follow each CAIG review to consider lessons teamed. Roughly quarterly, an administrative CAIG meeting win be devoted to sharing a collected summary of the lessons teamed. This will provide an institutionalized mechanism to analyze strengths and deficiencies of DoD estimating methods across programs and components to improve the cost estimating process. These administrative meetings will provide a forum for addressing concerns of the DoD cost-estimating community, and will give opportunities to recommend policy revisions to the Under Secretary of Defense (Acquisition).

Table C2.T1. Cost Analysis Improvement Group (CAIG) Timetable

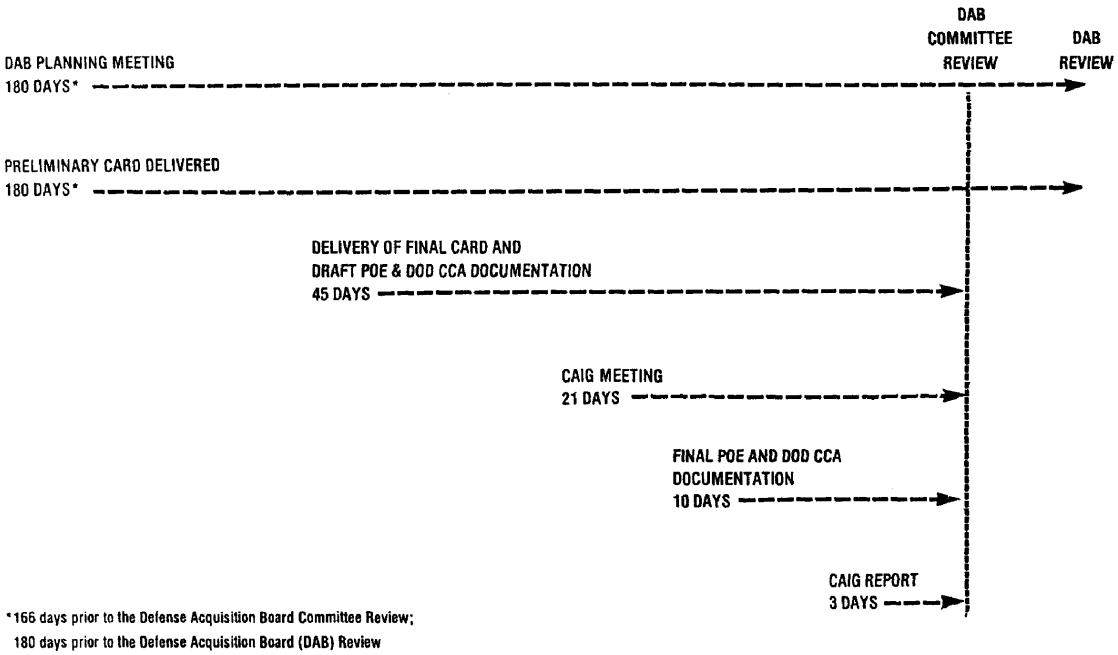


Table C2.T2. Defense Acquisition Program Life-Cycle Cost Categories
Research and Development

CONCEPT EXPLORATION/DEFINITION PHASE*

DEMONSTRATION/VALIDATION PHASE**

ENGINEERING AND MANUFACTURING DEVELOPMENT PHASE***
- Prime Mission Equipment
  - Structure, Integration, Assembly, Test and Checkout
  - Propulsion
  - Installed Equipment (hardware/software) (Specify)
  - System and Application Software (where applicable)
- System Test and Evaluation
- System Engineering/Program Management
  - Flyaway Cost
- Support Equipment (Peculiar and Common)
- Training
- Data
- Initial Spares and Repair Parts
- Operational/Site Activation
- Industrial Facilities
- In-house (Specify)
- Contingency/Risk Factor
- Other

TOTAL-RESEARCH, DEVELOPMENT, TEST, AND EVALUATION
- MILITARY CONSTRUCTION
- OPERATION AND MAINTENANCE
- MILITARY PERSONNEL

TOTAL RESEARCH AND DEVELOPMENT
NUMBER OF UNITS:

Program Data: Provide quantities: e.g., prototypes, engineering development hardware, flight test vehicles. Provide estimates for recurring costs separately from non-recurring costs for each R&D cost category. Functional costs (engineering, initial

set of tools, manufacturing, quality control, etc., see reference (l)) for each R&D cost category are to be provided, where appropriate, to support the analysis.

* Provide concept exploration and definition phase costs by program element (PE) and fiscal year for those concept exploration and definition phase program elements that can be specifically and uniquely identified as being development effort for the program approved at MS I.

** Provide same breakout as the Engineering and Manufacturing Development Phase, as appropriate.

*** Excluding Low Rate Initial Production (LRIP).

Table C2.T3. Investment

PRODUCTION AND DEPLOYMENT PHASE*

Prime Mission Equipment
- Structure, Integration, Assembly
  - Test and Checkout
- Propulsion
- Installed Equipment (hardware/Software)(Specify)
- System & Application Software (where applicable)

System Engineering/Program Management
- Flyaway Cost

Command and Launch Equipment (Specify)
Platform Modification (Specify)
Support-Equipment (Peculiar and Common)
Training
Data
Operational/Site Activation
Industrial Facilities
Initial Spares and Repair Parts
Other procurement

TOTAL PROCUREMENT
MILITARY CONSTRUCTION
OPERATION AND MAINTENANCE
MILITARY PERSONNEL

TOTAL INVESTMENT

Program Data: Provide quantities by fiscal year. Provide nonrecurring costs separately from recurring costs by fiscal year for each cost category. Provide total appropriation costs. Provide advanced procurement requirements by year only at the appropriation level of aggregation. Functional cost elements (e.g., sustaining engineering, sustaining tooling, recurring quality control, recurring manufacturing, recurring purchased equipment, nonrecurring rate tools, see reference (l)) for each investment cost category are to be provided, where appropriate, to support the analyses.

* Including Low Rate Initial Production (LRIP) from Engineering and Manufacturing Phase.

Table C2.T4. Operating and Support

Mission Personnel Pay and Allowances
- Operations
- Maintenance
- Other Mission Personnel

Unit Level Consumption
- Petroleum, Oil and Lubricants (POL)/Energy Consumption
- Consumable Material/Repair Parts
- Depot Level Reparables
- Training Munitions/Expendable Stores
- Other

Intermediate Maintenance (External to Unit)
- Maintenance
- Consumable Material/Repair Parts
- Other

Depot Maintenance
- Overhaul/Rework
- Other

Contractor Support
- Interim Contractor Support (ICS)
- Contractor Logistics Support
- Other

Sustaining Support
- Support Equipment Replacement
- Modification Kit Procurement/Installation
- Other Recurring Investment
- Sustaining Engineering Support
- Software Maintenance/Support
- Simulator Operations
- Other

Indirect Support
- Personnel Support
- Installation Support

TOTAL OPERATING AND SUPPORT

C3. CHAPTER 3

COST TERMS, DEFINITIONS, AND RELATIONSHIP TO LIFE-CYCLE COSTS, WORK BREAKDOWN STRUCTURES, AND APPROPRIATIONS

C3.1. OBJECTIVES

Seven cost terms are standardized by this Manual as follows: development cost; flyaway cost; weapon system cost; procurement cost; program acquisition cost; operating support (O&S); and life-cycle cost. This standardization:

C3.1.1. Provides a uniform and consistent frame of reference for identifying what is included or excluded from each cost term, and how each cost term relates to work breakdown structure elements, budget appropriations, as well as to life-cycle cost categories. It provides the means to ensure decision process.

C3.1.2. Establishes a basic definitional structure for understanding DoD acquisition program cost, when used in budget submissions prescribed in DoD 7110.1-M (reference (m)); Integrated Program Summary (IPS), and Selected Acquisition Reports (SARs) in accordance with DoD Instruction 5000.2 and DoD 5000.2-M (references (a) and (b)); Fiscal Guidance, Program Objective Memorandum, and Program Decision Memorandum in accordance with DoD Directive 7045.7 (reference (n)); and Congressional Data Sheets in compliance with Section 2431 of 10 U.S.C. (reference (o)). Funding determinations will be based on DoD 7110.1-M (reference (m)).

C3.2. REFERENCES

C3.2.1. Cost terms can be defined by budget appropriations, and by life-cycle cost categories. They may be further defined by the applicable acquisition elements of equipment (hardware and software); services; data; and facilities (see Work Breakdown Structure (WBS) elements as defined by Military Standard 881A (reference (p)) used on contracts) and by the applicable operating and support (O&S) elements of personnel, training, spares, supplies, maintenance, and fuel. Other reference sources, in addition to this Manual, include:

C3.2.1.1. DoD 7110.1-M (reference (m)) for appropriation-related definitions and funding distinctions; e.g., RDT&E, Procurement, O&M appropriations, etc.

C3.2.1.2. Military Standard 881A (reference (p)) for WBS definitions.

C3.2.1.3. Contractor Cost Data Reporting (CCDR) System Pamphlet (reference (l)) for functional cost element definitions (engineering, tooling, quality control, manufacturing, purchased equipment, overhead, general and administrative) as they apply to each WBS element.

C3.2.1.4. Visibility and Management of Operating and Support Costs Program (Chapter 4 of this Manual), and the Cost Analysis Improvement Group (CAIG), Operating & Support Cost-Estimating Guide (reference (f)) for defense program O&S elements.

C3.2.2. To assist in defining the seven cost terms, three figures are included in this enclosure.

C3.2.2.1. Figure C3.F1. provides a summary display of the seven cost terms. Shown are the relationships of life-cycle cost categories, major appropriations, and work breakdown structure (WBS) elements to each cost tern. The shaded areas identify those parts that are excluded from the definition. Since the basic terms include only certain funded costs, other related costs, as noted on Figure C3.F1. must be included to derive a complete life-cycle total.

C3.2.2.2. Figure C3.F2. further defines the cost terms by identifying in more detail, the life-cycle cost category and WBS element descriptions that are needed to complete each definition. This enclosure should be read from the center out by selecting the cost term to be defined. Once the term is located, the area enclosed by the box connected to the term identifies the three basic components which define each definition in terms of:

C3.2.2.2.1. Life-cycle cost category (on the left side);

C3.2.2.2.2. WBS elements (on the top when they apply); and

C3.2.2.2.3. Major appropriations (on the right side).

C3.2.2.3. Figure C3.F3. lists the typical equipments, subsystems, and software WBSs for the major DoD defense materiel items. The equipments, subsystems, and software that are not shown would be treated in a similar manner.

C3.3. COST TERM DEFINITIONS

The seven cost terms standardized by this Manual are described as follows:

C3.3.1. Development Cost

C3.3.1.1. Work Breakdown Structure (WBS). WBS elements of Prime Mission Equipment, System Engineering/Program Management, System Test and Evaluation (except Operational Test and Evaluation funded from Military Personnel or Operation and Maintenance appropriations), Training, Peculiar Support Equipment, Data, Operational/Site Activation, and Industrial Facilities (when provisions of Chapter 251 of DoD 7110.1-M (reference (m)) apply.

C3.3.1.2. Budget. Funded from the RDT&E appropriation (i.e., concept exploration and definition, demonstration and validation, and engineering and manufacturing development phases from the point the program and/or system is designated by title as a Program Element or major project in a Project Element).

C3.3.1.3. Life-Cycle Costs. The development costs, both contractor and in-house, of the Research and Development cost category, including the cost of specialized equipment, instrumentation, test, and facilities required to support the RDT&-E contractor and/or Government installations.

C3.3.2. Flyaway (Rollaway, Sailaway, etc.) Cost. Flyaway cost is used as a generic term to refer to the cost of producing a usable end item of equipment (hardware and software). Flyaway cost includes:

C3.3.2.1. Work Breakdown Structure (WBS). WBS elements of Prime Mission Equipment (such as basic structure, propulsion, electronics (hardware and software), system software, etc.), System Engineering/Program Management, and System Test and Evaluation.

C3.3.2.2. Budget. Funded from RDT&E and Procurement appropriations. This would include funding for warranties, engineering changes, preplanned product improvement (during system acquisition), and first destination transportation (unless FDT is a separate budget line item). Certain acquisition costs funded in the O&M appropriation (e.g., ship installations) are also included.

C3.3.2.3. Life-Cycle Cost. The flyaway costs (including Government-Furnished Equipment), both contractor and in-house, of the Research and Development and Investment Nonrecurring and Recurring cost categories.

C3.3.3. Weapon System Cost. Weapon System Cost includes:

C3.3.3.1. Work Breakdown Structure (WBS). WBS elements Prime Mission Equipment, System Engineering/Program Management, System Test and Evaluation (if funded by Procurement), plus WBS elements Training, Peculiar Support Equipment, Data, Operational/Site Activation, and Industrial Facilities (unless funded as a separate budget line item or by RDT&E).

C3.3.3.2. Budget. Funded from the Procurement appropriation. It includes funding for warranties, engineering changes, preplanned product improvement (during system acquisition), and first destination transportation (unless FDT is a separate budget line item). Certain acquisition costs funded in the O&M appropriation (e.g., ship installations) are also included.

C3.3.3.3. Life-Cycle Cost. The weapon system costs (including Government-Furnished Equipment), both contractor and in-house, of the Investment Nonrecurring and Recurring cost categories.

C3.3.4. Procurement Cost. Procurement cost includes:

C3.3.4.1. Work Breakdown Structure (WBS). The same WBS elements as in Weapon System Cost; i.e., Prime Mission Equipment, System Engineering/Program Management, System Test and Evaluation (if any of this effort is funded by Procurement), Training, Peculiar Support Equipment, Data, Operational/Site Activation, and Industrial Facilities (unless funded as a separate budget line item or by RDT&E), plus the WBS element: Initial spares and Repair Parts.

C3.3.4.2. Budget. Funded from the Procurement appropriation. It includes funding for warranties, engineering changes, preplanned product improvement (during system acquisition), and first destination transportation (unless FDT is a separate budget line item). For Navy shipbuilding programs, outfitting and post delivery costs are also included when Procurement funded. Certain acquisition costs funded in the O&M appropriation (e.g., ship installations) are also included.

C3.3.4.3. Life-Cycle Cost. The procurement costs (including Government Furnished Equipment), both contractor and in-house, of the Investment Nonrecurring and Recurring cost categories.

C3.3.5. Program Acquisition Cost. Program Acquisition Cost consists of Development Costs, Procurement Costs, and any construction costs that are in direct support of the defense acquisition program. It includes:

C3.3.5.1. Work Breakdown Structure (WBS). WBS elements of Prime Mission Equipment, System/Program Management, System Test and Evaluation (except Operational Test and Evaluation funded from Military Personnel or Operation and Maintenance), Training, Peculiar Support Equipment, Data, Operational/Site Activation, Industrial Facilities (unless funded by Procurement as a separate budget line item), and Initial Spares and Initial Repair Parts.

C3.3.5.2. Budget. Funded from the RDT&E, Procurement, and MILCON appropriations. It includes funding for warranties, engineering changes, preplanned product improvement (during system acquisition), and first destination transportation (unless FDT is a separate budget line item). Certain acquisition costs funded in the O&M appropriation (e.g., ship installations) are also included.

C3.3.5.3. Life-Cycle Cost. The program acquisition costs (including Government Furnished Equipment), both contractor and in-house, of the Research and Development, and Investment nonrecurring and recurring cost categories.

C3.3.6. Operating and Support (O&S). O&S costs include:

C3.3.6.1. All personnel, equipment, supplies, software, services, including contract support, associated with operating, modifying, maintaining, supplying, training, and supporting a defense acquisition program in the DoD inventory. This includes costs directly and indirectly attributable to the specific defense program; i.e., costs that would not occur if the program did not exist, such as:

C3.3.6.1.1. Mission Personnel. Pay and allowances for officer, enlisted, and civilian personnel assigned to support a discrete operational system or deployable unit. Includes personnel necessary to meet combat readiness, training, and administrative requirements.

C3.3.6.1.2. Unit Level Consumption. Fuel and energy resources; operations, maintenance, and support materials consumed below depot level; reimbursement of stock fund for depot level reparables; operational munitions expended in training; transportation of materials, repair parts and reparables between the supply or repair point and unit; and other unit level consumption costs such as purchased services for equipment lease and service contracts.

C3.3.6.1.3. Intermediate Maintenance. Labor, material, and other costs expended by designated activities and/or units (third and fourth echelons) performed external to the unit. Includes calibration, repair and replacement of parts, components or assemblies and technical assistance to the mission unit.

C3.3.6.1.4. Depot Maintenance. Personnel, material, overhead support, and depot-purchased maintenance required to perform major overhaul, and maintenance of a defense system, its components, and support equipment at DoD centralized repair depots, contractor repair facilities, or on site by depot teams.

C3.3.6.1.5. Contractor Support. Labor, materials, and depreciable assets used in providing all or part of the logistics support to a defense system, subsystem, or related support equipment.

C3.3.6.1.6. Sustaining Support. Procurement (exclusive of war readiness materiel) of replacement support equipment, modification kits, sustaining engineering, software maintenance support, and simulator operations provided for a defense system.

C3.3.6.1.7. Indirect Support. Personnel support for specialty training, permanent changes of station, and medical care. Also includes relevant host installation services, such as base operating support and real property maintenance.

C3.3.6.2. O&S costs are funded from Operation and Maintenance (O&M), Military Personnel, Procurement, Military Construction, stock funds, and other appropriations.

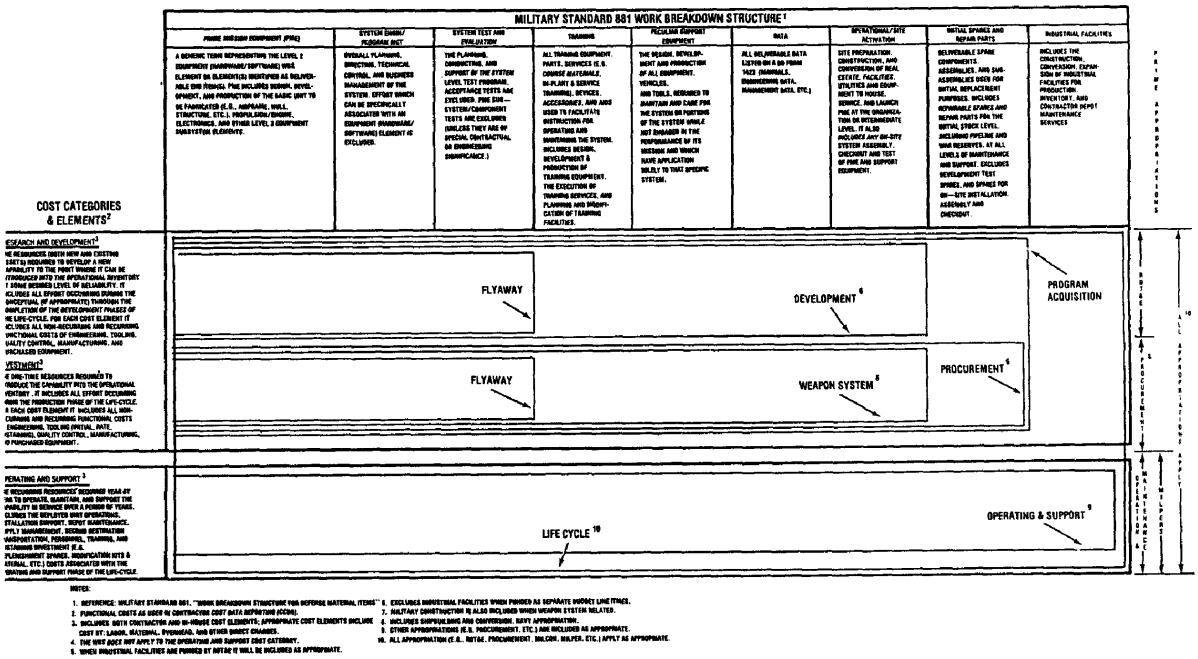
C3.3.7. Life-Cycle Cost. Life-Cycle Cost includes ALL WBS elements; ALL affected appropriations; and encompasses the costs, both contractor and in house effort, as well as existing assets to be used, for all cost categories. It is the TOTAL cost to the Government for a program over its full life, and includes the cost of research and development, investment in mission and support equipment (hardware and software), initial inventories, training, data, facilities, etc., and the operating, support, and, where applicable, demilitarization, detoxification, or long term waste storage.

Figure C3.F1. Discrete Cost Definitions
(Shaded areas are excluded from definitions)

TERM	COST CATEGORIES					APPROPRIATIONS					WORK BREAKDOWN STRUCTURE			
	RESEARCH & DEVELOPMENT		INVESTMENT		OPERATING & SUPPORT	RDT&E	PROC. 3/	MILCON	O&M	OTHER 4/	PRIME MISSION EQUIPMENT SYSTEM ENG/ PROGRAM MGT SYSTEM TEST & EVALUATION	TRAINING PECULIAR SUPPORT EQUIPMENT DATA OPER./SITE ACTIVATION	INITIAL SPARES AND REPAIR PARTS	INDUSTRIAL FACILITIES
	NON-RECURRING	RECURRING	NON-RECURRING	RECURRING										
DEVELOPMENT COST	$	$				$					$	$		5/
1/ FLYAWAY COST	$	$	$	$		$	$				$			
WEAPON SYSTEM COST			$	$			$				$	$ 6/		7/
PROCUREMENT COST			$	$			$				$	$	$	7/
2/ PROGRAM ACQUISITION COST	$	$	$	$		$	$	$			$	$	$	
OPERATING & SUPPORT COST					$		$	$	$	$	8/	8/	8/	8/
NOTE: THE SUM OF PROGRAM ACQUISITION, OPERATING AND SUPPORT, AND OTHER COSTS (E.G., MILITARY AND CIVILIAN MANAGEMENT PAY) EQUALS LIFE CYCLE COST														
LIFE CYCLE COST	$	$	$	$	$	$	$	$	$	$	$	$	$	$

NOTES
1 GENERIC TERM DEPENDING UPON COMMODITY. CAN ALSO BE CALLED "ROLLAWAY" OR "SAILAWAY"
2 ALSO KNOWN AS "ACQUISITION COST" OR "PROGRAM COST"
3 INCLUDES SHIPBUILDING AND CONVERSION, NAVY APPROPRIATION
4 OTHER APPROPRIATIONS (e.g. MILITARY PERSONNEL) AND FUNDS ARE INCLUDED AS APPROPRIATE
5 WHEN INDUSTRIAL FACILITIES ARE FUNDED BY RDT&E IT WILL BE INCLUDED AS APPROPRIATE
6 GENERALLY, OTHER PROGRAM PECULIAR WBS ELEMENTS (I.E., FLIGHT SUPPORT OPERATIONS AND SERVICES FOR SPACECRAFT) APPLY WHEN PROCUREMENT SUPPORTED
7 EXCLUDES INDUSTRIAL FACILITIES WHEN FUNDED AS A SEPARATE BUDGET LINE ITEM
8 THE MIL STD 881 WORK BREAKDOWN STRUCTURE DOES NOT APPLY

Figure C3.F2. Cost Definition Display



NOTES:

1. REFERENCE: MILITARY STANDARD 881, "WORK BREAKDOWN STRUCTURE FOR DEFENSE MATERIAL ITEMS"
2. FUNCTIONAL COSTS AS USED IN CONTRACTOR COST DATA REPORTING (CCDR).
3. INCLUDES BOTH CONTRACTOR AND IN-HOUSE COST ELEMENTS; APPROPRIATE COST ELEMENTS INCLUDE COST BY: LABOR, MATERIAL, OVERHEAD, AND OTHER DIRECT CHARGES.
4. THE WBS DOES NOT APPLY TO THE OPERATING AND SUPPORT COST CATEGORY.
5. WHEN INDUSTRIAL FACILITIES ARE FUNDED BY RDT&E IT WILL BE INCLUDED AS APPROPRIATE.
6. EXCLUDES INDUSTRIAL FACILITIES WHEN FUNDED AS SEPARATE INDIRECT LINE ITEMS.
7. MILITARY CONSTRUCTION IS ALSO INCLUDED WHEN WEAPON SYSTEM RELATED.
8. INCLUDES SHIPBUILDING AND CONVERSION, NAVY APPROPRIATION.
9. OTHER APPROPRIATIONS (E.G., PROCUREMENT, ETC.) ARE INCLUDED AS APPROPRIATE.
10. ALL APPROPRIATIONS (E.G., RDT&E, PROCUREMENT, MILCON, MILPER, ETC.) APPLY AS APPROPRIATE.

Figure C3.F3. Categories of Defense Material Items

CATEGORIES OF DEFENSE MATERIEL ITEMS

AIRCRAFT	ELECTRONICS/AIS	MISSILE	ORDNANCE	SHIP	SPACE	SURFACE VEHICLE
Air Vehicle Airframe Propulsion Air Vehicle Applications Software Air Vehicle System Software Communications/Identification Navigation/Guidance Central Computer Fire Control System Data Displays & Controls Survivability Reconnaissance Equipment Automatic Flight Controls Central Integrated Checkout Antisubmarine Warfare Armament Weapons Delivery Equipment Auxiliary Equipment	Prime Mission Product Subsystem 1...n Prime Mission Product Applications Software Prime Mission Product System Software Integration, Assembly, Test and Checkout Platform Integration	Air Vehicle Propulsion, Stages 1...n Payload Airframe Reentry System Post Boost System Guidance & Control Equip. Ordnance Initiation Set Airborne Test Equipment Airborne Training Equipment Auxiliary Equipment Integration, Assembly, Test Checkout Command and Launch Equipment Surveillance, Identification and Tracking Sensors Launch and Guidance Control Communications Command and Launch Applications Software Command and Launch System Software Launcher Equipment Auxiliary Equipment	Complete Round Structure Payload Guidance and Control Equip. Fuze Safety/Arm Propulsion Integration, Assembly Test and Checkout Launch System Launcher Carriage Fire Control System Ready Magazine Adapter Kits Integration, Assembly Test and Checkout	Ship Hull Structure Propulsion Plant Electric Plant Communications and Control Auxiliary Systems Outfit and Furnishings Armament Integration/Engineering Ship Assembly	Launch Vehicle Propulsion (Single Stage) Stage I Stage II...n Strap-on Units Shroud (Payload Fairing) Guidance and Control Integration, Assembly Test and Checkout Orbital Transfer Vehicle Propulsion (Single Stage Only) Stage I Stage II...n Strap-Ons Guidance and Control Integration, Assembly, Test and Checkout Space Vehicle Spacecraft Reentry Vehicle Payload 1...n Orbit Injector/Dispenser Integration, Assembly, Test and Checkout Ground Command, Control, Communications and Mission Equipment Sensor 1...n Telemetry, Tracking & Control External Communications Data Processing Equipment Launch Equipment Auxiliary Equipment Flight Support Operations and Services Mate/Checkout Prior to Launch Mission Control Tracking and C3 Recovery Operations and Services Storage Planning and Preparation Storage Removal and Transportation	Primary and Secondary Vehicle Hull/Frame Suspension/Steering Power Package/Drive Train Auxiliary Automotive Systems Turrent Assembly Fire Control System Armament Automatic Loading System Automatic/Remote Piloting System Nuclear, Biological, Chemical (NBC) System Body/Cab Special Equipment Navigation Equipment Communications Integration, Assembly, Test, and Checkout

C4. CHAPTER 4

VISIBILITY AND MANAGEMENT OF OPERATING AND SUPPORT COSTS (VAMOSC) PROGRAM

C4.1. BACKGROUND

The adequate funding of Operating and Support (O&S) costs is a key component of defense preparedness. O&S costs frequently exceed acquisition costs for many DoD defense systems. Additionally, the relative importance of O&S cost in total life-cycle costs appears to be increasing as weapon systems become more complex. DoD policy requires the explicit consideration of O&S costs from the beginning of the acquisition process throughout the operational life of a program to manage and control these costs. The OSD VAMOSC program has been established as a means of responding to this requirement.

C4.2. REQUIREMENTS

To achieve visibility of O&S cost, the DoD Components shall establish an historical data collection system and maintain a record of O&S data that facilitate the development of a well-defined, standard presentation of O&S costs by major defense acquisition program. These systems are to include a display of critical logistics support costs at the subsystem level for existing fielded major defense programs. VAMOSC data shall be used as a basis for decisions concerning affordability, budget development, support concepts, cost tradeoffs, modifications, and retention of current systems. Furthermore, the use of VAMOSC data in deriving O&S cost estimates for future (unfielded) defense programs is encouraged.

C4.3. OBJECTIVES

The objectives of the VAMOSC system are:

C4.3.1. To provide visibility of O&S costs for use in cost analysis of major defense acquisition programs and force structure alternatives in support of the PPBS process and satisfy the Congressional requirement that DoD track and report O&S costs for major acquisition programs.

C4.3.2. To provide visibility of critical maintenance and support costs at the subsystem level in sufficient detail to promote cost-conscious design and configuration management of new and fielded defense programs.

C4.3.3. To provide visibility of O&S costs so they may be managed to reduce and control program life-cycle costs.

C4.3.4. To improve the validity and credibility of O&S cost estimates by establishing a widely accepted database, thereby reducing the cost and time for collecting these defense program O&S costs for specific applications.

C4.4. USES OF VAMOSC DATA

The VAMOSC data developed by the DoD Components are the authoritative source for reliable and consistent historical O&S cost information about major defense programs. Therefore, it is incumbent upon all DoD Components to make VAMOSC data as accurate as possible. VAMOSC data shall be used to:

C4.4.1. Derive and/or validate O&S costs of defense programs within the acquisition process.

C4.4.2. Assist in design tradeoff analyses of defense programs and subsystems.

C4.4.3. Assist in the development of modifications and new management techniques for controlling O&S cost for defense programs.

C4.4.4. Support the development of programs and budgets for both existing and future defense programs as part of the PPBS process.

C4.4.5. Provide a basis for, or validation of, O&S cost factors used to establish standards for cost estimating.

C4.4.6. Assist operations and management of DoD Component organizations at all levels.

C4.5. DEFINITIONS

C4.5.1. VAMOSC System. The data and data management systems for the collection, display and cataloging of historical O&S costs, related data, and associated factors that determine those costs, by individual defense program. The DoD

Components are responsible for developing their own VAMOSC systems; hence, there is no single VAMOSC system but rather several closely related but independent VAMOSC systems.

C4.5.2. VAMOSC Program. This is an all encompassing term, which includes the VAMOSC systems, program management, and budget for the collection and reporting of historical O&S costs and related data.

C4.5.3. OPERATING AND SUPPORT. See Chapter 3, paragraph C3.3.6. of this Manual.

C4.6. ADMINISTRATION

C4.6.1. The DoD Components shall design and operate automated data processing systems to collect O&S cost data and identify these data to specific defense programs and subsystems.

C4.6.2. At a minimum, the DoD Components shall collect and report the costs for all fielded major defense acquisition programs as defined in DoD Instruction 5000.2, paragraph 4.3. (reference (a)). In addition, the CAIG may direct the DoD Components to collect VAMOSC data for other defense acquisition programs. Requests for waivers to these requirements shall be submitted to the CAIG Chair.

C4.6.3. The VAMOSC systems operated by the DoD Components shall comply with the broad system objectives and guidelines established by the CAIG.

C4.6.4. The CAIG is charged with executive oversight of VAMOSC. In this capacity the CAIG shall promote standardization of O&S cost data collection by the DoD Components, provide a forum for the exchange of ideas among the DoD Components, and promote the effective use of VAMOSC data in predicting future costs. The CAIG Chair shall convene the CAIG at least once a year to review the VAMOSC program and the DoD Components' VAMOSC systems. Other meetings may be scheduled as required at the call of the Chair. As executive oversight authority, the CAIG is authorized to:

C4.6.4.1. Establish broad system objectives.

C4.6.4.2. Formulate policy recommendations and guidance.

C4.6.4.3. Recommend improvements and establish guidelines for data consistency within and between the DoD Components.

C4.6.4.4. Recommend improvements and establish guidelines for data quality (including data validation or verification methodologies, techniques, and tools).

C4.6.4.5. Recommend improvements to data formatting, content, and retention policy.

C4.6.4.6. Require the use of VAMOSC data for cost analyses of individual weapon systems for milestone or program reviews.

C4.6.4.7. Foster high-level support for necessary VAMOSC program improvements and operations.

C4.6.4.8. Review VAMOSC system definition, objectives, policy, and use of VAMOSC data.

C4.6.4.9. Review and evaluate the DoD Components' VAMOSC programs to ensure adequacy of VAMOSC resources, and compliance with CAIG direction, DoD Directive 5000.4 (reference (k)), and this Manual.

C4.6.4.10. Provide guidance on improving analytical methods for using O&S cost data and developing algorithms and formats for presentation of these data.

C4.6.4.11. Review and process requests for waivers from VAMOSC reporting.

C4.6.5. VAMOSC data shall be made readily available to all DoD Components. Subject to the restrictions of the Freedom of Information Act, the DoD Components may release VAMOSC data outside of the Department of Defense. In general, release to the U.S. defense industry is encouraged because it may enhance the ability to design and develop more cost-effective defense programs and encourage modifications to improve these programs.