DSMC's CASA Model Still Going Strong

A Popular DoD Favorite, CASA is Still Distributed in the United States Free of Charge

JOEL M. MANARY

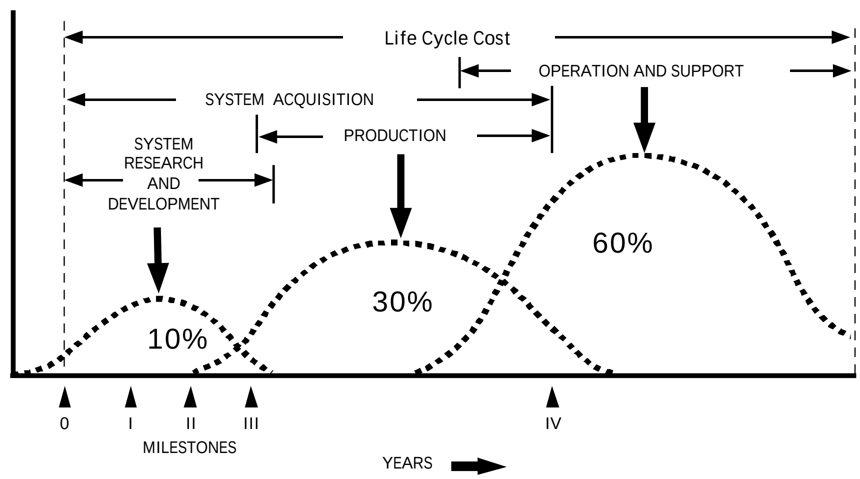
In response to a broad range of requirements gathered from many of the Services' acquisition program offices, the Defense Systems Management College (DSMC) developed the Cost Analysis Strategy Assessment (CASA) model. The CASA is a useful, general-purpose Life Cycle Cost (LCC) model that has been validated and used successfully by all three Services, industry contractors, and other government agencies such as the Federal Aviation Administration and the National Oceanic and Atmospheric Administration.

The model has evolved to the current 3.01 version, and more enhancements are planned as user requirements evolve. This article acquaints the reader with the CASA model, announces that the model continues to be available, and discusses planned model upgrades. Additionally, it summarizes the program manager's (PM) need for an LCC model, what constitutes a useful model, and contains a specific description of the CASA model that is distributed in the United States by DSMC free of charge.

The PM's Need for an LCC Model

Program managers need a tool that will focus the efforts of the Integrated Product Team. They need a concise method of assuring themselves and program management and decision makers at all levels that the reasonable decisions are being made.

Figure 1. Typical Life-Cycle Cost Distribution



Current DoD policies require that the PM ensure LCC influences system design, systems engineering, and the logistics engineering process during all acquisition phases. In accomplishing this goal, the PM requires a comprehensive, accurate, and current LCC estimate to support each management decision where cost is significant. Few decisions are made during a program's life cycle that do not affect LCC.

Similarly, a review of the policies, definitions, and objectives of Systems Engineering and Integrated Logistics Support in DoDI 5000.2 will lead to a conclusion that an *effective* Weapons Systems Support program is one that provides support resulting in achievement of the user's readiness requirement(s) using the most life-cycle-cost-effective approach.[1] The bottom line of our efforts must be focused on these two key quantifiable requirements: maximum mission *Readiness* and minimized total *Cost.*

Maximum Mission Readiness and Minimized Total Cost

An LCC estimate should have sufficient accuracy to permit comparison of relative costs of design and acquisition alternatives under consideration by management. Specifically, LCC is a decision aid, and *the LCC estimate should capture enough of total ownership costs to facilitate well-informed decisions.* The two main goals of LCC analysis follow:

- Identify the total cost of countering a threat, achieving production schedules, and attaining system performance and readiness objectives

Mr. Manary is currently a Professor of Systems Acquisition Management, DSMC.

(establish the decision baseline reference point).
- Estimate the overall cost impact of the various design and support options (compared to the baseline).

The decisions with the greatest chance of affecting LCC and identifying savings are clearly those impacting acquisition and Operating and Support (O&S) costs undertaken in the Pre-concept, Concept Exploration and Definition, and Demonstration and Validation phases. But, this idea should not imply that LCC trade-off analysis is not useful during later program phases. During the Production Deployment and Operating phases, the evaluation of actual readiness data and resource consumption information from “Maintenance Data Collection” systems regularly leads to identification of “bad actors” in need of corrective actions, such as improved reliability through an Engineering Change Proposal.

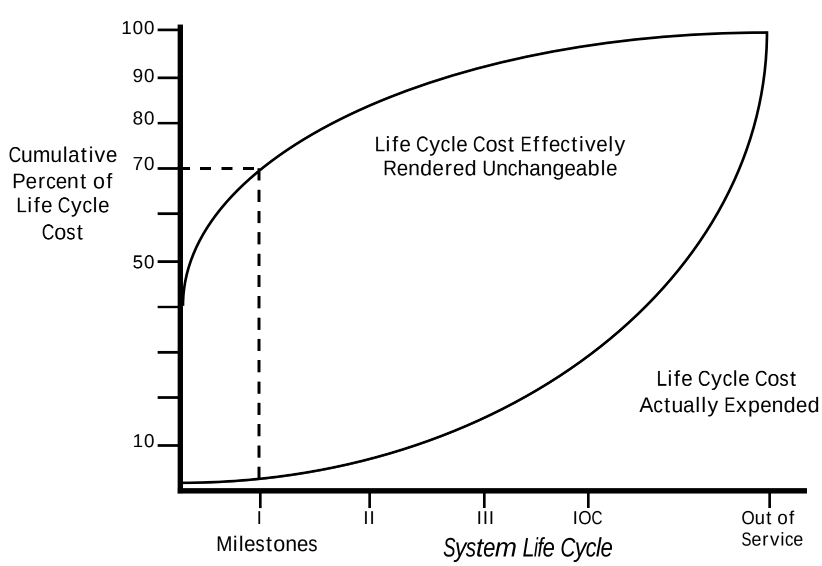
Description of a Useful LCC Model

Rodney Stewart describes the most valuable automated cost estimating tools as “the generic computer tools that can be used for any application.”[2] Blanchard and Fabrycky[3] assert that the model should encompass the following areas:

The bottom line of our efforts must be focused on these two key quantifiable requirements: maximum mission *Readiness* and minimized total *Cost.*

- Be comprehensive and include all relevant factors, and be reliable in terms of repeating results.
- Represent the “dynamics” of the system or product being evaluated, and be sensitive to the relationships of key input parameters.
- Be flexible to the extent that the analyst can evaluate overall system requirements as well as the individual relationships of various system components. In the analysis process, one may wish to view the system as a whole, identify high-cost contributors, evaluate one or more specific components of the system independent of other elements, initiate changes at the component level, and present the results in the context of the overall system.
- Be designed in such a way as to be simple enough to allow timely implementation. Unless the model can be used in a timely and efficient manner by the analyst, it is of little value.
- Be designed such that it can be modified to incorporate additional capabilities. It may be necessary to expand (or tailor) certain facets of the cost breakdown structure in order to gain additional visibility (for example).

Figure 2. Typical Life-Cycle Cost Commitment



This article shows that the CASA model fits all of these requirements. Professor Blanchard recently stated that the CASA model is the best LCC model available today.[4]

Research has shown prior development of a wide variety of LCC models. Some are special purpose, and others are general purpose. The government regularly requires contractors submitting proposals to use the “government-approved” models in estimating the cost of ownership of the solution being proposed. This requirement ensures that all of the contractors and government LCC estimates are comparable, repeatable, and understandable. Many of these models are cataloged in the *DoD Logistics Support Analysis (LSA) Techniques Guide* distributed by the Logistics Support Activity (LOGSA), an agency of the Army Materiel Command that serves all of DoD in the area of LSA and related tools.

Interviews and surveys of many industry representatives resulted in a finding that many government models were considered unnecessarily complex and “input data hungry.”[5] Both industry and government program managers wanted a flexible model that could operate effectively with inputs tailored to the magnitude and/or impact of the decision being considered.

"An LCC estimate should have sufficient accuracy to permit comparison of relative costs of design and acquisition alternatives under consideration by management." This quote from the *DSMC Logistics Guide*[6] means that an LCC model is a decision aid, and the model needs to capture enough (not necessarily all) of cost of ownership to facilitate well-informed decisions. The model developer identifies the main cost drivers of LCC and creates model algorithms to capture these costs. Ultimately, a general purpose model that captures the costs of a systems major end item in terms of production, initial support items, operation and also the recurring costs on all 10 ILS elements can be expected to produce a good LCC estimate.

The cost analysis process includes use of a detailed LCC model and aspects of risk, sensitivity, and data comparison analyses. Also, research, development, test, and evaluation (RDT&E) cost concerns as well as acquisition, operation, and support costs over the effective life of the system are included. Thus, a good LCC model covers the entire life of a system, from its initial research cost to those costs associated with yearly maintenance as well as spares, training costs, and other expenses incurred once the system is delivered.

The analyst formulates the problem statement to be analyzed; selects the appropriate model; collects the appropriate amount of model input data (some model data may be left blank if not relevant to the problem statement); runs the model, including selected sensitivities; and draws certain conclusions from the model outputs.

Cost Analysis Strategy Assessment (CASA) Model

The CASA model is basically a management decision aid based on LCC.[7] In actuality, CASA is a set of analysis tools formulated into one functioning unit. It collects, manipulates and presents as much of the total cost of ownership as the user desires. It contains a number of programs and submodels that allow the user to perform several tasks:

- generate program data files;
- perform life-cycle costing;
- perform sensitivity analysis;
- perform LCC risk analysis; and
- perform LCC comparisons and summations.

The model also includes a wide variety of preprogrammed output report formats designed to support the analysis process.

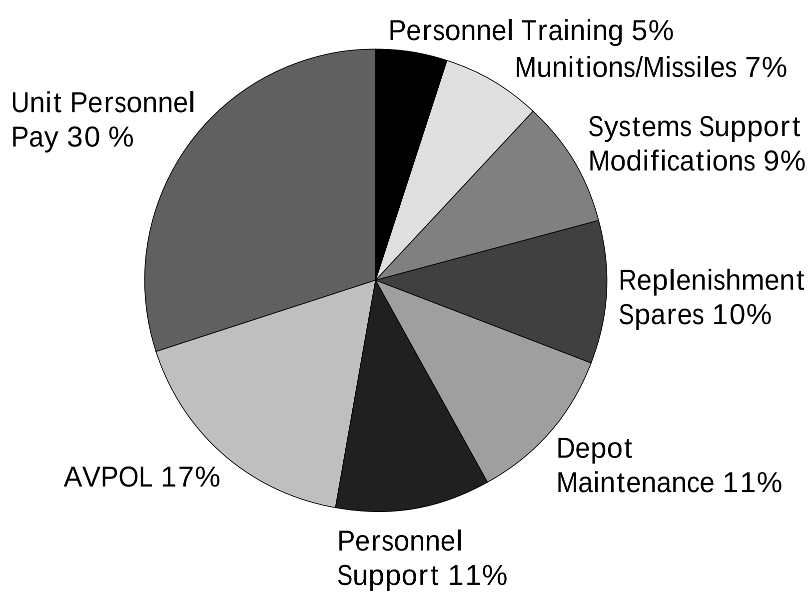
The CASA model covers the entire life of the system, from its initial research costs to those associated with yearly maintenance as well as spares, training costs, and other expenses incurred once the system is delivered. Currently, RDT&E and production costs are "throughput" costs, meaning they are not derived by the model – they are input and reported in some report outputs depending on their relevance to the analysis. The model calculates and projects the O&S costs over the 20 to 30 years of operating the system. Currently, RDT&E and production cost estimating modules are being considered in response to numerous users' requests.

The CASA model employs some 82 algorithms with 190 variables. Only a small number of the inputs are mandatory. Most of the inputs are optional and are subject to tailoring to the needs of the analysis. The CASA model, therefore, is a relatively "compact" model designed to facilitate well-informed decisions while holding model input data gathering to a moderate level.

Specifically, CASA works by taking the data entered, calculating the projected costs, and determining the probabilities of meeting, exceeding, or falling short of any LCC target value. Offering a variety of strategy options, CASA allows you to alter original parameters to observe the effects of such changes on strategy options.

At any number of program junctions, inputs may be saved and calculations may be made to that point for later

Figure 3. Typical Operating and Support Cost Distribution — Aircraft System Level



Source: 1984 USAF/ASD/ALTB F-16 O&S Cost Breakout evaluation. Furthermore, CASA will accept only correct inputs. It checks every entry as it is input; incorrect data will cause the cursor to refrain from movement and/or alert the user. The CASA model can be used for a wide range of analysis tasks:

- LCC Estimates
- Trade-off Analyses
- Repair-level Analyses
- Production Rate and Quantity Analyses
- Warranty Analyses
- Spares Provisioning
- Resource Projections (e.g., Manpower, Support Equipment)
- Risk and Uncertainty Analyses
- Cost Driver Sensitivity Analyses
- Reliability Growth Analyses
- Operational Availability
- Analyses with Automated Sensitivity Analysis
- Spares Optimization to Achieve Readiness Requirements
- Operation and Support Cost
- Contribution by Individual Components of the System

The CASA version 3.01 model is currently being distributed. This version expands the number of hardware items (repairable candidates) from 145 to 2,000. This feature, along with the LCC summation feature, virtually eliminates any limitation on the "size" of a system that can be analyzed.

The model runs well on modern 386/486DX PCs. It requires 4 to 5 megabytes of hard drive space depending on the size of hardware data files. The program currently runs best in a DOS environment since it requires 580K of RAM to operate properly. Conversion to a Windows environment is expected with the next revision. Several other model upgrades, such as the RDT&E and production cost estimation modules, are being considered to accommodate evolving user requirements.

Sources for Obtaining the CASA Model

The model comes compressed on two program file disks and one disk containing the user's manual. A variety of sources distribute the model. Some distribute the model essentially free but can offer limited user support, and some distribute the model for relatively modest fees to recover distribution and technical support costs. The LOGSA is preparing to begin distribution of CASA as a module of the logistics managers tool set called Logistics Planning and Requirements System (LOGPARS). Two primary points of contact exist for *internal* U.S. distribution of the model:

Defense Systems Management College - Logistics Support Department, Telephone: (703) 805-2497

U.S. Army Materiel Command - Logistics Support Activity (LOGSA), Telephone: (205) 955-9886

For distribution *outside* the United States, contact OMEGA Logistics International, Telephone: (619) 697-2207.

ENDNOTES

1. DoD Instruction 5000.2, *Defense Acquisition Management Policies and Procedures*, February 23, 1991.
2. Stewart, Rodney D., *Cost Estimating*, New Dimensions in Engineering Series, Wiley-Interscience Publications, 1991.
3. Fabrycky, Wolter J. and Benjamin S. Blanchard, *Life-Cycle Cost and Economic Analysis*, Prentice Hall International Series in Industrial and Systems Engineering, 1991.
4. Professor Benjamin S. Blanchard, Virginia Polytechnic Institute, in an interview with Joel M. Manary, July 24, 1995.
5. Manary, Joel M., "The Feasibility of Using a Life-Cycle Cost Procurement Technique When Buying Commercial Off The Shelf Electronic Test Equipment," Research Technical Report, Aeronautical Research Incorporated, Research Division, 1978.
6. *Integrated Logistics Support Guide*, Defense Systems Management College, May 1994.
7. *CASA Users Manual*, Defense Systems Management College, February 1994.

Continued from page 36

such as "the new group of exporters" that sprang up in the late 1980s (Brazil, South Korea, Israel, and Taiwan), economic laws have overcome international ones.

Arms Unbound also analyzes the economics of strategic alliances in the production of arms. Shared interests in market access, desire by the developing countries to acquire new technologies, and the requirement to amortize defense research and development over large markets, combine to create a convenient marriage between the "first- and second-tier states." As a result, the offspring is "weapons-on-the-cheap." The author cites U.S. M1A1 Abram tank parts production in Egypt and F-16 assembly in South Korea as examples of this symbiotic relationship. Together with the "weaponization of commonly available technologies," Mussington suggests that a divorce between so enamored a couple is difficult to imagine.

Mussington concedes that the "transition to lower post-Cold War levels of defense spending may increase the proliferation of advanced weapons to developing counties"; but there is hope. He recommends that policy makers "modify the existing approach to technology restrictions through the removal of the disincentives that inhibit new states from joining established supplier groupings." Only by including second-tier defense producers "will the defense economy become more transparent and amenable to control." This study will be invaluable to export control analysts, in particular, and observers of the technology and arms transfer question, in general.

EDITOR'S NOTE

David Mussington is a defense research associate for a London policy studies institute. Ordering information follows: David Mussington, CSIA Studies in International Security No. 4, Brassey's (US), Cambridge, MA, 1994, $14.00, pp. 88.