

NAVAL CENTER FOR COST ANALYSIS



COST ANALYSIS REQUIRMENTS DESCRIPTION (CARD) OUTLINE AND GUIDANCE

Purpose

The essential foundation of Department of Defense (DoD) Acquisition Program cost estimates is the Cost Analysis Requirements Description (CARD). To assist program offices in the timely development of an acceptable CARD in accordance with DoD 5000.4-M, "Cost Analysis Guidance and Procedures" (December 1992), the Naval Center for Cost Analysis (NCCA) has developed this CARD Outline and Guidance. Within this document is the basic CARD structure as defined in DoD 5000.4-M along with some insights NCCA has gained with prior CARD submissions.

NCCA Points of Contact

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NCCA CARD OUTLINE AND GUIDANCE

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 following items should be included within Section 1.1:

- A WBS and accompanying dictionary
- Key performance parameters
- Detailed equipment list (identifying which items are Government Furnished)
- A comprehensive, understandable system description
- Software requirements
- An explanation of how the system interacts with other systems
- An explanation of how the sub-systems interact within the system

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, III, 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. System Characteristics.

This section provides a technical description of the hardware, software, and human characteristics of the system. Typical items included in this section are:

- Comprehensive, detailed hardware description for each major piece of identified hardware,
- Comprehensive, detailed software description to include: Software configuration, sizing metric, language, number of CSCI (if any), COTS (if any), development process.

It is divided into the following sub elements:

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 sub-element) 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 sub-element 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 sub-element. The discussion should address the

programming language and programming support environment (including standard tools and modern 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 sub-elements.

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. Specific areas that should be addressed are:

- Hardware and software maintenance concepts,
- Quantitative reliability goals such as Mean Time to Failure (MTTF), Mean Time to Repair (MTTR),
- Description of required support equipment, if applicable.

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. 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 B. In those instances, notional unit manpower documents showing the relationship to the unit manpower documents for the predecessor system should be provided. Any manpower tables should include information on pay-grade, rank or skill level.

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, operating locations and schedule.

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 electromagnetic 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 re-supply.
- 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, 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).

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 labeling 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 supportability 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).