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LIFE-CYCLE COST (LCC)

“As to government expenditures, those due to broken-down chariots, worn-out horses, armor and helmets, arrows and crossbows, lances, hand and body shields, draft animals and supply wagons will amount to 60 percent of the total.”

Sun Tzu, *The Art of War* (Sixth century B.C.)

13.1 POLICY

13.1.1 Broad Policy

Defense acquisition policy, as stated in DoDD 5000.1, includes the requirement to obtain quality products, “... at a fair and reasonable price.” This directive, which governs the defense acquisition system, goes on to address cost and life-cycle costs in each of the three major policy areas. Requirements include the need to:

- minimize the cost of ownership in the context of a total system approach;
- view cost in the context of Cost As an Independent Variable (CAIV), recognizing that the majority of costs are determined early in a program;
- work closely with the user to achieve a proper balance among cost, schedule, and performance while ensuring that systems are both affordable and cost-effective.

The Program Manager (PM), together with the user, are to propose cost objectives and thresholds for Milestone Decision Authority (MDA) approval, which will then be controlled through the Acquisition Program Baseline (APB) process. Further, the PM is asked to search continually for innovative practices to reduce costs, including prudent investments in pollution prevention in an effort to reduce life-cycle environmental costs and liability. Finally, the acquisition community is to recognize that competition provides major incentives for industry to enhance the application of advanced technology and life-cycle cost advantages to defense programs as well as a mechanism to obtain an advantageous price.

13.1.2 DoD 5000.2-R Policy

For all Acquisition Category (ACAT) I and IA programs, a life-cycle cost estimate shall be prepared by the program office in support of program initiation (usually Milestone I) and all subsequent milestone reviews. The Component’s staffing authority shall prepare a staffing estimate for ACAT I programs in support of Milestone II and Milestone III. For ACAT I programs, the MDA may not approve entry into engineering and manufacturing development or production

and deployment unless an independent estimate of the full life-cycle cost of the program and a staffing estimate for the program have been completed and considered by the MDA (10 USC §2434).

The life-cycle cost estimates shall be:

- explicitly based on the program objectives, operational requirements, contract specifications for the system, and (for ACAT I programs) a life-cycle cost and benefit element structure agreed upon by the Integrated Product Team (IPT);
- comprehensive in character, identifying all elements of cost that would be entailed by a decision to proceed with development, production, and operation of the system regardless of funding source or management control;
- for ACAT I programs, consistent with the cost estimates used in the analysis of alternatives and for staffing estimates behind the operation and support costs, consistent with the (Component's) staffing estimate.
- Neither optimistic nor pessimistic but based on a careful assessment of risks and reflecting a realistic appraisal of the level of cost most likely to be realized.

For ACAT I programs, the DoD Component sponsoring the acquisition program shall establish, as a basis for the life-cycle cost estimates, a description of the salient features of the acquisition program and of the system itself. This description, referred to here as a Cost Analysis Requirements Description (CARD), is given to the teams preparing the program office life-cycle estimate, Component cost analysis, and independent life-cycle cost estimate. The description should be prepared 180 days in advance of a planned Overarching Integrated Product Team (OIPT) or Component review, unless another due date is set by the OIPT. The CARD shall be flexible, tailored, and make reference to information available in other documents available to the cost estimators. For joint programs, the CARD shall include the common program as agreed to by participating DoD Components. For ACAT IA programs, the PM shall prepare the CARD in coordination with the appropriate IPT members.

For programs with significant cost risk or high visibility, the Component Acquisition Executive (CAE) may request that a component cost analysis estimate also be prepared in addition to the program office life-cycle cost estimate. For all ACAT I programs, the Office of the Secretary of Defense (OSD) Cost Analysis Improvement Group (CAIG) shall prepare an independent life-cycle cost estimate and a report for the appropriate MDA for all milestone reviews after Milestone 0.

For all ACAT IA programs, the Office of Secretary of Defense (OSD) Principal Staff Assistant (PSA) or sponsoring DoD Component shall ensure that a Component cost analysis is created for Milestone I and updated for Milestone II. The MDA may direct an updated analysis for subsequent decision points if conditions warrant. At Milestone I, the component may conduct a sufficiency review of the PM's life-cycle cost estimate in lieu of a full analysis. The IPT shall establish the content of sufficiency review.

13.2 USES OF LIFE-CYCLE COST

The LCC estimate plays a key role in the management of an acquisition program. Its primary functions include providing the following information:

- major input to acquisition decisions among competing major system alternatives;
- input in requirements determination; and
- within a selected system alternative –
 - identification of cost drivers,
 - index of merit for tradeoff evaluations in design, logistics, and manufacturing, and
 - the basis for overall cost control.

13.3 MILESTONE DECISION POINTS AND COST

Upon approval of a Mission Need Statement (MNS), an approach shall be formulated to set and refine cost objectives. By program initiation (usually Milestone I), each ACAT I and ACAT IA PM shall have established life-cycle cost objectives for the program through consideration of projected out-year resources, recent unit costs, parametric estimates, mission effectiveness analysis and trades, and technology trends. A complete set of life-cycle cost objectives shall include Research, Development, Test, and Evaluation (RDT&E), production, operating and support, and disposal costs. At each subsequent milestone review, cost objectives and progress towards achieving them shall be reassessed.

At each milestone decision point, including the decision to start a new program, life-cycle costs, cost/performance/schedule tradeoffs, cost drivers, and affordability constraints will be among the major considerations.

13.4 COST CONTENT WITHIN THE ACQUISITION PROGRAM BASELINE

The cost parameters stated in the APB shall be limited to these costs:

- RDT&E costs,
- procurement costs,
- military construction costs,
- costs of acquisition items procured with Operations and Maintenance (O&M) funds, if applicable,

- total quantity (to include both fully configured development and production units),
- average unit procurement cost (defined as the total procurement cost divided by total procurement quantity),
- program acquisition unit cost (defined as the total of all acquisition related appropriations divided by the total quantity of fully configured end items), and
- any other cost objectives designated by the MDA, e.g., life-cycle cost objective.

All estimates are to be expressed in base-year dollars. As the program progresses through later acquisition phases, procurement costs shall be refined based on contractor actual costs from program definition and risk reduction, engineering and manufacturing development, or from initial production lots. The amount budgeted shall not exceed the total cost threshold estimated in the APB. For ACAT IA programs, the ACAT I cost parameters apply, with the addition of military pay and Defense Working Capital Fund (DWCF).

No funds shall be obligated for an ACAT I program after that program enters the Engineering and Manufacturing Development (EMD) phase or production and deployment until an APB has been approved by the MDA, unless the USD(A&T) has specifically approved the obligation (10 U.S.C. §2435(b)4).

13.5 COST/PERFORMANCE TRADEOFFS

The best time to reduce life-cycle costs is early in the acquisition process. Cost reductions are accomplished through cost/performance tradeoff analyses, which are conducted before an acquisition approach is finalized. To facilitate that process, the Overarching IPT (OIPT) for each ACAT I and ACAT IA (as required) program establishes a Cost Performance IPT (CPIPT). The user community is represented on the CPIPT. Industry representation, consistent with statute and at the appropriate time, is also considered.

Maximizing the PM's and contractors' flexibility to make cost/performance tradeoffs without unnecessary higher-level permission is essential to achieving cost objectives. Therefore, the number of threshold items in requirements documents and acquisition program baselines are strictly limited; the threshold values represent true minimums; and requirements are stated in terms of performance rather than technical solutions and specifications. The systems engineering process, system analysis, and control are established to serve as a basis for evaluating and selecting alternatives, measuring progress, and documenting design decisions. This includes the conduct of tradeoff studies among requirements (operational, functional and performance), design alternatives and their related manufacturing, testing and support processes, program schedule, and life-cycle cost. These tradeoff studies should be performed at the appropriate level of detail to support decision-making and lead to a proper balance between performance and cost. Request For Proposals (RFPs) include a strict minimum number of Key Performance Parameters that will allow industry maximum flexibility to meet overall program objectives. Cost objectives are used as a management tool. The source selection criteria communicated to industry

should reflect the importance of developing a system that can achieve stated production and life-cycle cost thresholds.

13.6 COST MANAGEMENT INCENTIVES

Incentives shall be applied to both government and industry to achieve the objectives of CAIV. Awards programs (both monetary and nonmonetary) and "shared savings" programs are used creatively to encourage the generation of cost-saving ideas for all phases of life-cycle costs. Incentive programs target both individuals and teams in both government and industry. Incentives include up-front investments to minimize production and/or operation and support costs, where applicable.

13.7 ACQUISITION LOGISTICS COST

Acquisition programs establish logistics support concepts, e.g., two-level and three-level, early in the program and refine them throughout the development process. Life-cycle costs play a key role in the overall selection process. Support concepts for new and future systems provide for cost-effective, total life-cycle logistics support.

The PM ensures that reliability, maintainability, and availability activities are established early in the acquisition cycle so that operational requirements and reduced life-cycle ownership cost are met. Reliability, maintainability, and availability requirements are based on operational requirements and life-cycle cost considerations. The requirements and considerations are stated in quantifiable, operational terms that are measurable during developmental and operational test and evaluation and defined for all elements of the system, including support and training equipment. Figure 13-1 shows the dominant role that logistics plays in system life-cycle cost.

13.8 THE DEFENSE WORKING CAPITAL FUND (DWCF)¹

As a revolving-fund financial structure, the DWCF builds on revolving-fund principles previously used for industrial and commercial-type operations. The DWCF consists of multiple divisions identified by Component and by business area. Within these business areas, there are support organizations (providers) which operate like commercial businesses by selling goods and services to DoD's operating forces and other business areas (customers).

Customer orders (funded requests for goods and service) provide the budgetary resources to finance defense business operations. Customers fund their requests primarily with appropriated resources (e.g., operation and maintenance; procurement; and research, development, test, and evaluation). Income (or budgetary resources) derived from the sale of goods and services is then used to finance the DWCF business areas' continuing operations without fiscal year limitations. Unlike profit-oriented commercial businesses, DWCF businesses strive to reach break-even prices charged to customers. Revenue from customers sustains the full cost and the continuous cycle of DWCF business operations.

¹ Reference for this paragraph is as follows: *Defense Working Capital Fund (DWCF) Handbook*, CALIBRE Systems, Inc., Falls Church, Virginia, and Office of the Under Secretary of Defense (Comptroller), Washington, DC, 1995, pp. 1-2 to 1-4.

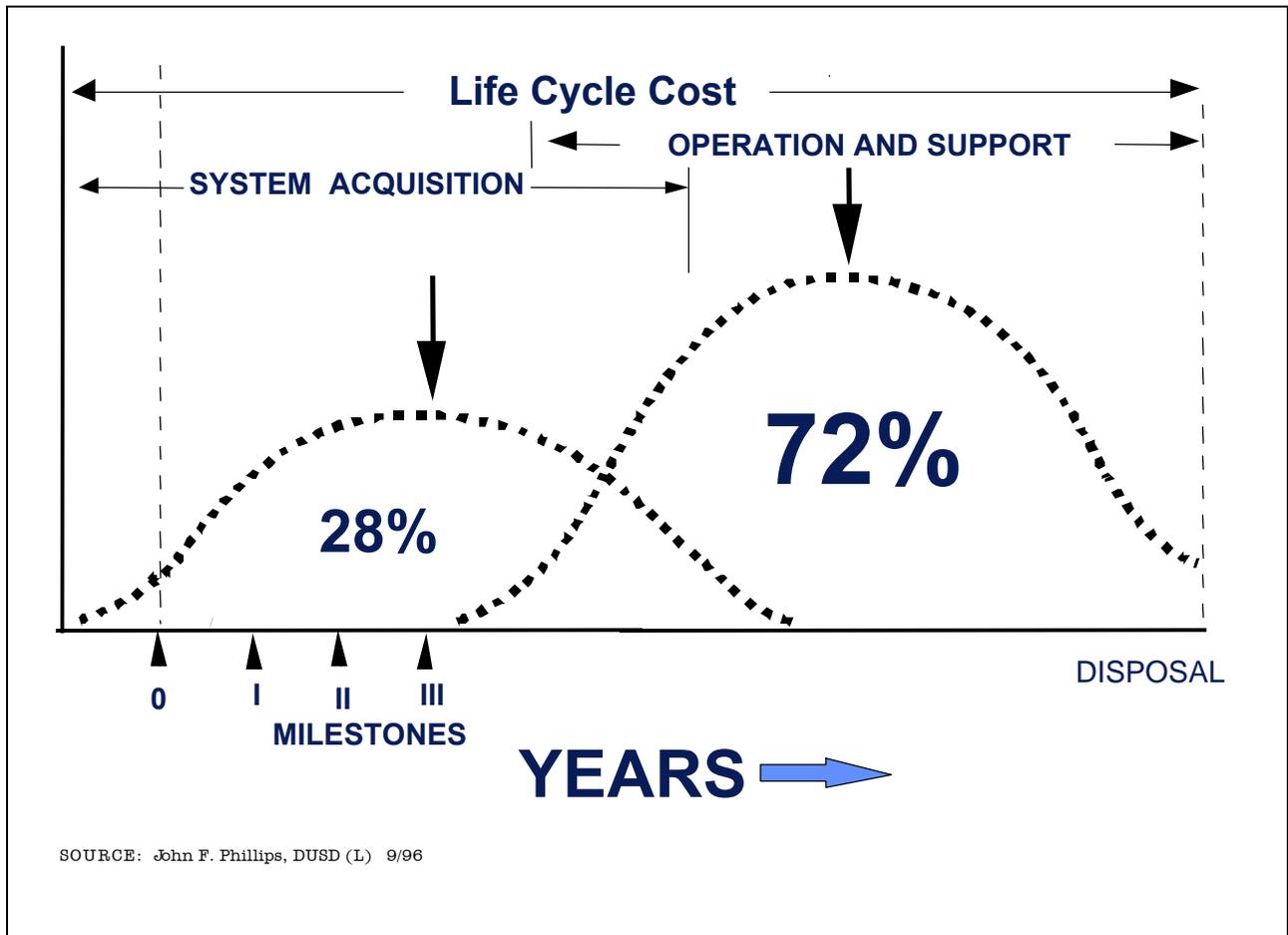


Figure 13-1: Nominal Cost Distribution
 (TYPICAL 1980 DOD ACQUISITION PROGRAM
 WITH A SERVICE LIFE OF ABOUT 30 YEARS)

The basic tenet of the DWCF financial structure is to create a customer-provider relationship between military operating forces and support organizations.

- Customers of the DWCF business area providers include any DoD command or organization, non-DoD Federal Government agencies, and other U.S. and foreign agencies and commercial enterprises when authorized by DoD.
- Providers in the DWCF customer-provider relationship are the business areas and related support organizations that are responsible for providing goods and services to the operating forces and that are financed through the DWCF.

The customer-provider relationship is fundamental to the DWCF financial structure. The relationship has significantly increased the customer's responsibility for properly determining sup-

port requirements and the level of performance required from DWCF-financed support organizations. The result of the customer-provider relationship is a meaningful “linkage” between military mission operations and the cost to support those operations.

This linkage is a major feature of the DWCF’s control process. The inclusion of previously directly financed areas in the DWCF is causing the DWCF business area operations to be financially sized (in both budget and implementation) based on their customers’ requirements and appropriated resources available for DWCF goods and services. In other words, the resources required by the DWCF business area organizations to continue operations vary directly with their customers’ needs for their goods and services. As the volume of customer requirements decline, so, too, will the relative financing of a supporting DWCF business area. The significance of this linkage makes it essential for customers and providers alike to understand the nature of the DWCF financial processes and the potential impact they can have on military readiness.

In summary, the DWCF financial structure and management processes focus on total-cost visibility and full-cost recovery for the Department’s support functions. The DWCF financial structure provides DoD managers with improved financial management tools and facilitates the reduction of DoD support costs through better business practices. The use of the DWCF financial structure is intended to:

- foster a business-like customer-provider approach that enables the customer to make economical buying decisions and encourages the provider to become more cost conscious;
- identify the full costs of support, measure performance on the basis of cost/output goals, and foster efficiency and productivity improvements;
- provide timely and accurate information to decision makers at all levels to enhance the decision making process; and
- more closely relate the support infrastructure with the force structure.