DoD Product Support Business Case Analysis Guidebook

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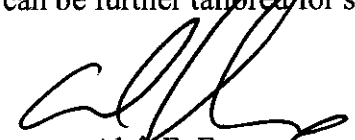
FOREWORD

The Department of Defense (DoD) must continue to improve product support, with a specific focus on increasing readiness and enabling better cost control. In 2008, the Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness (ASD(L&MR)) established a group of senior government, industry, and academia representatives called the Product Support Assessment Team (PSAT) to drive this effort. In November 2009, Dr. Ashton Carter, Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), approved and signed the Weapon Systems Acquisition Reform Product Support Assessment (WSAR-PSA) report and its eight integrated recommendations to improve life cycle product support. One of the eight recommendations included clarifying and codifying policies and procedures pertaining to the use of analytical tools, including business case analysis (BCA) in the life cycle product support decision making process.

In addition to the PSAT effort, this DoD Product Support BCA Guidebook supports Dr. Carter's November 2010 memorandum on "Better Buying Power" by laying out a uniform methodology for accurate, consistent, and effective support of value-based decision making, while better aligning the acquisition and life cycle product support processes. The guidebook fulfills the need to standardize the DoD BCA process used to conduct analyses of costs, benefits, and risks. A senior team of system engineers, logisticians, acquisition experts, and financial experts from the Services, Agencies, Industry, and Academia embedded their broad knowledge and experience into this guidebook to help BCA practitioners serve their primary customers, the Warfighter and the Taxpayer. This guidebook is a living document that will continue to be updated with new best practices and methodologies, and provides overall guidance for conducting a Product Support BCA. This guidebook should be used in conjunction with other analytical tools and guidance and can be further tailored for specific types of BCAs.



Alan F. Estevez
Principal Deputy Assistant Secretary of Defense
for Logistics and Materiel Readiness

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INTRODUCTION TO THE PRODUCT SUPPORT BCA

1. Introduction and Purpose

1.1. Introduction

The Product Support Business Case Analysis (BCA) is a structured methodology and document that aids decision making by identifying and comparing alternatives by examining the mission and business impacts (both financial and non financial), risks, and sensitivities. BCAs may be somewhat different from other decision support analyses through their emphasis of the enterprise wide perspective of stakeholders and decision makers and assessment of the holistic effects impacted by the decision. Other names for a BCA are Economic Analysis, Cost-Benefit Analysis, and Benefit-Cost Analysis. Broadly speaking, a BCA is any documented, objective, value analysis exploring costs, benefits, and risks.

The Product Support BCA concludes with a recommendation and associated specific actions and an implementation plan to achieve stated organizational objectives and desired outcomes. One principle application of the Product Support BCA guidebook is to assist the Product Support Manager (PSM) in identifying the product support strategy that achieves the optimal balance between Warfighter capabilities and affordability.

The Product Support BCA does not replace the judgment of a decision maker. Rather, it provides an analytic, standardized, and objective foundation upon which credible decisions can be made. The Product Support BCA should be a comprehensive, fair, and accurate comparison when evaluating multiple alternatives. It should take into account broad Department wide impacts and context throughout the analysis. The PSM prepares a Product Support BCA for major product support decisions, especially those that result in new or changed resource requirements. The Product Support BCA helps leadership with significant investment and strategic decisions across all applications of Product Support. For example, Product Support BCAs may support decisions on whether or not to transform business operations, develop a web-based training curriculum, develop solutions to any of the Integrated Product Support Elements (IPS Elements), or retire an asset.

1.1.1. Product Support BCA Structure

The Product Support BCA has three major elements: the purpose, process components, and quality foundation (see Figure 1). The BCA purpose identifies the problem statement, objectives, and metrics. The items of this element should clearly annotate what issue the BCA is attempting to solve and how success will be measured. The BCA process components are those subsections of the BCA that directly execute and report on analytical actions. The third major BCA element contains the supporting foundation of the BCA that directly affects the quality and completeness of the analysis. Background research, due diligence, governance, and data management and control underlie and prop up the entire process. Governance represents the oversight and enterprise wide context that helps to steer the analysis throughout the process. The three elements work together to ensure the Product Support BCA targets the relevant subject matter, credibly analyzes and reports the results, and integrates into the organization's mission and leadership's vision.

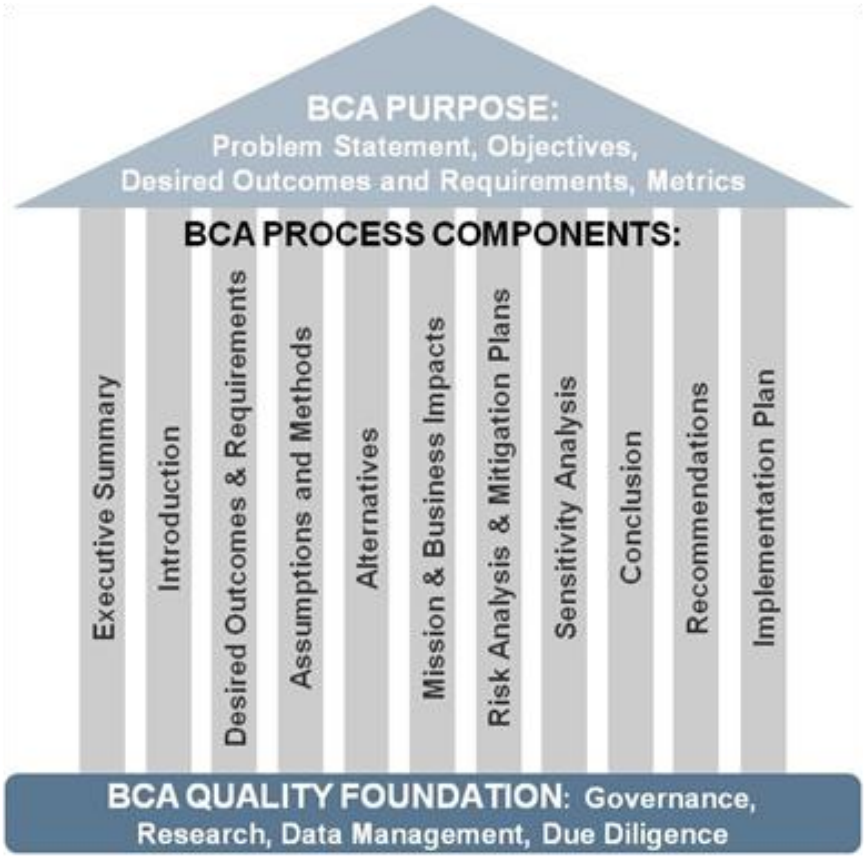

Figure 1: Product Support BCA Elements

1.2. Guidebook Purpose

The purpose of this guidebook is to provide a standardized process and methodology for writing, aiding decision making, and providing analytical decision support for a Product Support BCA. This guidebook is organized into two sections:

- **Introduction to the Product Support BCA**; providing the background, people, roles and responsibilities, and data management involved in creating a Product Support BCA
- **The Product Support BCA Process**; providing the method of preparing the Product Support BCA, including research, data analyses, and delivery of a Product Support BCA report

2. People

The People section provides guidance on assembling a Product Support BCA team. It addresses involving the right stakeholders at the kickoff meeting and assembling the Governance structure and board. While the PSM is statutorily responsible for the BCA, the conducting of a Product Support BCA is a team effort undertaken by experienced participants across a wide range of specialties (See Table 1). Many BCAs have an expert analyst as the team lead specific to the BCA effort. This does not relieve the PSM of his/her statutory position.[1] Each position identified

[1] Reference Appendix G, National Defense Authorization Act (NDAA) 2010 Section 805

in this section should be filled by highly competent and dedicated personnel who are given the resources, time, and money to fully and properly perform the tasks required. From the initial stages of accomplishing the background research and gathering the data, through the final stages of staffing the Product Support BCA for senior Department decision makers, it must be expected that conducting the Product Support BCA requires significant effort by all those involved.

2.1 Audience

This guide was designed for the Product Support Manager (PSM) as the primary user while also providing valuable insight to budget and business managers, senior decision makers, approval authorities, and stakeholders.

2.2 Sponsor

The sponsor is the primary decision maker. Depending on the size, scope, and sensitivity of the decision, it may be the Milestone Decision Authority (MDA), Program Executive Office (PEO), etc. The sponsor assigns the owner and uses Product Support BCA recommendations and findings to assist in decision making. The sponsor may help identify and agree to the uses of assumptions, constraints, and other metrics, most notably the weighting of factors' importance.

2.3 Owner

The owner of the Product Support BCA is most often the program office. The program office employee responsible for the Product Support Strategy BCAs of major defense acquisition programs is the PSM. The Program Manager (PM) is the primary executer of the actions and recommendations derived out of the BCA. Within the program office, the PSM has the responsibility to plan, develop, implement, and execute the Product Support Strategy, informed by the Product Support BCA.

The PM estimates the cost of conducting and obtains resources necessary for accomplishing the Product Support BCA. By statute, the PSM, while reporting to the PM, owns and is responsible for the Product Support BCA. To avoid a biased analysis to the maximum extent possible, the PSM should employ an objective, independent team to execute the analysis and provide the BCA recommendations. If an independent third party resource is not possible, the PSM should ensure objective analysis through maximizing structured analysis in a transparent manner.

2.4 Functions, Roles, and Responsibilities

Team effort is required to ensure the accuracy of analyses and viability of resulting recommendations. It is imperative that all program management team members and stakeholders understand individual roles and team efforts related to executing Product Support BCAs effectively.

There is a critical due diligence period when the PSM assembles the Product Support BCA team to plan the Product Support BCA. This effort includes the timeline, scope, assembly of the key stakeholders, etc. After this initial planning is complete, but before beginning the Product Support BCA, the team should meet with all the necessary stakeholders and SMEs. During this

kickoff meeting, the team should establish the intended outcomes, constraints, and methodology for conducting the Product Support BCA. Assembling the right stakeholders from the beginning is critical to the success of the Product Support BCA process and final outcome.

Table 1 describes the functions or roles of the individuals that should or may be involved throughout the Product Support BCA process. The levels of involvement will vary according to the type of Product Support BCA being conducted, the stage of the Product Support BCA writing process, and the organization.

Function/Role	Responsibility Description
Warfighter	Impacts on the Warfighter are the primary considerations of the Product Support BCA. As the user of the weapon system, the Warfighter is typically the ultimate beneficiary of the Product Support BCA. The Warfighter provides the performance requirements for the weapon system which are ultimately taken into account for the support strategy. The Warfighter also provides feedback on the system and support strategy.
Program Manager (PM)/ Product Support Manager (PSM)	The PSM, working for the PM, is responsible for the Product Support BCA. This includes overseeing the team that is conducting and writing the sections of the Product Support BCA. These roles are also defined by statutes.[23]
Governance Body/ Approval Authorities	Approval authorities provide directional guidance and concurrence throughout the Product Support BCA process on such matters as the problem statement, assumptions, constraints, data sources, risk mitigation strategies, etc. The governance body has the responsibility to ensure that the Product Support BCA strategy integrates an enterprise wide perspective. Normally, the governance board is determined by the impacts of the decisions being made, as well as, the PM's chain of command.
Business Analyst (Financial, Cost, and Budget analyst)	The business analyst has the analytical training and skills to conduct the majority of the Product Support BCA analysis. This includes the financial/cost analysis section, the analytical methodology for the Product Support BCA, and the conclusions and recommendations. The analyst conducts the funding analysis and budget plan with regards to the recommended Product Support BCA approach (see Section 10.2.3.).
Logistician (Requirements, Logistics, and Supportability Manager)	The logistician is responsible for ensuring the sustainment strategy, requirements, and performance measures are addressed in the Product Support BCA. Additionally, this person is responsible for completing the mission impact section, including assisting with the non financial analysis of the Product Support BCA.
Systems Engineering and Engineering Disciplines	This person validates that the alternatives under consideration are technologically plausible and comprehensive in nature to support the BCA's purpose.
Product Support Integrator (PSI)/Product Support Provider (PSP)	The PSI and PSP may provide subject matter expertise and consultation with regards to the attributes of the product support strategies and alternatives that are being explored in the Product Support BCA. The PSI is an entity performing as a formally bound agent (e.g., contract, Memorandum of Agreement, Memorandum of Understanding) charged with integrating all

[2] See Appendix G for Product Support BCA Policies, Statutes, and References

[3] Reference Section 2 of the PSM Guidebook, PSBM, Roles and Responsibilities, Product Support Arrangements, and Product Support Strategy and Implementation for further description on these roles

Function/Role	Responsibility Description
	sources of support, public and private, defined within the scope of product support arrangements to achieve the documented outcomes.[4]
Data Manager	The data manager is responsible for maintaining and keeping historical records of past Product Support BCAs. These records include research, performance outcomes, cost estimates and methodology, sources of data, etc. as recommended in the GAO report GAO-10-717 on O&S costs. Historical records maintenance is critical to future analysis, variance analysis, and future iterations of the Product Support BCA.
Legal and Contracts	The legal and contracting officers and managers review the Product Support BCA as an advisor concerning compliance with laws and regulations.
Subject Matter Experts (SMEs)	SMEs are recognized experts in the specialized knowledge applicable to the analysis and preparation of the Product Support BCA components (e.g., cost estimation, system requirements, risk analysis, etc.) This includes other relevant stakeholders that provide inputs to and impacts on the Product Support BCA analysis.
Other	This role is as required. The Sponsor or Owner makes the decision to bring this role into the Product Support BCA process.

Table 1: Roles and Responsibilities Table

3. Data Management

3.1 Data Management Introduction

3.1.1 Data Collection

Early in the life of a Product Support BCA, the program office should discuss and plan for locating, collecting, verifying, and using data within decision support products. The data collection should include both benefit/non-monetary factors, as well as financial data. The PSM should work very closely with the product support business analysts, logisticians, and contracting officers to ensure that the proper data is contracted for and executed from the beginning of the life cycle of the program. Likewise, due diligence for data collection and availability must be ensured from appropriate government sources. Not collecting the correct functional and cost data can reduce the effectiveness of the BCA and hinder, delay, or inhibit later decision making efforts. As the data is collected, the program office should execute a cohesive plan for archiving and efficiently dispersing the data to applicable stakeholders.

3.1.2 Access to Data

The program office should understand and specifically dictate from the beginning how the data will be made available for the PSM to conduct the Product Support BCA. This should be discussed and agreed upon by all parties following the ground rules for data rights management.

[4] Please see the Product Support Manager Guidebook for more information, Appendix G

For instance, will the data be provided via a web-access system, MS Excel, or verbally? Will it be provided in hard copy or electronically? If it is provided electronically, will it be in Excel or PDF? MS Excel is highly recommended not only for program office and analytical purposes, but also for higher level agency review and oversight.

3.2 Recommended Authoritative Data Sources

3.2.1 Authoritative Data Sources

The governance board should also approve the authoritative data sources from which the Product Support BCA team will conduct the financial and non-financial analysis. This is a critical component to the Product Support BCA and repeatedly cited as a weakness in existing Product Support BCAs by numerous GAO reports.[5] The criteria for the authoritative data source should be: accurate, comprehensive, consistent, timely, available, and accepted. This approval step may occur numerous times in the course of the BCA process as data sources are revealed.

Use the template below as an example for documenting data sources.

Data Element	Source	POC/Office	Contact Info	Date Data Generated	Used for. .
Example 1	Database 1	Person 1/Office	Email/phone	Date data was created	Data element used to calculate. . .
Example 2	Database 2	Person 2/Office	Email/phone	Date data was created	Data element used to calculate. . .
Example 3	Database 3	Person 3/Office	Email/phone	Date data was created	Data element used to calculate. . .

Table 2: Data source table

3.2.2 Data Control and Configuration

In addition to collecting quality and relevant data, the PM should encourage open book style accounting for both the organic and contractor support. PSMs should seek out and utilize information technology tools in order to automate and reduce the level of effort required to collect and analyze programmatic data. This ensures that the Product Support BCA team is able to access relevant information and compare like data points.

As a general note, research and data management is the responsibility of all the appropriate roles involved in conducting the Product Support BCA. Each functional area lead is the expert for their particular requirements and sources of data in order to perform their respective analyses. As such, each functional representative should spearhead the solicitation and configuration control of Product Support BCA data in conjunction with the data manager and other members of the Product Support BCA team.

Make efforts to only use non-proprietary methods in a Product Support BCA and ensure that all data and processes will be available to the program office so that subsequent iterations of the

[5] GAO 09-41: Improved Analysis and Cost Data Needed to Evaluate the Cost-effectiveness of Performance Based Logistics, December 2008

Product Support BCA may be accomplished or updated by the government or a contractor other than the original creator of the Product Support BCA. The government will have the rights to fully utilize the data and processes contained in a Product Support BCA in any manner and for any purpose the government deems proper, including but not limited to executing BCA recommendations and/or follow-on analyses.

PRODUCT SUPPORT BCA PROCESS

4. Product Support BCA Outline

The DoD Product Support BCA outline represents the standardized DoD Product Support BCA report. While a Product Support BCA is not executed in this linear format,[6] the report should follow this generic outline with tailoring for specific circumstances.

The outline of the DoD Product Support BCA is as follows:

1. Executive Summary
2. Introduction
    i. Problem Statement
    ii. Background
    iii. Scope
3. Desired Outcomes and Requirements
    i. Desired Outcomes
    ii. Requirements
4. Assumptions and Methods
    i. Ground Rules and Assumptions
    ii. Analysis Methods, Tools, and Rationale
    iii. Evaluation Criteria
5. Alternatives
    i. Current Baseline/Anticipated Initial Support/Status Quo
    ii. Alternatives
6. Mission and Business Impacts
    i. Benefits and Non-Financial Analysis
    ii. Cost and Financial Analysis
7. Risk Analysis and Mitigation Plans
    i. Risk Analysis
    ii. Mitigation Plans
8. Sensitivity Analysis
9. Conclusion
    i. Comparison of Alternatives
    ii. Summary of Results
10. Recommendations
    i. Specific Actions Based on Business Objectives
    ii. Implementation Plan

4.1 Executive Summary (Product Support BCA)

This section discusses drafting the Product Support BCA Executive Summary.

4.1.1 Product Support BCA Executive Summary

Decision makers often read and analyze the Executive Summary first, making it a critical part of the overall product support strategy documentation. The Executive Summary should be written

[6] Reference Appendix A, 2.0, page 42 for a Product Support BCA execution and process flow

last even though it is usually the first section read. The Executive Summary should be concise[7], identify the problem statement in question, and highlight key elements of the recommendation. It should summarize mission and business impacts, risk and sensitivity analyses results, as well as briefly address other important sections as required to help the reader quickly understand the BCA's product support strategy recommendation.

The Executive Summary provides the recommended solution and why it is recommended over the competing alternatives. It should include a reference to each rejected alternative and how it compares to the recommended alternative in costs and benefits, pros and cons, and other relative merits established in the Product Support BCA. This comparison can be portrayed as a balancing of tradeoffs among alternatives for a more robust recommendation.

Items within the recommendation section should minimally include:

- Key assumptions that drove the recommendation
- Brief description of the alternatives
- Description of the approach
- Summary of objective criteria and conclusions
- Description of the implementation plan at a level of detail necessary to support the recommendation

4.2 Introduction (Product Support BCA Main Body)

This section provides guidance on drafting the problem statement and background to begin the main body of the Product Support BCA. The introduction lays out much of the background and reasoning for conducting the Product Support BCA and helps to define the issue being addressed and supported by the analysis.

4.2.1 Problem Statement

The Problem Statement should provide an accurate and concise reason for conducting the Product Support BCA, as well as define the analysis framework for the current deficiencies, additional requirements, or opportunities for improvement. This statement should not assume a specific means of achieving the desired result. Rather, the Problem Statement contains an objective description of the desired end state or outcome (i.e., not biased toward any one alternative). Biases or unfounded assumptions in the problem statement undermine the analytical purpose of the Product Support BCA by jumping to conclusions.

Questions to consider as the team develops the Problem Statement include:

- What is the desired end state?
- What is the purpose of the analysis?
- What is the scope of the analysis?
- Who is the decision maker?

[7] Recommend this not exceed more than two pages in length

- What are the potential impacts to the enterprise?

Having a clear and well-defined Problem Statement provides a reference point to go back to throughout the analysis. After reading this section, the decision maker should understand the purpose of the analysis and the framework of its conclusion. The approval authorities or governance board should review the draft Problem Statement for validation at the Product Support BCA kickoff meeting. Such clarification can avoid unnecessary rework and ensure the analysis covers the assigned subjects.

4.2.2 Background

Provide necessary background on the organization, industry/market conditions, or other systems which create cost and performance drivers for the system being analyzed. Also include relevant background on historical precedents, previous BCA or product support strategy attempts, acquisition documentation such as AoAs, and stakeholders.

4.2.2.1 Previous Product Support BCA Results

If applicable, the Product Support BCA process should always build on itself to incorporate lessons learned and best practices from previous iterations of a Product Support BCA. For example:

- If this is a "Milestone C Product Support BCA," revisit and document the recommendation from the "Milestone B Product Support BCA"
- If this is five years after a Product Support BCA or prior to a change in the strategy, document recommendations from the previous Product Support BCA
- Document the recommendation implemented from the previous Product Support BCA, and compare to the alternatives as the current baseline

4.2.2.2. Research and Due Diligence

The Product Support BCA team members should conduct a large part of the research and due diligence prior to the Product Support BCA kickoff to help guide initial decision making, such as validating the problem statement, and throughout the process of conducting a Product Support BCA. In the beginning, the team members should gather data, interview SMEs, examine previous iterations of the Product Support BCA (if applicable), and collect other documentation according to the Product Support BCA outline and as needed throughout the analysis. This effort should include and emphasize the relationship between the product support decision and the capabilities, objectives, potential impacts, and possible fallout across the enterprise.

4.2.3 Scope

Scope is the range of coverage encompassed by the BCA along with several dimensions such as time and functional areas of sustainment. A few examples include software, integrated training products, depot repair, technical publications, obsolescence management, and supply chain. Boundaries define the scope precisely and provide rules for data, organizational influences, and personnel. Other areas of concern that influence the boundaries the BCA should include:

- Time and schedule
- Cost/Benefit
- Organizations

- Functions and positions
- Geographical areas, sites, and locations
- Technology
- Peace vs. Wartime operating environment
- Other categories that have a potential impact on the decision

4.3 Desired Outcomes and Requirements

This section provides guidance on gathering and documenting the desired outcomes and requirements. It also discusses the preparation that must go into conducting a Product Support BCA. Early understanding of the requirements and desired outcomes provides a target for which to pursue through the analysis process.

4.3.1 Desired Outcomes

Identify and document the Warfighters' desired outcomes rather than just the documented requirements. Identifying both the desired outcomes and requirements ensures that the desired outcomes are not buried in the details of the requirements. The Product Support BCA team and its stakeholders must come to consensus on the desired outcomes and periodically refer to them to stay on track. The governance board should concur with the desired performance outcomes in any deliverables to the sponsor.

4.3.2 Requirements

After identifying the desired outcomes, state the Program requirements. Some possible sources of the requirements may be the Key Performance Parameters (KPP), Key System Attributes (KSA), Performance Metrics already identified by the Capability Development Document (CDD), Capabilities Production Document (CPD), etc. Identify the KPPs and KSAs, including the range of KPPs and KSAs.[8] Performance Metrics must be addressed through the recommended approach and policy documents (i.e., Joint Supply Chain Architecture (JSCA) Metrics[9] and RAM-C manual[10]).

The documented outcomes and requirements may take the form of a Product Support Arrangement (PSA). A PSA is a generic term representing the range of implementing agreements, such as contracts, Memorandums of Understanding (MOUs), Memorandums of Agreement (MOAs), Commercial Service Agreements (CSAs), Service Level Agreements (SLAs), and similar formal agreements to ensure performance expectations (on both sides) are clearly articulated.

[8] See Life Cycle Sustainment Outcome Metrics from the Deputy Under Secretary of Defense for Logistics and Materiel Readiness for more information on KPPs and KSAs, Reference Appendix G CJCSI 3170.01 G JCIDS, Mar 09

[9] See JSCA metrics and benchmark guide, Appendix G

[10] See RAM-C manual at http://www.acq.osd.mil/sse/docs/DoD-RAM-C-Manual.pdf

4.4 Assumptions and Methods

This section provides guidance on documenting the ground rules, assumptions, and methodology of the Product Support BCA. Assumptions and methodology are two items to be explored early in the Product Support BCA process.

4.4.1 Ground Rules and Assumptions

4.4.1.1. Ground Rules

The ground rules document the Product Support BCA's known or dictated parameters and conditions. Prior to formulating assumptions, what is known with certainty should be stated under the ground rules: facts, laws, defined criteria, constraints, regulations, OSD, or Service guidance. Include any factor known to be true that may affect the current or future business conditions under consideration in the analysis.

Constraints are those factors known or discovered during the research and due diligence period, normally beyond the control of the PM or PSM, which bound the Product Support BCA analysis. The BCA team must understand these constraints before beginning the analysis. Constraints should be presented to the governance board and reader of the BCA. For example, funding constraints such as congressional mandates could qualify as a ground rule.

A non-exhaustive list of major Product Support BCA ground rules includes:

- Source of funding streams
- Legislation, regulations, and policy
- Financial data in constant or current dollars
- Directed inflation index
- Quantity of fielded systems
- Expected OPTEMPO and service life

4.4.1.2. Assumptions

An assumption is an informed position about what is true of a current or future state of affairs for a situation where explicit factual knowledge is unobtainable (i.e., inflation rates). Assumptions define aspects that are beyond the control of the BCA team. They are explicit statements about the conditions on which the BCA team bases the analysis.

After stating factors in the ground rules section, list the assumptions about what is not known, or about future states affecting business conditions. It is crucial to identify all key assumptions and gain stakeholder concurrence used in the Product Support BCA and critical for the risk or sensitivity analysis. Any non-concurrence by a stakeholder should be documented. Describe why a particular item is an assumption.

In the sensitivity analysis section, evaluate each major assumption for its impact on the Product Support BCA recommendation if the assumption is significantly off target. Omitting, changing, or misusing of an assumption can directly influence which alternative is recommended. A non-exhaustive list of major Product Support BCA assumptions includes:

- Financial metrics and inputs (inflation)

- Physical environment
- Operational tempo or contingency vs. non-contingency operations
- Expected useful life of a weapon system

4.4.2 Analysis Methods, Tools, and Rationale

Document the types of financial and non-financial analysis methods used and why. The Product Support BCA team should use guidance from OMB Circular A-94[11]: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (OMB A-94) on cost benefit analysis at all relevant points. As a general rule, the Product Support BCA team should include the following financial analysis metrics, tools, and techniques unless there is a documented rationale not to use them: Net Present Value (NPV), Payback Period, Break Even Point, Return on Investment (ROI), Internal Rate of Return (IRR), Life Cycle Cost (LCC), Time Value of Money Considerations (current or constant dollars and discounted dollars), Operating and Support (O&S) cost.

4.4.3 Evaluation Criteria[12]

One of the most critical and difficult components of a BCA is analyzing benefits in addition to cost, and thus making a final recommendation based on a set of evaluation criteria that enables a best value assessment. Best value is often defined as the intersection of performance and cost, based on specific criteria. The Product Support BCA team will establish the evaluation criteria for both financial and non-financial factors early in the process after conducting background research and obtaining approval from the governance body.

4.4.3.1. Quantitative and Qualitative Values

The Product Support BCA problem statement, requirements, and Warfighter desired outcomes should drive the evaluation criteria. All criteria should be numerical and may include both quantitative and qualitative criteria. Criteria may be inherently quantifiable, for example, financial benefits and cost per flight hour. Other criteria may require numerical transformation of a qualitative variable, for example, morale, maintainability, supportability, or customer satisfaction. The methods and rationalization for numerical transformation of subjective (qualitative) factors must be fully described. Evaluation criteria should be independent, relevant, discriminating, and clearly defined for the reader of the BCA.

Consider the following, non-exhaustive list of quantitative and qualitative benefits categories:

- Availability
- Reliability
- Supportability
- Operational tempo or contingency vs. non-contingency operations
- Expected useful life of a weapon system
- Manageability

[11] Reference Appendix G – OMB Circular A-94

[12] For more information on decision-focused thinking for the evaluation criteria, please refer to materials and classes offered by the Army Logistics Management College (ALMC), see Appendix G

- Sustainability
- Versatility
- Affordability (note: this is normally considered a cost variable but may be explored here as well depending on the analytical team's approach)

4.4.3.2. Scoring and Weighting

After identifying the quantitative and qualitative criteria, the governance board prioritizes the values for the criteria by agreeing on a scoring and weighting methodology such as Value Focus Thinking (VFT) and Analytical Hierarchy Process (AHP).[13] Establishing the scoring and weighting criteria ensures traceability for the next iteration of a Product Support BCA or auditing capabilities during a variance analysis. The scoring and weighting criteria should correlate to the Warfighters' and sponsor's identified desired outcomes and requirements.

4.4.3.3. Quantifying Qualitative Values

Financial costs are by their very nature quantifiable; however, benefits may be more qualitative in nature. Consider using SMEs to generate scores. When trying to quantify areas that are not easily quantified, always define the scores used. Always define and document the scoring system used and how the resultant the scores were applied in an evaluation. For example, morale could be rated as a 0 for "does not improve morale", 1 for "maintains current morale", or 2 for "improves current morale". The larger the span of ratings, the greater the difficulty in explaining what improvements an alternative would need to move up a point in the ratings scale. Any number of potential scoring methodologies can be devised. However, avoid situations where one alternative is rated 18 out of 20 and another is rated 19 out of 20 without any accompanying definition to show what made one alternative one point above the other. Another concern to consider is that not all benefits may be equally important to the decision maker, and should be prioritized and weighted accordingly.

4.4.3.4. Normalization

To compare benefits with different units of measure, score or poll them on a consistent scale (e.g., 1 through 10). Describe the scoring criteria for each benefit to identify how the benefit will be measured and how that measure will translate into a score. If there is uncertainty or disagreement on how to score any of the alternatives, address it in the sensitivity analysis to determine how it will impact the overall decision.

4.4.3.5. Rank Ordering/Prioritization

Establishing the weighting and scoring criteria is also important in cases such as, "Is the benefit of morale improvement equal to safety improvement?" or "Is safety improvement equal to targeting accuracy?" Just as in determining a rating scale, deliberately define the weighting scale. For example, a 100% weight means the benefit is "critical importance," a 75% weight indicates "above average importance," 50% shows "average importance," 25% shows "below average importance," and 0% means the benefit does not impact the recommendation.

If using SMEs to generate the scores, define and document the specific methodology and parameters in the Product Support BCA. Also identify the justification for differences in scoring

[13] For more information on VFT and AHP, please refer to materials and classes offered by the ALMC (Appendix G)

between alternatives based on specific factors or reasoning. Refer to the suggested methodology below:

1) Vote. Have each individual spread 100 points over the value measures based on the measures' importance and range.
2) Discuss significant differences. Have the "outliers" discuss their rationales.
3) Revote until the group agrees on the ordinal ranking of the value measures.
4) Vote again requiring each person's weights to follow the group's ordinal ranking of the value measures.
5) Average the weights (cardinal ranking of weights) and normalize so they sum to one.
6) Discuss significant differences. Have the "outliers" discuss their rationales.
7) Repeat these steps until the group agrees.

4.4.3.6. Sensitivity Analysis of Subjective Analytical Methods

Once the scoring and weighting is complete, evaluate the results to ensure that the results are not skewed or unrealistic. For example, if the results show that Alternative A scored 100 times greater than Alternative B, take a moment to ensure that the results are not artificially inflated in any one direction as a result of the scoring and weighting criteria.

Once the comparison and analysis is complete, summarize the significance of what the numbers indicate to help the decision maker make a final decision with a focus on value.

If there is any concern on the impact of the weighting and scoring criteria including unusually high or low data that skews results, neutralize it through sensitivity analysis by conducting an analysis on extreme ends of the numerical spectrum. This will help discern when decisions begin to change and tip the decision in one direction or another.

4.5 Alternatives

This section discusses how to develop, describe and choose a list of alternatives; brainstorming and drafting alternatives must be conducted early in the process.

4.5.1 Overview of an Alternative

For programs that already have official status, Figure 2 Sustainment Chart below displays a top level overview of key management items of interest. It contains a brief description of the program's plans, schedule, benefits, and costs. While this quad chart by itself does not provide enough information to conduct a BCA, it can provide a roadmap and starting point for deriving solutions to issues. It also provides a mechanism by which the Baseline alternative and other Alternatives (following section) can be described from a top level viewpoint. The quad chart easily organizes the alternatives as options with the trade space among these four sections. The supporting data backing up this chart is among the data used by the analytical team when performing the different phases of analysis.

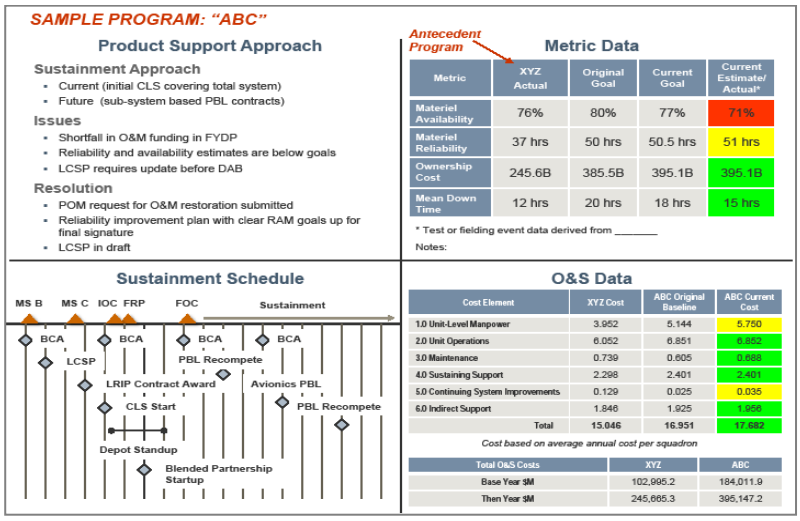

Figure 2: Sustainment Chart

4.5.2 Current Baseline/Anticipated Initial Support Status

Identify the performance and cost baseline of the program, organization, or system using the source documents or information that ultimately feeds the Sustainment Chart.[14] Describe the status and relevant attributes of the current state of affairs. The current strategy, operations and tactics that are being followed should be fully explained and rationalized. If no current baseline exists, only new alternatives exists. Once a BCA informs a decision maker and an initial decision is made to solve the problem statement, an initial support alternative exists by which to baseline off of. Use this baseline as the foundation for a documentation trail of changes during the next BCA and decision making round.

4.5.3 Development of Alternatives

4.5.3.1. Choosing Alternatives

Alternatives should include a wide range of all possible solutions from which feasible solutions for in depth analysis are selected. Possible alternatives could include:

- Government provided depot maintenance
- Contractor provided depot maintenance
- Various feasible combinations of depot and contractor maintenance percentages, such as 50–50, 25–75, or 75–25
- Various contract types
- Management functions and execution strategies
- Technical Data Rights Strategies

Consider extreme alternatives that may be tailored to inspire innovative alternatives such as no or low maintenance scenarios that may trade O&S costs with procurement costs. Identify the

[14] Refer to Appendix G, USD AT&L Policy Memo, "Strengthened Sustainment Governance for Acquisition Program Reviews", DTD 5 Apr 10, https://acc.dau.mil/CommunityBrowser.aspx?id=360875&lang=en-US

decision points, "when do costs and benefits occur?" and "when do they change?" When identifying alternatives, keep in mind that "all organic" or "all contractor" supported systems are rare, and are generally limited to mission driven operational environment factors (all organic) or commercial or commercial-derivative systems (all contractor). In reality, neither the organic nor commercial industry base possesses the resources, infrastructure, or the skills base to accomplish all sustainment functions for most defense systems. The Product Support BCA should avoid narrowly defined "all organic" or "all contractor" alternatives. The real alternative analysis focuses on achieving, for each of the IPS Elements required for sustainment, the best blend of organic and industry capabilities to arrive at a best value solution.

The alternative must identify the full time period to address the cost of the decisions and should not be constrained by appropriation categories. Identify and describe in detail the feasible alternatives to the current support method, including changes to the current state and any assumptions specific to each alternative. Alternatives concerning the source of work should include organic, commercial, and partnership arrangements. Alternatives should also include partnerships tailored to IPS elements at the component, sub-assembly, or system/platform level. Final alternatives must be realistic and assume the possibility of selection.

4.5.3.2. Validating Alternatives

An initial attempt at developing alternatives should be included in the kickoff agenda to obtain input from potential providers, improvements, and new or alternative approaches to satisfying the requirement. More alternatives may be added by the BCA team during or soon after the kickoff meeting. Document the filtering or pare down criteria to explain how the Product Support BCA team and the governance body chose which alternatives will be analyzed and considered throughout the Product Support BCA.

4.5.3.3. Using the Decision Matrix for Product Support (DMPS)

Product Support BCA alternatives can vary depending on a range of pertinent factors. These factors include the point in the system life cycle in which the Product Support BCA is accomplished, the scope of product support for the objective system, and considerations reflecting statutory, policy, guidance, or financial requirements. Figure 3, The Decision Matrix for Product Support (DMPS)[15], defines the potential range of product support strategies as defined by two key strategic system characteristics:

- Weapon system scope: the level at which readiness and sustainment outcomes are measured and managed at the platform, major subsystem, or component level
- Integration approach: the desired or required industry, organic, or blended (partnership) industrial capabilities

[15] Refer to Appendix G, the Product Support Manager Guidebook, for additional information on using the DMPS.

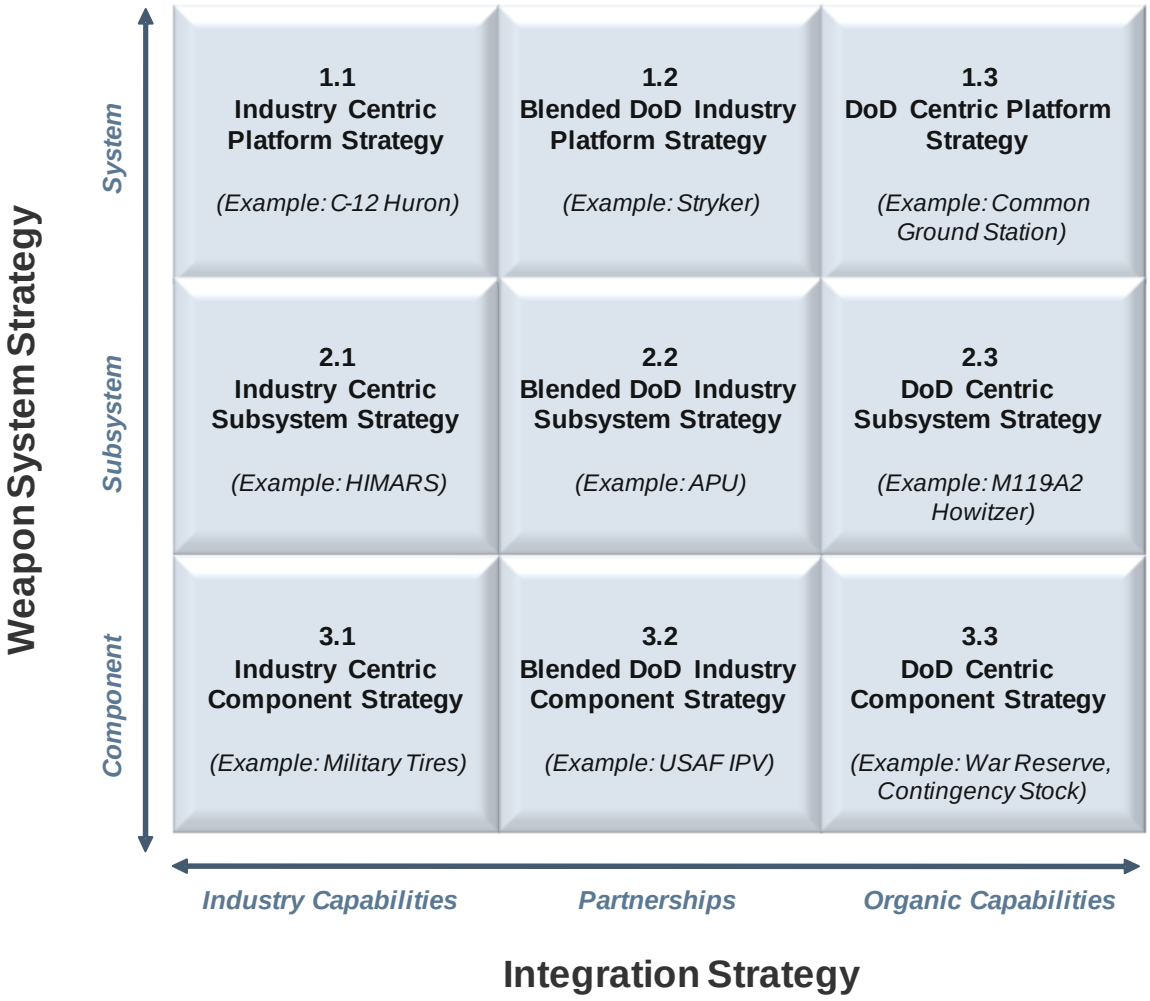

Figure 3: Decision Matrix for Product Support (DMPS)

While the DMPS portrays nine separate product support option blocks, a tailored best value product support strategy may be located at an infinite number of points within the 3×3 matrix framework. In that regard, the DMPS serves as an initial guide to the PSM outlining the boundaries of potential product support strategies.

4.5.3.4. Alternatives at Various Stages of Life Cycle

Product Support Alternatives (PSAs) will, to some degree, be dictated by where the system is in the life cycle. Early in the life cycle (between Milestone B and Milestone C), the PSM's focus is on sustainment planning. DoD policy does not require establishment of an organic depot maintenance capability until four years following IOC.[16] During the early life cycle design and development of the system there is a minimal amount of performance or supportability data. The early life cycle Product Support BCAs serve to initiate the Product Support BCA process, institutionalizing the collection and analysis of available data, and evolving the analysis as the amount and accuracy of data matures. As more and improved data becomes available, the

[16] Refer to Appendix G, DAG, Chapter 5 – Life Cycle Logistics (5.2.1.3. Key Depot Maintenance Analysis Elements)

Product Support BCA serves as an iterative, evolving tool to guide the planning and phasing of the best available options for product support.

When adequate data is sufficient to make a life cycle product support strategy decision, DoD regulations stress the importance of making the best possible use of DoD and industry resources at the system, subsystem, and component levels while maximizing the use of outcome based product support strategies. When a program's support strategy is under further assessment, the intent of the Product Support BCA is to derive the best value sustainment strategy for the objective system based on available competencies, capabilities, and cost while complying with Title 10 requirements for workload sourcing.

4.6 Mission and Business Impacts

This section provides guidance on conducting the analysis for the Product Support BCA.

4.6.1 Benefits and Non-Financial Analysis

The benefit analysis should focus on the non-monetary factors influencing the decision. To determine which benefits to include, stakeholders should assess which factors are most important for the desired outcome. JCIDS requirements found in CJCSI 3170-01G[17], enclosure B, should be explored in the Benefits and Non-Financial Analysis section of the Product Support BCA. These are Materiel Availability and Materiel Reliability. Ownership Costs is a third JCIDS requirement, but should be assessed in the Cost and Financial Analysis section of the BCA. Additionally, those other KPP requirements and other metrics that the program office deems important should also be included in the analysis. These should be tied to program requirements and parameters, such as schedule, technical performance, mission completion, etc. Benefits are frequently qualitative in nature, which injects a degree of subjectivity into the assessment. While this subjectivity sometimes cannot be avoided, it is important to ensure that the scoring and outcomes are traceable and repeatable as described in the Section 4.4.

4.6.1.1. Performance Data

Performance metrics are only as good as the supporting data. Data collected for the metrics needs to be timely, accurate, and meaningful. Metrics should conform to SMART: specific, measurable, attainable, relevant, and timely. The selected metrics should not be so complex that good data collection becomes too expensive and difficult to achieve. Existing data collections should be used whenever possible. Data collection methods should minimize burdens on the Warfighter and should not add significant costs to the logistics support providers.

4.6.1.2. Benefits and Non-Financial Analysis Methodologies and Strategies

The costs and benefits should be weighted using the criteria established in Section 4.4 Evaluation Criteria, to account for their relative importance. For example, if availability and customer satisfaction are both benefits being evaluated, the program office would likely determine that availability of the objective system to the Warfighter is twice as important to the BCA decision as customer satisfaction, and weigh it accordingly. It is important to document the weighting approach in the Product Support BCA.

[17] See Appendix G

The application of outcome or performance based strategies makes consideration of qualitative factors crucial to the Product Support BCA decision process. Most cost estimating methodologies apply consistent ground rules and assumptions (GR&A) factors across all alternatives and price them out based on cost of labor, cost of infrastructure, and other applicable cost elements. While it is important to have established GR&A to ensure uniformity in estimation and analysis, the evaluation of process efficiencies should not be eliminated from consideration. This requires flexibility in the benefits analysis.

The consideration of process efficiencies may play an important role in the results of the Product Support BCA. The BCA should not assume assignment of similar efficiencies to all sourcing alternatives. Rather, it should document and substantiate all analytical decisions for generating efficiency figures. Specifically, if one alternative is given credit for a more efficient process (such as fewer workers) as compared to other alternatives, this efficiency should be discussed in the BCA report and documented with substantiating material. Also, it should be referenced directly to the supporting mathematical BCA documentation where this figure is applicable. Likewise, those key processes that are assumed or set in the analysis to be equal should be also be explained and documented.

4.6.2 Cost and Financial Analysis

4.6.2.1. Cost Estimation

The objective of cost estimation is to compile and forecast the cost to perform the tasks associated with each IPS Elements, for each alternative, during a specified time period of analysis. Cost considerations must be included in every decision relating to the allocation of resources. The appropriate cost estimating method depends on the program being evaluated and the availability of data.

BCA acceptance depends largely on the credibility of the cost estimates. Therefore, an analyst must document data sources, provide the derivation of all costs, and maintain a clear audit trail. There are multiple sources available to provide additional guidelines and details on conducting cost estimates.[18]

At a minimum, the following guidelines should be observed in developing Product Support BCA cost estimates:

- Include all incremental, direct, and indirect costs to the taxpayer.
- Support the comparative analysis process by fully documenting the status quo (existing system) and providing its cost estimate.
- Include all relevant anticipated costs directly or indirectly associated with each feasible alternative over the life of the program. Show all resources required to achieve the stated objective. Estimate all future costs from the start of the earliest alternative (other than the status quo) through implementation, operation, and disposal for a program or project. In the disposal, include the cost of disposal, and/or residual value for the old unit.
- Ensure that cost estimates are consistent with the assumptions, ground rules, and objectives of the product support strategy.

[18] GAO-09-3SP Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs, March 2009 (See appendix G)

- Estimate all relevant future costs from inception through implementation, operation, and disposal for the program or project; not that all cost elements necessarily deserve the same weighted importance. If a cost associated with a certain element is very small and not significant to the program, spend an appropriate amount of time estimating this element. Devote the appropriate time to the more significant cost driving elements. The cost of an alternative includes the cost of operating the status quo programs until the chosen alternative is fully implemented.
- Do not include sunk costs as part of the evaluation, analysis, or recommendation.
- Disclose confidence levels per the Weapon System Acquisition Reform Act (WSARA) of 2009.[19]

4.6.2.2. Example Cost Estimating Methods

The engineering, parametric, analogy, and expert opinion approaches are four examples of cost estimating methods. The use of a specific approach varies with the amount and reliability of data available. Each approach may have positive attributes and limitations for a particular application.

- *Engineering Approach*. The engineering or bottom-up approach can be broadly defined as an examination of separate segments of work at a low level of detail and a synthesis of the many detailed estimates into a total. Estimating by the engineering method requires the analyst to have an extensive knowledge of the system characteristics such as the system design, the sustainment processes, and the sustainment organization. Break the system, activity, or item of hardware into its level components and make estimates of each component. An analyst may use different estimating methods in estimating the costs of some components. Combine the costs of the components and the costs of integrating the components to get the total system cost. The detailed knowledge required for an engineering analysis is not always available, making this approach the most difficult to apply.
- *Parametric Approach*. In parametric cost estimating, the cost is based upon physical attributes or performance characteristics and their relationships to highly aggregated component costs. For example, the total estimated cost of an item will depend on such things as size, weight, and speed. The lack of a significant number of data points can limit or preclude the use of parametric cost estimating. The results of a parametric estimate depend upon the ability of the analyst to establish valid relationships between the attributes or elements that make up the alternative and its cost. Therefore, properly choose and describe the Cost Estimating Relationship (CER). When documenting results that have used a CER, present the statistical characteristics of the CER, the source database, and all assumptions surrounding the CER development.
- *Analogy Approach*. The analogy approach is based on direct comparison with actual data, historical information of similar existing activities, systems, or components. The major disadvantage of this method is that it is a judgment process, requires considerable experience and expertise, and assumes that analogous systems are available. Use this method when the comparability of the analogous system and the product/process is well documented. The documentation should give a convincing argument that the product/process is similar enough

[19] Reference Appendix G for the full brief for additional context and details at http://thomas.loc.gov/; please search for S.454, Weapon Systems Acquisition Reform Act of 2009

to the source to make the analogy valid. A variation to this methodology is to make an adjustment to the source data to account for some variation in the estimate of the product/process. For example, if commercial vehicle data are used to estimate some aspect of a tactical vehicle, an adjustment could be made to the source data. Document the "adjustment technology" well so that there is no doubt about the methodology.

- *Expert Opinion Approach.* The expert opinion approach uses the judgment of an experienced individual or group. This method requires just as much rationalization and explanations as any other method. While estimates developed by expert opinion are occasionally both useful and necessary, they are normally highly uncertain and have a low confidence rating. Do not use expert opinion when time permits the preparation of a more thorough analysis. Do not use expert opinion as a convenient substitute for more scientific methods when such methods are available for use. If expert opinion is used, the documentation should contain the sources and qualifications of the opinion and a list of the attributes of the sources. One of the expert opinion methods used is the Delphi questionnaire. This method involves the query of expert opinion from a group. Seek information and supporting rationale from each expert independently. Summarize the results and send a report to each expert. Gather a second opinion after each individual reviews the report, and then summarize the results. Continue this iteration process for several cycles until there is a consensus, or near-consensus.
- *Other Approaches.* The Cost Assessment and Program Evaluation (CAPE) O&S Cost Estimating Guide references Actual Costs and Cost Factors as two additional approaches. Other cost modeling and analysis techniques also exist. The BCA report should have the proper description and documentation of all analytical techniques deployed in order to maintain the tenets of credibility, traceability and repeatability. Most often this intricate detail is contained in an appendix to the main body in written documentation and Excel/other mathematical tools. The main body of the BCA contains a top level description and review of the analytical techniques utilized.

4.6.2.3. CAPE Guidance on Cost Estimation

Cost and Financial Analysis should be captured according to the IPS Elements[20] and the CAPE Cost Elements[21], and customized according to where the weapon system is in the life cycle. Every category and cost element should be examined in order to collect the entire cost. This level of analysis should be repeated for each alternative.

According to the 2007 OSD Cost Analysis Improvement Group (CAIG) Cost Element Structure, the O&S cost element structure is divided into six major categories. The basic scope and intent of the six major categories should be retained, even if changes are made to lower level entries. The six major categories are:

- *Unit-Level Manpower*: Cost of operators, maintainers, and other support manpower assigned to operating units. May include military, civilian, and/or contractor manpower.
- *Unit Operations*: Cost of unit operating material (e.g., fuel and training material), unit support services, and unit travel. Excludes all maintenance and repair material.

[20] Please refer to Appendix G, the Product Support Manager Guidebook for more information on IPS Elements.

[21] Refer to Appendix G, O&S Cost-Estimating Guide is available at http://dcarc.pae.osd.mil/reference/osd_ces/O_S_Cost_Estimating_Guide_Oct_2007.pdf. Also see Appendix B for more information on how to accurately capture costs

- *Maintenance*: Cost of all maintenance other than maintenance manpower assigned to operating units. May include contractor maintenance.
- *Sustaining Support*: Cost of support activities other than maintenance that can be attributed to a system and are provided by organizations other than operating units.
- *Continuing System Improvements*: Cost of hardware and software modifications to keep the system operating and operationally current.
- *Indirect Support*: Cost of support activities that provide general services that cannot be directly attributed to a system. Indirect support is generally provided by centrally managed activities that support a wide range of activities.

Using IPS and CAPE elements, two sets of costs should be identified: one for non-recurring or investment costs and another for recurring costs. Once both sets of costs are identified, add them together for each year under consideration in order to come to the total cost. The total costs can then be used for other financial analysis (such as net present value).

4.6.2.4. All Relevant Comparative Costs: Life Cycle Cost

As discussed in the Defense Acquisition Guidebook, the LCC of a program consists of elements directly associated with the program plus other indirect costs that are "logically attributed to the program." [22] Include any incremental cost to the taxpayer that can be traced to an alternative when executing the cost portion of the BCA, regardless of agency, appropriation, or timing.

The Department is taking several new steps towards more thorough and accurate projections of collective systems' LCC in order for cost reduction efforts to be taken earlier within the Acquisition process. For example, LCC-focused estimates of cost for material alternatives during the Analysis of Alternatives (AoA) process will be conducted with the intent to strongly steer initial systems specification, development, and acquisition. LCC consideration and influence on the earliest system configuration, sourcing, and trade-off decisions should be made. LCC estimates and analyses that are built on AoA findings and continued as major decisions will play a major role in the evolution of design, development, and establishment of an effective life cycle sustainment program. For fielded and mature programs, comprehensive LCC measurement and analysis can help reduce costs and influence Product Support BCA factors for the performance capabilities of future upgrades and entire replacement of systems.

- The CAIG (now the Office of the Deputy Director, Cost Assessment (OSDDCA)) defines LCC categories in the Operating and Support Cost Estimating Guide of October 2007. The major categories include Research and Development (R&D), Investment, Operations and Support, and Disposal. They are summarized as:
    - *Research and Development*: Consists of development costs incurred from the beginning of the materiel solutions analysis phase through the end of the engineering and manufacturing development phase, and potentially into low rate initial production. Typically includes costs of concept refinement, trade studies, advanced technology development, system design and integration, development, fabrication, assembly, and test of hardware and software for prototypes and/or engineering development models, system

[22] Refer to Appendix G, https://acc.dau.mil/dag, Chapter 3: Affordability and Life Cycle Resource Estimates, section 3.1.5

test and evaluation, system engineering and program management, peculiar and common support equipment, peculiar training equipment/initial training, technical publications/data, initial spares, and repair parts associated with prototypes and/or engineering development models.

- *Investment*: Consists of production and deployment costs incurred from the beginning of low rate initial production through completion of deployment. Typically includes costs associated with producing and deploying the primary hardware; system engineering and program management; peculiar and common support equipment, peculiar training equipment/initial training, technical publications/data, and initial spares and repair parts associated with production assets; interim contractor support that is regarded as part of the system production and is included in the scope of the acquisition program baseline; and military construction and operations and maintenance associated with system site activation.
- *Operations and Support*: Consists of operating and sustainment costs incurred from the initial system deployment through the end of system operations. It includes all costs of operating, maintaining, and supporting a fielded system. Specifically, this consists of the costs (organic and contractor) of personnel, equipment, supplies, software, and services associated with operating, modifying, maintaining, supplying, training, and supporting a system in the DoD inventory. These costs may include interim contractor support when it is outside the scope of the production program and the acquisition program baseline. O&S costs include costs directly and indirectly attributable to the system (i.e., costs that would not occur if the system did not exist), regardless of funding source or management control. Direct costs refer to the resources immediately associated with the system or its operating unit. Indirect costs refer to the resources that provide indirect support to the system's manpower or facilities. For example, the pay and allowances (reflected in composite standard rates) for a unit level maintenance technician would be treated as a direct cost, but the (possibly allocated) cost of medical support for the same technician would be an indirect cost.
- *Disposal*: Consists of costs associated with demilitarization and disposal of a military system at the end of its useful life. It is important to consider demilitarization and disposal early in the life cycle of a system because these costs can be significant, depending on the characteristics of the system. Costs associated with demilitarization and disposal may include disassembly, materials processing, decontamination, hardware, collection/storage/disposal of hazardous materials and/or waste, safety precautions, and transportation of the system to and from the disposal site. Remember that there may be residual value or positive credit for resource recovery and recycling.

4.6.2.5. Appropriation Category Limitations

Initially, the Product Support BCA owner should not restrict or bind the requirements of the financial analysis according to the guidelines provided in the DoD Financial Management Regulation 7000.14-R, and should instead focus on capturing costs and benefits in accordance with OMB A-94 guidance. After conducting the analysis with the assumption of "colorless money," splay the costs across budgetary appropriations. If the appropriation category is a known limitation from your sponsor or other stakeholders, it should be identified as such under

the GR&As and mitigated in the Programmatic Risk (as a Funding Risk) section and the Implementation section of the BCA.

At the point of developing the recommendation, ensure the project plan includes steps for how the program office plans to fund and execute the decision. The PSM needs to ensure processes are in place to enable the PSM and PM to maintain an awareness of funding complexities such as when one category of funding goes up, another category of funding is forced down as a result. Although this may happen, there should always be a demonstrated savings that is mapped to the guidance provided by CAPE.[23]

4.7 Risk Analysis and Mitigation Plans

This section provides guidance on conducting a risk analysis and associated mitigation plans.

4.7.1 Risk Analysis

4.7.1.1. Risk Analysis in a BCA

Each risk should be separately reviewed and assessed by comparing and quantifying factors such as probability and impact of occurrence. Risk analysis is critical—the level of risk can be a factor in eliminating or reducing the value of an alternative that is otherwise highly evaluated. For example, a particular alternative PSP may evaluate highly due to attractive labor rates for a particular workload which requires highly skilled personnel. However, further data reflects that the PSP has insufficient manpower to accomplish the projected workload and must hire additional personnel in order to meet the requirement. The risk of hiring highly skilled personnel or training lower skilled personnel to accomplish the more complex workload is a significant organizational and technical risk, and could lead to concluding that an alternate PSP with higher labor rates but adequate in-place skilled personnel is the best value option.

4.7.1.2. Risk Classification

Risk should be viewed as an undesirable implication of uncertainty. Risk can be estimated in terms of probability of occurrence and impact of occurrence. In certain situations, probabilities of various outcomes can be estimated and the impact quantified. Risk can be classified as Business or Programmatic, Operational, Suitability, Process, Technical, Schedule, Organizational, Sustainability, Safety, and Environmental.

- *Business or Programmatic Risk*: Risk of undesirable consequences that affect the program's viability, affordability, and budget. For example, the unknown problems associated with managing product support providers; the risk associated with not anticipating all requirements when developing a contract and paying a premium for those requirements at a later date. Other examples include poor performance on behalf of a product support provider, cost growth, and extended labor disputes.
- *Operational Risk*: Risk to the Warfighters' ability to perform the mission as planned. Included in operational risk is examining the readiness and equipment performance. Examples are: How would other alternatives affect the risk to the overall operations, how do the alternatives increase or decrease wartime effectiveness, and is there any potential degradation across the operational spectrum?

[23] Refer to Appendix G, Operating and Support Cost-Estimating Guide of October 2007

- *Suitability Risk*: Risk to the availability and reliability of systems and support systems and the comparative impact to the combat or operation.
- *Process Risk*: The potential for undesirable performance in a newly established process that could cause failure to meet the anticipated performance or standards. An example of a process risk is a depot maintenance facility being unable to meet the requirements of a new process.
- *Technical Risk*: Risk associated with failing to develop or implement the technology necessary to institute process change or technologies that may render an alternative useless. Typically, technical risk increases with the use of immature technologies. Using systems engineering methodologies such as spiral development can mitigate some technical risks.
- *Schedule Risk*: Risk associated with time allocated for performing the defined tasks. This factor includes the effects of programmatic schedule decisions, the inherent errors in schedule estimating, and external physical constraints.[24]
- *Organizational Risk*: Risk associated with difficulties in implementing a change within an organization. Implementing an effective communication and change management strategy can mitigate organizational risks.
- *Sustainability Risk*: Risk associated with addressing the needs of the present at the cost of the needs of the future. The PM must consider whether the project can balance economics (i.e., profit), efficiency, environment, safety, and social responsibility (i.e., impact on local community) in the long term.
- *Safety Risk*: Risk associated with exposing personnel to hazardous work environments. Unsafe conditions endanger the human capital of the organization and create legal liabilities.
- *Environmental Risk*: The chance of harmful effects to ecological systems resulting from exposure to physical, chemical, or biological stressors which may adversely affect specific natural resources or entire ecosystems. Damage to the local environment can drain organization resources for clean up, litigation, and bad public relations.

4.7.1.3. Risk Prioritization

Risks are prioritized according to their potential implications for meeting the program's objectives. A common approach to prioritizing risks is to use a Risk Probability and Impact Matrix (see Figure 4, Sample Risk Probability and Impact Matrix). The specific combinations of likelihood and impact that lead to a risk being rated as high, medium/moderate, or low overall effect on a risk scale between 1 and 5 are usually set by the organization. Also provide a definition of the thresholds for high, medium, and low for the reader. There should also be a description of the impact of the risk on the program or system (e.g., time delayed in days, loss of funds, etc). The risk score helps guide and prioritize risk responses.

[24] http://www.dau.mil/pubs/gdbks/docs/RMG%206Ed%20Aug06.pdf

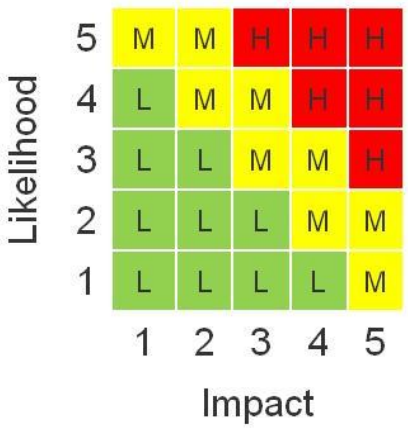

Figure 4: Sample Risk Probability and Impact Matrix

4.7.2 Mitigation Plans

After identifying, ranking, and prioritizing the risks, develop a mitigation plan. Adopting less complex processes, conducting more tests, or choosing a more stable supplier are examples of mitigation actions. Taking early action to reduce the probability or impact of a risk occurring on the project is often more effective than trying to repair the damage after the risk has occurred. Mitigation plans may involve making tradeoffs in capabilities, cost, schedule, and performance. If budgets are cut, certain tradeoffs will be made (reduced capabilities, delayed schedule, lesser accepted performance, etc.). To make fully informed decisions on which course to take, leadership needs to understand the risks in all these areas. Important components of the risk mitigation plan include roles and responsibilities, risk analysis definitions, and risk thresholds for low, medium/moderate, and high risks.

Risk mitigation implies a reduction in the probability and/or impact of an adverse risk event to an acceptable threshold. However, the program manager should be aware that in some cases there are follow-on effects of risk mitigation. Mitigating risk in one area may have adverse effects in other areas of the program. Mitigation may require prototype development to reduce the risk of scaling up from a bench scale model of a process or product. Where it is not possible to reduce the risk probability, a mitigation response may lessen the impact by targeting linkages that determine the severity.

Risk and risk mitigation strategies should inform and influence the sensitivity analysis section.

4.8 Sensitivity Analysis

This section discusses the sensitivity analysis section of the Product Support BCA.

4.8.1 Sensitivity Analysis

Sensitivity analysis is a repetition of an analysis with different quantitative values for cost or highly variable ground rules and assumptions to determine their effects for comparison with the results of the basic analysis. It is a tool that can be used for assessing the extent to which costs and benefits are sensitive to changes in key factors. Sensitivity analyses conducted on major unknowns for each feasible alternative can provide a range of costs and benefits that may

provide a better guide or indicator than a single estimate. It is not sufficient to present the decision maker with a set of alternatives whose costs and benefits are based on most likely factors and assumptions. The decision maker needs to be informed about how well the rankings hold up under reasonable changes to factors and assumptions. Describe how sensitive the costs and benefits are to changes.

Ensure sensitivity analyses are done as frequently as deemed necessary. It becomes more critical when a BCA does not favor any one alternative or there is significant uncertainty about a cost element, benefit, other parameter or assumption. Sensitivity analysis should explain what happens to costs and benefits if an underlying assumption changes or is wrong, or how certain changes in inputs have an impact on the output. Analyses should identify the "what if" scenarios or the confidence range for your analysis results. These can be performed using tools like Monte Carlo simulations, sampling of variables, and emulator methods. Assumptions and contributing factors can include length of system life, volume, mix and pattern of workload, future labor and overhead rates, etc. Sensitivity analysis can also be performed on subjective weighting and prioritizing aspects of the analysis, especially those components found in the Comparison of Alternatives section.

4.9 Conclusion

This section provides guidance on completing the analysis and comparing the results as input into the final recommendation for the Product Support BCA.

4.9.1 Comparison of Alternatives

Compare the baseline against the alternatives according to the selection criteria identified during the kickoff with the key stakeholders and approval from the governance body. Provide a value analysis that includes a narrative explaining the methodology and rationalization of comparison criteria. Finally, restate the methodologies and tools used to develop the conclusion. There may be a need for an incremental analysis approach for complex systems. The trade space among key analytical factors should be fully vetted and described in order to present a fully matured analysis and conclusions focused on providing the decision maker the richest understanding of the feasible choices and tradeoffs.

4.9.2 Summary of Results

Summarize all the results of all the different analyses conducted in the BCA, across all alternatives. This should be a list of all alternatives, along with pros, cons, risks, and additional findings/observations for each.

4.10 Recommendations

This section provides guidance on the final step of the Product Support BCA, completing the draft and making recommendation and its associated implementation plan. State the final recommendation on which strategy to choose and why that strategy should be chosen.

4.10.1 Specific Actions Based on Business Objectives

Recommendations provide closure to the Product Support BCA process and begin the transition to the selected product support strategy. Provide the rationale, justification, and supporting

information for each recommendation. Other pertinent information to include is a roadmap and implementation plan that includes time for validation and approval of Product Support BCA, documenting or archiving the Product Support BCA, determining gaps, and documenting other lessons learned.

4.10.2 Implementation Plan

4.10.2.1. Communications Plan

Without effective communication, key stakeholders in a project may miss out on vital information and may not understand the need for change. Customers might not be aware of the plans for a new way of doing business, and raise concerns about how the proposed alternative would meet their needs. The other military services, DFAS, or the Joint Staff may need to be informed of the Product Support BCA recommendation. Oversight groups such as OSD, OMB, Joint Staff, or Congressional staff may need to be informed or require approval of the Product Support BCA recommendation through the budget formulation process if not by any other means.

Provide a communications plan[25] for the proposed alternative. Focus on increasing integrated efforts, strategic messaging, and clear communication of desired actions. The best way to approach communication is to develop a clearly planned approach or strategy. Address the means, methods, and messages—including who will issue messages—along with a schedule for delivery. Explain the initiative to stakeholders and other parties impacted by the proposed new way of doing business.

Target Audience	Objective	Communication Tool	Responsible Party	Due Date	Costs?
Identify the Target Audience by considering the following: • Who will benefit from the project? • Who are the key stakeholders? • Who are the stakeholder groups and target audience within them?	What do you intend to communicate to the stakeholder groups? What are the key points stakeholder groups need to understand and act upon?	What communication methods and tools are most appropriate for the stakeholder groups? e.g., electronic, verbal, written	Who will be responsible for implementing each action?	When must the action be implemented?	What are the costs associated with each action?

Table 3: Communications Table

[25] Reach out to appropriate offices to assist with developing the communications plan (i.e., Public Affairs Office, Legislative Liaison Office, etc.)

4.10.2.2. Project Plan

Provide a project plan for the recommended alternative. With a well thought out, high level project plan, the PM or PSM will be able to communicate, coordinate the tasks, and manage the risks necessary for a successful transition throughout pilot, implementation and sustainment phases. The well thought out project plan may also help validate or uncover aspects of a recommendation that were not previously considered.

Implementation plans should have specific events tied to specific, achievable milestones that factor in technological, cost, and schedule risk. Ensure the plan includes steps for how the program office plans to fund the decision. Identify the type of approach to implementing the preferred alternative, for example one large project, a number of smaller projects or a combination of both. Brief the implementation or action plan with all stakeholders to verify that all necessary tasks are accounted for, are in their proper sequence, and are assigned to appropriate organizations or individuals. Product Support BCA preparers must make sure the implementation plan is consistent with scheduled costs and budgets elsewhere in the Product Support BCA.

4.10.2.3. Budget Plan

Provide a budget proposal in line with the Services' annual program and budget process in concert with the PPBE calendar based on the Product Support BCA analysis and recommendations. Identify the amount of funding required for each phase of the recommended alternative, identify the source for these funds, and the current funding status. Be sure to understand and account for any restrictions associated with these funding sources.

The budget plan should consider and address:

- What is the amount of funding from existing or previously submitted budgets for the existing operation that could be used for the new proposed operation?
- What is the amount of new funding, if any, needed to be requested by appropriation or major budget account?
- What is the rationale for requesting funds from these sources?
- What are the limitations on these funding sources?
- Will proposed funding require other existing or planned efforts or programs to go unfunded or have budgeted amounts reduced?
- What is the effect of funding impacts on organizations for the function or the organization proposing the new way of doing business?
- What is the risk of availability of funding source(s)?

5. Governance, Validation, and Approval

This section provides guidance on establishing the governance structure and body, as well as the validating and approving the Product Support BCA.

5.1 Governance

Establish a governance body with the relevant approval authorities at the kick off meeting. The governance body is normally tied to the sponsor's and PM's chain of command. This body will continue to provide guidance throughout the process. Additionally, this governance body also helps ensure buy-in during each step and major milestone of completing a Product Support BCA. The governance body should meet periodically at an agreed upon timeline in order to discuss progress, issues, and next steps. A non-exhaustive list of steps include: the purpose, GR&A, evaluation criteria, and all other critical factors contained within the BCA. The Product Support BCA owner should have this governance body in mind when writing the Product Support BCA. The periodic meetings should ensure that no stakeholder or approval authority is surprised by the final Product Support BCA recommendation.

The validation and approval of a BCA is ultimately dependent upon the decision maker. This and the following sections provide the BCA team insight that many decision makers request a wide range of diverse perspectives prior to and in support of making major decisions. The people and organizations representing this diversity are essentially the foundation for governance, validation, and approval type bodies.

5.2 Validation and Approval

The Product Support BCA owner should consider adopting the GAO comment procedure that can be seen in the appendix of most GAO reports. This provides the organization an opportunity to comment on the study or recommendations in order to avoid the "accept or reject" process. This streamlines the approval process that is repeatedly cited as one of the lengthiest process segments in completing a Product Support BCA.

The Product Support BCA sponsor should conduct a final review of the Product Support BCA and look for a Product Support BCA recommendation that is comprehensive, consistent, accurate, timely, and unbiased. The sponsor or the ultimate decision maker should document the reason for agreeing or disagreeing with the Product Support BCA recommendation. This final decision documentation serves as an archive, and combined with the Product Support BCA, provides the baseline for the next iteration of the Product Support BCA.

6. Documentation

6.1 Lessons Learned and Best Practices

The Program Office should require a step in the Product Support BCA process to capture the lessons learned and share the best practices across the DoD. The program office should document the results of the variance analysis and research the "why" of the results in order to pull out some valuable lessons learned and best practices for the process.

6.2 Documentation

The data manager is responsible for maintaining and keeping historical records of Product Support BCAs to include the research, performance outcomes, cost estimates and methodology,

sources of data, etc. This is a critical step to support subsequent iterations of the Product Support BCAs or a variance analysis as the program matures or requires additional analysis to support decisions as there is a change in the program strategy.

6.3 Revalidation Analysis of Product Support Strategy BCAs

At the five year mark or prior to a change in the Product Support strategy, the Program Office will conduct a ”revalidation” of the previous Product Support Strategy BCA.[26] The revalidation analysis examines the actual results versus the planned or estimated results and includes four primary categories of information: operations, cost, performance, and funding. Customize the variance analysis according to the stage of the life cycle and document the results in the next iteration of the Product Support BCA. The variance analysis creates a validation or check on the recommendation from the previous Product Support BCAs concerning Product Support Strategies and creates a more formalized lessons learned process. This process can also be followed for other applications of Product Support BCAs other than Product Support Strategies.

[26] Reference appendix G, NDAA 2010 Section 805

Appendix A – Product Support BCA Checklist and Phases

This attachment provides a guide for those responsible for preparing or reviewing the Product Support BCA. This checklist and process steps is provided as an initial guide for those responsible for preparing or reviewing the Product Support BCA. It is designed to enhance consistency in Product Support BCA products, and is not all-inclusive. Tailoring to the specific program and alternatives being assessed should be done.

A.1 Product Support BCA Checklist

1. Executive Summary:

    a) Does the executive summary adequately state the problem, study objective, and significant criteria, assumptions and constraints?
    b) Are the feasible alternatives clearly identified and differences explained?
    c) Is the recommended alternative adequately supported by referencing details of the analysis?

2. Introduction, Outcomes, and Requirements:

    a) Is the outcome clear and specific?
    b) Is the outcome realistic?
    c) Are any feasible alternative solutions excluded due to a bias in the objective statement?
    d) Is the objective, as stated, unbiased as to the means of meeting the objective?
    e) Are the expected outputs/accomplishments defined in quantifiable, measurable terms?
    f) Are criteria specified for selection of a preferred course of action?
    g) Is the objective statement phrased so that the type and variety of potential alternatives are not unnecessarily limited?
    h) Is the statement of the objective/problem well documented?
    i) Have performance measures and outcomes been identified which are appropriate for monitoring the business performance under the proposed new business plan?

3. Assumptions and Methods :

    a) Are all assumptions recognized and identified?
    b) Are the assumptions realistic, justified, and realistically supported?
    c) Are assumptions used only when actual facts are unavailable?
    d) Are assumptions unnecessarily restrictive, thereby preventing consideration of feasible alternatives?
    e) Do assumptions include economic life and future changes in operations requirements?
    f) Are key facts, ground rules, laws, DoD or Service policies, and other constraints stated?
    g) Are all assumptions pertinent to the analysis identified and rationale provided?
    h) Is a project time frame established?
    i) Are space, construction, furniture, and lab equipment needs included?
    j) Are necessary geographical constraints included?
    k) Are assumptions too restrictive or too broad?
    l) Are facts presented as assumptions? Can the facts be verified? Are uncertainties treated as facts?
    m) Are all assumptions/constraints well documented?
    n) Are methods, factors, evaluation criteria, and their approval process by the governance board clearly documented?

4. Alternatives:

a) Are all feasible alternatives considered?
b) Were alternatives rejected before a full analysis was adequately documented?
c) Are the alternatives significantly different as opposed to superficial restructuring of a single course of action?
d) Was the status quo used as the baseline for alternative evaluation?
e) Were other government agencies' capabilities to provide a product or service considered, where applicable?
f) Were contracting alternatives considered (including public private competition under OMB Circular A-76 or termination and consolidation of existing contracts)?
g) If appropriate, is lease versus buy evaluated as an alternative?
h) Are options applicable to each alternative presented?
i) If the project increases productive capacity, has a contracting alternative been examined?
j) Are the alternatives well defined?
k) Do alternatives overlap one another? Why?

5. Benefits and Non-Financial Analysis:

a) Have all project results, outputs, benefits, or yields been included?
b) Do the benefits relate to the project objective?
c) Are the benefits identified in measurable terms where possible?
d) Are benefits measuring techniques properly defined and supported?
e) Is benefit priority or ranking criteria clearly stated and used in the evaluation? Is any weighting scale consistently and reasonably applied?
f) Are negative results or outputs identified and adequately evaluated?
g) Is the list of benefits free of double counting?
h) Are secondary benefits (not related to the objective) identified?
i) Are all cost savings represented as a negative cost rather than as a benefit?
j) Are the benefits suitably tabulated, graphed, etc.?
k) Are the assumptions identified and rationale explained? Are they too restrictive or too broad?
l) Are estimating techniques defined? Are they appropriate?
m) Are information/estimation sources clearly identified?
n) Are data collection methods valid and adequate?
o) Are benefits estimating techniques valid?
p) If savings have been claimed, will a budget actually be reduced? Have the identified savings been fully coordinated with the impacted activity?
q) Have all advantages and disadvantages of the alternatives been identified?
r) Is expert opinion used? Were these experts properly qualified?

6. Cost and Financial Analysis:

a) Are cost and savings schedules realistic?
b) Have all incremental costs to the taxpayer, including common costs, been provided for each alternative?
c) Have cost estimates been provided for the status quo? Are they reasonable? Can they be verified?
d) Are all government direct and indirect costs included for each alternative?
e) Do investment costs include CAPE guidance, IPS Elements, etc.?
f) Are personnel costs all inclusive; that is, specific skill levels, fringe benefits, overtime and shift differentials, etc.? Are personnel costs broken out by rank/grade, number of employees in each category, etc.?

g) Are future equipment replacement costs included as investments as opposed to operations costs?
h) Are available asset values considered and are such values adequately documented?
i) Are cost collection and aggregation methods correct?
j) Are estimating relationships and procedures identified and properly supported?
k) Are program or project costs expressed in constant dollars?
l) Where inflation or cost escalation is used, have the factors been identified and validated?
m) Are cash flows discounted at the proper discount rate using OMB Circular A-94 guidance?
n) Are the sources of estimates identified? Are these sources accurate and appropriate?
o) Are cost factors current and supportable?
p) Is appropriate backup documentation, e.g., cost data sheets and variable explanation sheets, provided to support cost estimates?
q) Are cost estimates consistent with assumptions and constraints?
r) Has the life cycle cost estimate been provided for all feasible alternatives?

7. Risk:

a) Assuming that a risk analysis has been performed, how were the probability estimates derived?
b) Has an uncertainty analysis been performed? What technique was used (for example, a fortiori or contingency analysis)?
c) Were ranges of values used for unknown quantities?
d) Were point values varied to illustrate impact?
e) Have all relevant "what if" questions been answered?

8. Sensitivity Analysis:

a) Were the effects of possible changes to the objective requirements evaluated?
b) Has a sensitivity analysis been performed to show the impact of changes in dominant cost elements? Examples are length of economic life; volume, mix or pattern of workload; requirements; organizational structure; equipment, hardware, or software configuration; or, impact on the length of time for project completion. If no sensitivity analysis has been performed, why not?
c) What do the sensitivity analysis results imply about the relative ranking of alternatives?
d) Would the recommendation stay the same if a given characteristic varied within a feasible range?

9. Conclusion and Recommendation:

a) Do the comparison and selection criteria agree with those in the project or mission objective statement?
b) Does analysis data clearly support the recommendation?
c) Were alternative selection criteria applied consistently?
d) Were cost and benefit data suitably displayed to accurately depict relationships?
e) Were the alternatives compared to a common baseline (minimum requirements level)?
f) Were alternative comparison techniques suitable for the program project being evaluated; that is, present value, payback period, uniform annual cost, etc.?
g) Was a specific course of action recommended?
h) Does the analysis seem free of bias in favor of a particular alternative (for example, no benefits indicated for one or more of the alternatives, biased assumptions, etc.)?
i) Are the recommendations logically derived from the material?
j) Are the recommendations feasible in the real world of political or policy considerations?
k) Are the recommendations based on significant differences between the alternatives?
l) Do benefits exceed relevant costs for the preferred alternative?

m) Have all significant differences between the recommended alternative and others been emphasized?
n) Does the communication plan show a reasonable plan for spreading the word about the proposed business process to all affected parties?
o) Is there a project plan that spells out in sufficient detail the actions different offices or organizations must take to implement the new way of doing business?
p) Does the plan include reasonable steps that are sequenced in proper order to get from the "as-is" to the "to-be" state of business?
q) Do steps in the action plan acknowledge any barriers to implementation and allow time and a reasonable plan of action to overcome implementation barriers?

10. Documentation:

a) Are the costs thoroughly documented in appendixes so an independent reviewer may replicate it?
b) Is it possible to trace costs to their basic inputs, units of measure, sources derived from, and as of date for any special rates or factors?
c) If costs, assumptions, or other input to the estimate is based upon expert opinion, does the supporting documentation include the individual's office symbol, email address, and phone number?
d) Will the Product Support BCA "stand on its own?"
e) Will an independent reviewer be able to reach the same conclusion?

11. Coordination:

a) Has coordination of all participating offices and organizations been obtained?

12. Sustainability:

a) Is the project economically viable?
b) Is the project energy and resource efficient?
c) What is the program's potential environmental impact?
d) What is the program's plan and mitigation strategies for potential environmental impacts?
e) Is the project safe for workers and end users?
f) What is the impact to the local community?
g) Does the project consider the 6Rs of closed loop material flow (Recover, Recycle, Redesign, Reduce, Remanufacture, and Reuse)?
h) Does the project consider the 7 Elements of Sustainable Manufacturing (Cost, Resource Consumption, Environment, Health, Safety, Waste Management, and Local Community)?

A.2 Product Support BCA Process Flow

The following process flow provides a visual representation of the general steps necessary to complete a Product Support BCA. This is provided for illustrative purposes. Tailoring of the process must occur to meet the needs of the stakeholders and sponsor.

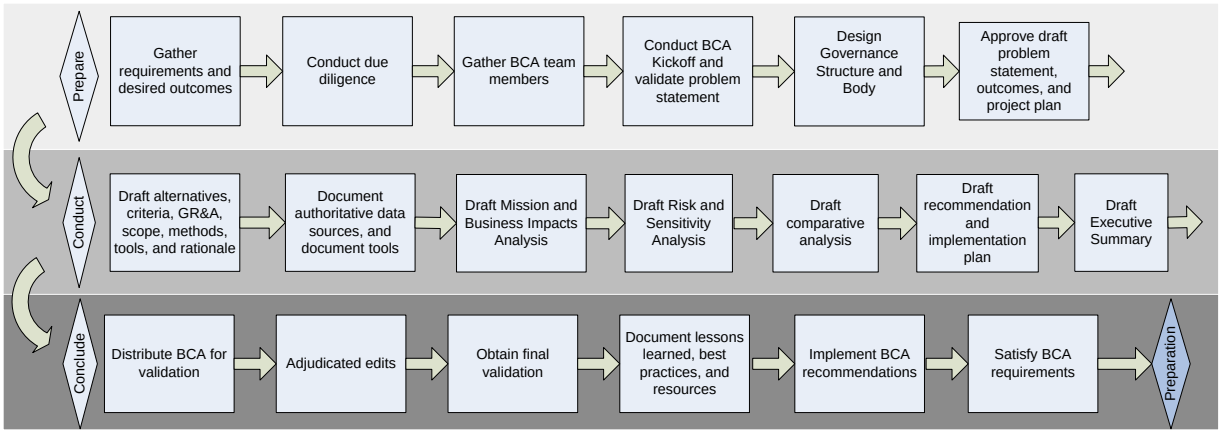

Figure 5: Product Support BCA Flow Process

Appendix B – Guidelines for Capturing Cost

The guidelines for capturing cost should follow the Directive Type Memorandum (DTM) 09-007, "Estimating and Comparing the Full Costs of Civilian and Military Manpower and Contract Support," released by the Office of The Secretary of Defense on January 29, 2010.

The DTM establishes business rules, required by Deputy Secretary of Defense Memorandum, in accordance with the authority in Deputy Secretary of Defense Memorandum, for use in estimating and comparing the full costs of military and DoD civilian manpower and contract support. The full costs of manpower include current and deferred compensation costs paid in cash and in kind as well as non-compensation costs.

The full DTM can be found at:
https://acc.dau.mil/GetAttachment.aspx?id=348579&pname=file&aid=48987&lang=en-US.

Appendix C – Product Support BCA Timeline and Life Cycle

Per FY2010 NDAA Sec. 805, Life Cycle Management and Product Support, conduct a Product Support BCA every five years or prior to a change to the strategy. Each iteration of a Product Support BCA should build on the previous Product Support BCA and use the previous Product Support BCA's recommendation as the baseline to compare alternatives.

The levels of detail in the Product Support BCA differ according to where the program is in the life cycle, as shown in the diagram below.

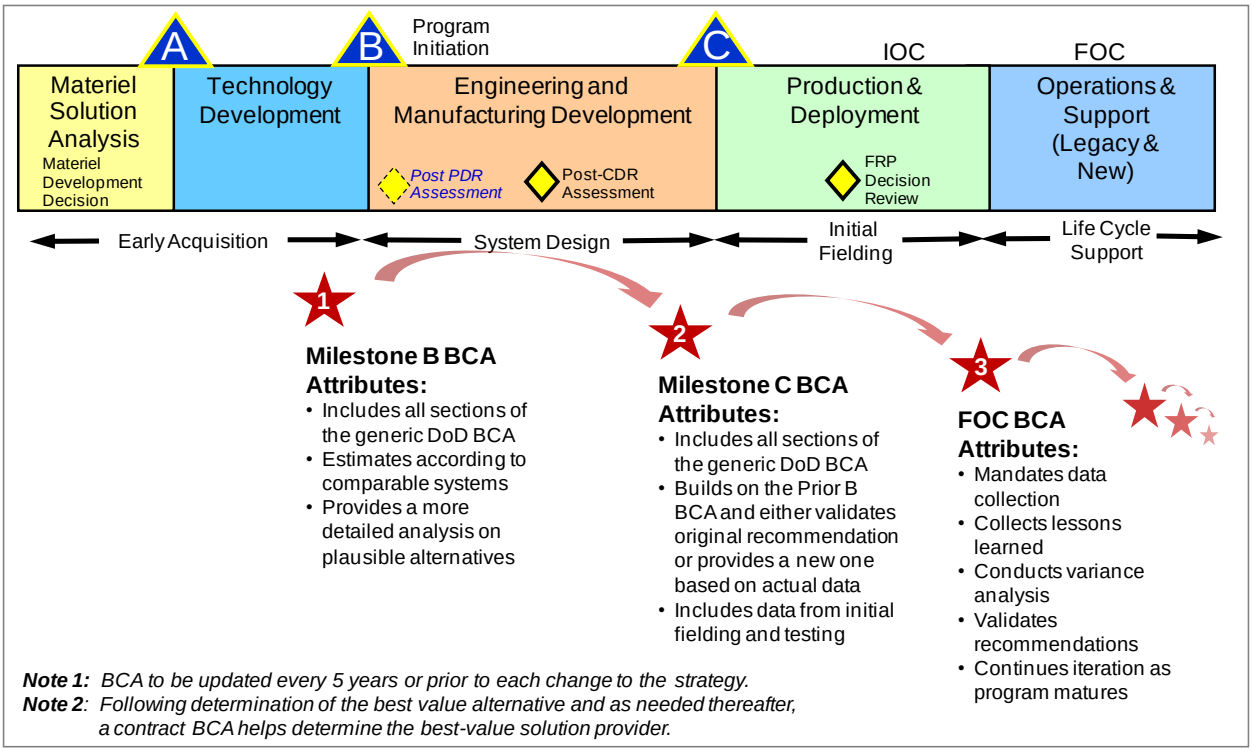

Figure 6:Product Support BCA Schedule throughout the Life Cycle

Product Support BCAs are accomplished throughout the life cycle. The data, factors, alternatives, and purpose of the Product Support BCA evolve consistent with the point at which the analysis is performed within the life cycle. For example, a Milestone B Product Support BCA, accomplished concurrent with the approval of a defense system program office, is necessarily constrained by the lack of real world performance, supportability (reliability, availability, and maintainability), and cost data, making it highly reliant on analogous data (if available). It is important to conduct a Milestone B Product Support BCA to the best of the PSM's ability and carefully document all assumptions. At Milestone B there is most often no in-place organic support infrastructure. The development system is almost entirely reliant on the commercial development OEM (Original Equipment Manufacturer) for sustainment throughout the design, development and most of the production phase for the program. A Milestone B Product Support BCA initiates and institutionalizes the resources, skills, and process infrastructure to collect, compile, update, and analyze the requisite data as it grows and matures. Each iterative updated Product Support BCA will improve the ability of the PSM to identify and compare viable product support strategy alternatives when sufficient data accuracy and

availability will enable a life cycle decision support strategy analysis. In that context a Milestone B Product Support BCA will utilize the same format and section content as subsequent Product Support BCAs, but will contain much less detail and will reflect "placeholders" or assumptions for content until better data becomes available.

A Milestone B Product Support BCA will establish the Product Support BCA framework and process for a program. A Milestone C Product Support BCA, with available test and evaluation data, will begin to identify the viable sourcing and support alternatives, and accomplish initial analysis of those alternatives sufficient to develop the scope of the product support framework and the identification of the key performance and supportability outcomes appropriate to the objective system. As organic infrastructures are established, the Product Support BCA is the primary means by which the public private partnerships and best competency, best value workload sourcing decisions can be accomplished.

Given that the product support alternatives vary as the life cycle evolves, there is no standard set of alternatives for a Product Support BCA, such as "organic," "contractor," or "partnership." For acquisition programs the alternatives, to a great degree, will materialize through the Product Support BCA process as it is used to assess the IPS elements required for sustainment of the objective system. The merits of various sourcing and partnering options will be identified as capabilities, infrastructures, costs, supportability, and performance data are accrued and analyzed.

The comparison includes a cost benefit or cost effectiveness analysis of the alternatives and compares them in a methodical manner, preferably in conjunction with a financial analysis such as discounted cash flow. The analysis considers the long and short term impacts (quantitative and qualitative) and risks to the whole organization or business (e.g., increased throughput/higher productivity, reduced logistics response time). It considers the broad implications of implementing each alternative, including local and global implications as well as immediate and future costs and savings.

A Full Operational Capability (FOC) Product Support BCA requires an analysis of the impact on the program as a whole, as well as the quantitative and qualitative ramifications of the alternatives described within the initiative. It considers the broad implications of the implementation of each alternative, including local and global implications as well as immediate and future costs and savings.

Acquisition and early operational fielding BCAs are primarily used to select a product support strategy. Later Product Support BCAs (e.g., out of production legacy systems, etc.) are generally used to assess changes from the current product support strategy. In that sense, the process is simplified by the following characteristics:

- There is a current status quo baseline in place
- The identification of alternatives is less complex
- There is mature data on cost, performance, and supportability
- The shortcomings (and benefits) of the status quo baseline are well known
- The opportunities for improving performance and supportability while reducing cost are more tangible

Given a status quo baseline (existing support strategy and support provider(s)), known performance, known deficiencies, and known cost of support, the objective of the Product Support BCA is to assess the feasibility and viability of changing the product support strategy (to include a change in Product Support Provider(s)) to achieve:

- Improved readiness
- Improved sustainment
- Improved mission effectiveness
- Reduced cost

The alternatives will always include the status quo baseline and one or more alternatives generally characterized as alternative sources of support (i.e., another organic organization, an organic-commercial partnership). The Product Support BCA will primarily focus on a quantitative (cost) analysis, because the consideration of any qualitative process efficiencies will inherently be included in the cost proposals from the alternative support providers. For example, if the status quo baseline is $100M over the next 5 years with performance at *x* level, then the Product Support BCA would evaluate the cost of alternative sources *a*, *b*, *c*, etc. willing to be held accountable for meeting *x*+ performance. An alternative source cost lower than the status quo ($100M) yet fully accountable for improved performance would be a de facto better support strategy alternative. And, since an *x*+ level of performance is included in their cost, the process efficiencies necessary to achieve that level of performance are inherent in their price.

Appendix D – Analytical Tools

The following table of analytical tools was in response to the November 2009 Weapon System Acquisition Reform Product Support Assessment (WSAR-PSA) report requirements. The PSAT compiled this list from different software, analytical techniques, guidebooks, processes and best practices across a wide variety of sources all concerning the analysis of financial and logistics investment and strategic decisions. Continued work is ongoing to produce an interactive and intuitive web based version to provide the analyst a quick, useful repository for finding the right tool for the right analysis, at the right time. This appendix is the first issuance of the data pull and is intended to be utilized as a reference only. At the time of this guidebook's publishing, there is no endorsement by USD AT&L for or against any of these items presented in this appendix. This appendix should be viewed strictly as informative in nature. Any analytical tools used by analysts should still be vetted, reviewed, and approved through appropriate channels consistent with all other professional work performed.

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
1	Facilities Acquisition Management Program	Model is a spreadsheet based tool, developed and in use for past 12 years. Complexity level is moderate to low.	FAPM model forecasts NAVFAC's annual costs to execute customer funded BOS, SRM, and ENV contract workload.	NAVFAC
2	Base Operating Support (BOS) Model	BOS Performance/Pricing Model links resources (input) to performance (output) for 8 mission capability areas, 23 functions, and 107 sub-functions.	An accredited BOS model will provide more accurate, and more defendable BOS requirements. An independently accredited BOS model will enable decision makers to identify risks and opportunities while evaluating different levels of service.	N46
3	OPOM (Ordnance Programs Optimization Model)	Ordnance OM,N requirements across FYDP in three major categories. WSS (Manpower), QE (Reliability), and Maintenance (Availability)	Assess Ordnance requirements against CNO War planning goals for sufficiency and War fighter goals for Effectiveness. Model correlates funding impacts on system readiness, outputs include budget exhibits and spend plans and various metric reports.	OPNAV N41
4	Airframe Depot Readiness Assessment Model	Ability to meet CNO Goals "C" Rating	Assess budget requirements	OPNAV N432
5	Engine Depot Readiness Assessment Model	Ability to meet CNO Goals "C" Rating	Assess budget requirements	OPNAV N432
6	Flying Hour Projection System	Budget Quality Output	Integrate the Hours with the Pricing to develop a requirement	OPNAV N432D
7	Flying Hour Resource Model	Hours/Readiness	Provide hours to Flying Hour Projection System	OPNAV N432D
8	SEDRAM (Support Equipment Depot Readiness Assessment	The model produces the total cost, cost per each subcategory and deferred maintenance.	Used to simulate the readiness impact of funding decisions: Readiness status of SE inventory and Cost of SE repairs	OPNAV N432G/NAVAIR 6.7.2

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
	Model)			FRC SEFAC
9	CALIBRATION COST ESTIMATOR FOR AVIATION READINESS (CESAR)	"What if" Analysis CNO Objectives/Metrics (Fleet Response Plan, TMDE Availability, Laboratory Readiness) wrt OMN Funding	Forecasting of NAVAIR 1C7C OMN calibration requirements	OPNAV N432G AIR 6.7.6.3 (METCAL PM)
10	1B4B Ship Maintenance Summary	Ability to meet CNO Goals Ships Ready For Tasking	Assess programming and budget requirements and risk	OPNAV N431D
11	Mission Funded Naval Shipyard Model	Requirement (Overhead Non-labor, Direct and Indirect Workforce FTE, Direct Non-labor) to execute assigned Workload	Calculate and Assess Maintenance requirements	OPNAV N431C
12	Mission Funded Regional Maintenance Centers Model	Requirement (Overhead Non-labor, Direct and Indirect Workforce FTE, Direct Non-labor) to execute assigned Workload	Calculate and Assess Maintenance requirements	OPNAV N431G
13	TYCOM Ship Maintenance Model	Requirement (CNO Availability, Continuous Maintenance, Emergent Maintenance, & Other Maintenance) to execute Ship Class Maintenance Plans	Calculate and Assess Maintenance requirements	OPNAV N431M
14	V & H Ship Operations Model	Ship Operations Requirement to train and operate ships and submarines as required to support FRP A_o. Controls. Budget exhibits, SNaP Report.	Calculate Operations requirement, allocate fiscal controls, and create budget exhibits.	OPNAV N431/USFF N40

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
15	Aegis Optimization Model (AOM)	Shipboard Spares Allowance List	(1) Generate Readiness Based Sparing (RBS) List to optimize Operational Availability (A_o) at minimum cost (e.g., Shipboard Allowance, Installation and Checkout). This model can also optimize A_o for available storage space and/or weight limitations. (2) Assess potential system A_o for existing shipboard spares assets. (3) Determine probability of sustaining system operation for *x* (any set period) days with existing spares complement or other defined spares complements.	NAVSEA, PEO SHIPS FL [Model developed by Lockheed Martin. Navy has unrestricted government rights.]
16	Tiger-Availability Centered Inventory Model (Tiger-ACIM)	Shipboard Spares Allowance List	Generated Shipboard Readiness Based Sparing (RBS) List to optimize Operational Availability (A_o) at minimum cost.	NAVSUP, Mechanicsburg, PA
17	Multi-echelon Model	Wholesale Spares List	Generated wholesale level spares list that optimize Operational Availability (A_o) at minimum cost.	NAVSUP, Mechanicsburg, PA
18	Fleet Logistics Support Improvement Program (FLSIP) familyof models	Wholesale Spares List	Generated wholesale level spares list. This is a demand-based model.	NAVSUP, Mechanicsburg, PA
19	NAUTILUS Model		Life Cycle Spares Management and Life Cycle Sustainment Cost Projection Model. Following is a list of products: (1) Wholesale spares pipeline requirements/cost by year for total life cycle. (2) COTS/NDI life time support management tool, taking into account production window, repair support window, fielded systems lifetime support window, and asset re-use. (3) Diminishing Manufacturing Sources and Material Shortage (DMSMS) requirements and alternate solutions analysis. (4) Cost Of Ownership analysis. (5)	Technology Service Corporation, Fairfax, VA

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
			Spares budget submissions and substantiation. (6) Return On Investment analysis. (7) Performance Based Logistics (PBL) contract spares level determination and spares quantities risk assessments. (8) PBL/Business Case Analysis (9) Alternate maintenance approach cost trade off analysis.	
20	QuARTPRO	MTBF and Sparing Analyses	Data to determine sparing levels	NSWC Crane/WXM QL
21	Relex Reliability Studio	Reliability Block Diagrams/LCC analysis, etc	Model the reliability of systems and determine/forecast LCC	NSWC Crane/WXM QL
22	Crystal Ball	Monte carlo simulations and outputs	Model the probability of outcomes for multiple variables	NSWC Crane/WXM QL
23	"@Risk"	Decision support SW simulations	Simulations to support decisions	NSWC Crane/WXM QL
24	Microsoft® Excel	Model of system LCC, TOC, BCA, ROI, etc.	develop custom tool to determine LCC, TOC, BCA, ROI, etc.	NSWC Crane/WXM QL
25	Relex/217plus	RMA	Predictions	NSWC Crane/WXM QL
26	LC2 from a Jim Jones Class (Logistics Management Associates)	Life Cycle Costing	Assist in predicting potential costs that may be incurred during ownership of an item or equipment	NSWC Crane/WXM N
27	Horizon Solutions Suite	Diminishing Manufacturing Sources and Material	The tool is used to monitor the life cycle status of parts (both Commercial-off-the-Shelf (COTS) and Mil-Spec),	NSWC Crane/GXQ

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
		Shortages (DMSMS)	project system supply availability, assist with sustainment approaches, project cost of solutions alternatives, and manage DMSMS cases and metrics.	R
28	SLICwave	Maintenance Planning, provisioning, Reliability/Cost Tradeoffs	Logistics Support Analysis Modeling	NSWC PHD VB S41
29	Virtual Safety, Effectiveness, & Affordability Review (VSEAR)	Metrics for Safety, Effectiveness, Affordability	Review of Lifecycle issues impacting system safety, effectiveness, and affordability	NSWC PORT HUENEME DIVISION
30	Extend 7	Life Cycle Cost estimate	Life Cycle Cost	RMS
31	Aceit	Life Cycle Cost estimate	Life Cycle Cost	RMS
32	Simulation Assisted Reliability Assessment	Reliability Estimates	Reliability Modeling	University of Maryland, Center for Advanced Life Cycle Engineering
33	MOSS Model	Life Cycle Cost estimate	Life Cycle Cost	
34	OMODFF	Provisioning Estimate	Provision Depot Spares for SM	RMS
35	ILMF Resource Model	ILMF Resource Requirements	Determine Resources Needed	RMS
36	Logistics Model	GFM Requirements	Determine Resources Needed and Supply Chain Activity for Missile Assembly	RMS
37	Consolidated Obsolescence Management and Part Availability Support System (COMPASS)	Obsolescence "health" of STANDARD Missile (or other systems that may use this model)	Track and display the obsolescence "health" of the system down to the piece part level.	RMS

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
38	Future Obsolescence Cost Analysis System (FOCAS)	Future cost of NRE to resolve obsolescence issues	Project the cost of NRE to resolve obsolescence issues	RMS
39	Budget Line Item Stratification System (BLISS)	Stratification data for STANDARD Missile components	Stratify STANDARD Missile components for development of the program's spares budget	NSWC PHD
40	Computer Aided Spares Budget (CASB)	P18 forms for STANDARD Missile spares budget	Produce P18 spares budget forms for STANDARD Missile	NSWC PHD
41	JOINT SEMI-AUTOMATED FORCES	The Joint Semi-Automated Forces (JSAF) system is an Air Force modeling-and-simulation application employed in various war games by the War Gaming Department at the Naval War College.	The Battlespace Applications Branch (5.4.2.2) uses the Joint Semi-Automated Forces (JSAF) Model to provide positional and other Situational Awareness parameters to an integrated environment. These integrated environments are used to conduct Distributed Simulation Events in support of various Test & Evaluation customers. The War Gaming Department (WGD) conducts approximately 50 games a year. These events support internal College educational needs and externally-generated requests from Navy departments and operational commands, the Joint Services, foreign navies, and other sources. The business areas JSAF would best support are Command & Control and Training. JSAF is used in war games such as Urban Resolve 2015 and Northwest Pacific to provide simulated unit movement and tracking in a synthetic environment, and to provide that data to other applications such as GCCS and C2PC. These applications provide players with a common operational depiction of deployed forces for such purposes as force planning, force employment, and force laydown.	NAVAL AIR SYSTEMS COMMAND (NAVAIR)

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
			All war games are used to study some aspect of maritime and joint strategic and operational warfare. The games are sponsored by the college itself (education), by other naval commands, joint activities, and other defense agencies. The result in the war games is the ability for participants to understand and employ maritime operational strategy in a hostile environment, to examine strategic and operational issues, and to prepare for future naval preparedness.	
42	BlockSim	System Reliability Prediction, Reliability Drivers System Maintainability Prediction	Provides for complete system reliability and maintainability analysis utilizing a reliability block diagram (RBD) or fault tree analysis (FTA) approach to obtain system results based on architecture and component data.	ReliaSoft
43	Weibull++	Measures component lifetime and reliability characteristics	Reliability and life data analysis (Weibull analysis)	ReliaSoft
44	RBS Suite	System Availability Prediction, Mission Spares Projection	Provides the capability for inventory allowance development to achieve specified weapon system Operational Availability (Ao) or Full Mission Capability (FMC) goals and minimize investment. It can also maximize readiness at a fixed cost. Optimizes ACIM .	NSLC
45	TIGER	System Reliability Prediction, Reliability Drivers System Maintainability Prediction	Monte Carlo type simulation tool which uses system reliability architecture and component reliability as an input to assess system reliability and identify readiness drivers	NAVSEA
46	CARAT	Reliability Block Diagrams, System Reliability Simulation model in TIGER format	Graphically create and edit Reliability Block Diagrams (RBD's) and prepare initial input files to the TIGER simulation program	NSLC
47	ACIM	Mission Spares Projection	Computes spares using marginal analysis to optimize support for readiness drivers and to factor sparing cost	NSLC

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
48	Obsolescence Management Information System (OMIS™)	Sustainability Assessment	Proactive monitoring to respond to system wide obsolescence incidents	NAVSEA, Keyport (N00253)
49	LoadRunner	Generates simulated users of the website/portal	Simulates web site/portal users logged on/off or logging on/off	MARCORSYSCOM Product Group -10
50	FLOVENT	Generates airflow/temperature data, gradients, hot/cold spots, and highlights deficient cooling/heating/ventilation areas	Heating, Ventilation, and Air Conditioning modeling/simulation	MARCORSYSCOM Product Group -10
51	Joint Communications Simulation System (JCSS) (formerly known as NETWARS)	Provides network speed, delays, latencies, and throttling/bottleneck areas in network pipes inside or outside the data center in question	Network modeling and simulation environment for the defense system networks	MARCORSYSCOM Product Group -10
52	System of Systems Analysis Toolset (SoSAT)	Support optimization decision support tool	Optimizes supply and sustainment support through modeling and simulation over a period of time of known and/or simulated RAM data and assists with validation of maintenance support concepts	PEO Land Systems PM JLTV
53	Total Life Cycle Management-Assessment Tool (TLCM-AT)	Run “what if” scenarios by manipulating the data inputs in order to see the long term effects to all elements of the life cycle	Model the myriad of industry accepted elements which directly affect the Operational Availability (A_o) of a system	HQMC (I&L) PM LW155
54	Availability Centered Inventory Model (ACIM)	Sparing	Computes maritime spares using marginal analysis to optimize support for readiness drivers at least cost	NAVSUP

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
55	TIGER	Readiness Assessment	Maritime simulation model (Monte Carlo-type) which uses Reliability Block Diagram information as an input to determine readiness drivers and project readiness	NAVSUP
56	Aviation Readiness Requirements Oriented to Weapon Replaceable Assemblies (ARROWS)	Sparing	Multi Echelon/Multi Indenture RBS sparing model for aviation weapon systems	NAVSUP
57	Defense Sustainment Chain Operational Readiness Evaluator (D-SCORE)	Readiness Assessment	Simulates DoD's entire sustainment value stream, from the operational level through intermediate level maintenance to wholesale supply and depot maintenance. It has a unique capability to evaluate alternative logistics process improvements in terms of results.	NAVSUP
58	Computation and Research Evaluation System (CARES)	Wholesale Levels Analysis	Set of computer programs which emulate the performance of UICP (Uniform Inventory Control Point) to simulate wholesale stocking levels and project performance subject to budgetary constraints	NAVSUP
59	Service Planning & Optimization (SPO)	Sparing	Forecasts parts demand and determines optimal stocking lists and stocking levels at the lowest cost to achieve desired readiness goal	NAVSUP
60	Simulation Package for Evaluation by Computer Techniques - Readiness, Utilization and Maintenance (SPECTRUM)	Series of Monte Carlo. Discrete Event simulation models that model all levels of Navy Maintenance (O, I and D). Also includes the suite of data processing and analysis programs that prepare AV-3M. Transaction History File	See Product Tool (Output)	Air-4.10

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
		(THF), and other data for input to the models and generate reports for validation and future analysis.		
61	Naval Aviation Maintenance and Supply Model (NAVSM)	Naval Aviation Maintenance and Supply Model (NAVSM) provides a modeling and simulation capability that will be used to assess and test sortie generation capabilities as well as associated manpower utilization. The effort includes representing processes and being able to accurately evaluate manning associated within AIMD, AIr Wing and Aviation Supply. The capability to analyze the impact of General Arrangement (ship design) and the resultant impact on Aviation Maintenance and Supply processes and manpower is also a key part of the overall effort. The end result of this work is the creation and evolution of a NAVSM that interfaces to other model components making up the CVN21 virtual	See Product Tool (Output)	PMS-378

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
		Carrier in order to address the complex interdependencies of ship design, organizations and processes that must work together in order to support aviation operations to achieve sortie generation capabilities.		
62	Automated Cost Estimating Integrated Tool (ACEIT)	Cost Estimating	ACE is the estimating portion and heart of the ACEIT application suite. ACE is a model building tool consisting of a structured format for analysts to quickly structure their cost estimate and a calculation engine to quickly process the information.	USMC COTS
63	wInsight	Proactive cost, schedule and risk management	Insight is a business intelligence tool for analyzing, sharing, consolidating, and reporting earned value management data. Deltek provides integrated analytical and oversight tools for cost, schedule, and risk management.	USMC COTS
64	Vmetric XL	Inventory Control Spare Parts End Items Costs Availability Defects (Materials)Repair	The Marine Corps is seeking to centralize the management of secondary repairables and is considering options that include centralizing responsibility and funding (while keeping the inventory model as it is) and changing the inventory model.	USMC COTS
65	Reliasoft BlockSim	Reliability and Maintainability Analysis	BlockSim provides a comprehensive platform for complete system reliability and maintainability analysis utilizing a reliability block diagram (RBD) or fault tree analysis (FTA) approach to obtain system results based on component data.	USMC COTS
66	Crossbow	Vulnerability/Lethality Analyses	An application toolset designed to help expedite vulnerability/lethality (V/L) analyses	USMC COTS
67	Designer's Edge	Technology Based Training	Designer's Edge is a revolutionary set of integrated pre-	USMC

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
			authoring toolsets and wizards, built by instructional experts, to accelerate the analysis, design, and evaluation of effective technology based training.	COTS
68	EDCAS	Front end Analysis	Performs front end analysis and provides feedback on the life support costs and logistic performance of design alternatives to bring logistic concerns inside the systems engineering decision loop.	USMC COTS
69	Integrated Computerized Deployment System (ICODES)	Ship stow planning	ICODES is the DOD crossservice migration system for ship stow planning. It provides intelligent decision support to Army, Navy, and Marine Corps users during unit deployment operations. ICODES supports unknown vessels with a generic ship generating tool.	USMC COTS
70	Imprint	Network Modeling	Imprint is a dynamic, stochastic discrete event network modeling tool designed to help assess the interaction of soldier and system performance throughout the system life cycle from concept and design through field testing and system upgrades.	USMC COTS
71	TREMOR	Vulnerability Assessments	Survivability Team Members use TREMOR to perform vulnerability assessments. This product is a visualizer of modeling inputs and is used to perform what/if scenarios required for Vulnerability Criticality Analysis tasks.	USMC COTS
72	TIP QA	Quality Assurance, Corrective Action, and Nonconformance Reporting	TIP QA is an integrated suite of quality assurance applications designed to meet the unique quality assurance requirements in the manufacturing enterprise. PM AAA personnel use two (2) modules in TIP QA, the Corrective Action (CA) Module	USMC COTS
73	Deltek Risk+™ for Project	Schedule and Risk Management	Deltek Risk+ is a comprehensive risk analysis tool that integrates seamlessly with Microsoft® Project to quantify the cost and schedule uncertainty associated with project plans.	USMC COTS

Navy	Model Name	Product Tool (Output)	Purpose of Tool	Owner (DON Code)
74	@RISK for Project	Schedule and Risk Management	@RISK for Project uses Monte Carlo simulation to show you many possible outcomes in your project and tells you how likely these outcomes are to occur. You can determine which tasks are most important and then manage those risks appropriately.	USMC COTS
75	@RISK for Excel	Cost, Schedule, and Risk Management	@RISK is a true add-in to Microsoft Excel, integrating completely with your spreadsheet. Browse, define, analyze while never leaving Excel.	USMC COTS
76	MechRel	The Evaluation of Mechanical Designs for Reliability	MechRel automates the use of the "Handbook of Reliability Prediction Procedures for Mechanical Equipment" and guides the user through the application of material properties, design parameters, and the intended operating environment to a conclusion	USMC COTS
77	Minitab	Statistical Analysis	Minitab Statistical Software gives you the tools you need to analyze your data and make informed decisions about how to improve your business. Minitab 15 gives you the statistical tools you need to analyze your data and improve quality in one easy-to-use	USMC COTS
78	SLICREAD/CmStat	Metrics Management	A tool to support engineers and managers in the use and execution of the PSP[SM] and TSP[SM]; automates metrics collection and analysis. *Personal Software Process, PSP, Team Software Process, and TSP are registered service marks of Carnegie Mellon University.*	USMC COTS
79	Total Life Cycle Management Assessment Tool (TLCM AT)	Decision Support	Decision support tool supporting development of budgets in support of weapon systems operations, as well as resource trade studies during acquisition logistics planning for future weapon system and throughout the life cycle to reduce life cycle cost	USMC COTS

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
1	Aircraft Total Life Cycle Assessment Software Tool (ATLASTTM)	PM Utility Helicopter for UH-60M, Lowell Bidwell 256-313-1616	Sean Connors, Clockwork Solutions 512-338-1945 x111	Tool to support Army aircraft overhaul and repair cost estimating using variables such as: flying hour programs by station location, component age and reliability, repair capacity and time, life limits, customer wait times, and spares acquisition schedules.	Program: UH-60M; Purpose: component reliability requirements, Availability
2	ALTA	Members of ARDEC Reliability Mgmt Branch, POC is RMB Chief, Dr. Jason Cook, Jason.Cook1 @us.army.mil , 973-724-3930	Reliasoft	Develop accelerated life testing plans and evaluates data to determine life estimates	Used to determine shelf and service life of ammo and weapon systems
3	AMSAA Reliability Growth Suite	Danielle Wayda, 586-574-6863, danielle.wayda@us.army.mil	AMSAA	This software is used to create reliability growth curves to project idealized growth. It also functions as a software tool to track reliability growth throughout testing.	This software will be used on the JLT CDD reliability requirements are achi growth throughout the various phases
4	ARENA	PM Medium Altitude Endurance for Sky Warrior,	Rockwell Software	Ao Tool for analyzing complex, medium to large scale projects involving highly sensitive changes related to supply chain,	Program: Sky Warrior UAS Purpose: Reliability, Availability performance requirements

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
		Kirk McCollum, 256-313-5355		manufacturing, processes, logistics, distribution, warehousing, and service systems.	
5	AUTODISE	Chris Bolton, PM-MEP 703-704-1995 chris.bolton@us.army.mil	Internal development	This model calculates the most efficient distribution of power sources and distribution equipment based on the physical layout of the using system, the power consuming equipment in use in that system, and the assumed duty cycles and mission profiles of that system. This produces a more accurate solution as opposed to taking nameplate power values or using peak power requirements.	We use this model on multiple generator fielding efforts to determine the most efficient allocation of generator and power distribution equipment. The Central Power concept for standardized Command Post organizations is a prime example. The number of generator sets is obviously a LCC driver for the user, but the average loading (and efficiency) of these sets drives fuel consumption, which is a much bigger element of total LCC.
6	Automated Cost Estimate – Integrated Tool (ACE-IT)	Used throughout the Army	Tecolote	A predictive cost modeling tool used to prepare Life Cycle Cost Estimates for Weapon Systems. The ACE-IT Model can respond to "what/if" excursions, estimating future costs based on a given scenario.	This model is required for all ACAT level I and II programs and is recommended for ACAT III programs.
7	Automated Cost Estimate – Integrated Tool (ACE-IT)	Maj Mike Mastria, USMC David Holm, Army 586-574-5680	Tecolote Research, Inc.	Tool for developing, sharing, analyzing, and reporting life cycle costs of the product of an acquisition program.	ACE-IT is being used on the JLTV program to evaluate the effect of program and design changes on life cycle cost.
8	Automated Cost Estimating Integrated Tools (ACE-IT)	Chris Waltsak 732-427-5936	Tecolote Research, Inc.	The Army's Automated Cost Estimating Integrated Tools (ACE-IT) is an integrated tool	We are using LCET as one of the tools to help us develop our Type II Business Case Analysis in pursuit of

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				suite designed to facilitate cost estimating. ACE-IT is an integrated tool suite of several software products specifically designed for the cost estimating community. Core features include a database to store technical and normalized cost data, a statistical package specifically tailored to facilitate cost estimating relationship (CER) development, and a uniquely designed spreadsheet that promotes structured, systematic model development and built-in government approved proven inflation, learning, time-phasing, documentation, sensitivity, what/if, risk, and other analysis capabilities. ACE-IT integrates all the necessary cost estimating functions but allows you to enter the process at any level.	a Performance Based Logistic, Life Cycle Sustainment program for our target DCGS-A Mobile System
9	Automated Cost Estimating Integrated Tools (ACE-IT)	PM Unmanned Aircraft Systems; Kirk McCollum, 256-313-5355. PM Aviation	ASA(FMC) Army Cost and Economics	Tool for analyzing, developing, sharing, and reporting cost estimates, providing a framework to automate key analysis tasks and simplify/standardize the estimating process.	Program: Sky Warrior UAS, Joint Cargo Aircraft, Purpose: O&S cost estimation

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
		Systems, PD Joint Cargo Aircraft; Mike Tesi, 256-313-3745			
10	Automatic Requirements Computation System Initial Provisioning (ARCSIP)	CECOM; Ken Steinberg, LEO-S-SM-P	CECOM	The ARCSIP system is designed to automatically compute initial issue quantities (IIQ) consisting of order ship time, operating level, and safety level quantities for non-repairable items; and order ship time, operating level, safety level and turn around quantities for repairable items. Replenishment quantities are also computed. These are the gross quantities required to support an EI for up to 5 years for locally managed items, and for the first 12 months of deployment for non-locally managed items. In short, the system computes the support items required to support new EIs being fielded. Computation of the gross initial issue and replenishment quantities is accomplished by bringing together the PMR, the EIP file, the MMD file, the ARCSIP formulas based on DoD, DA, and Development and Readiness Command policies	

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				and regulations.	
11	BlockSim	Members of ARDEC Reliability Mgmt Branch, POC is RMB Chief, Dr. Jason Cook, Jason.Cook1@us.army.mil, 973-724-3930	Reliasoft	Develop system reliability and availability models from component or failure mode level inputs for evaluation of system/platform or SoS level reliability and operational availability(Ao)	Determine compliance with requirements or assist in requirement validation and decomposition in areas of RAM. Also useful in testing sparing and repair strategies and optimizing CBM, applicable to any system type.
12	Computerized Optimization Model For Predicting and Analyzing Support Structure (COMPASS)	Bill Colon	Government	The Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS) is the Army standard Level of Repair analysis (LORA) model that optimizes maintenance concepts to achieve an end item Operational Availability (Ao) at the least total ownership cost. A LORA determines where each item is cost effectively repaired. SESAME algorithms are embedded in COMPASS to simultaneously optimize maintenance and supply support. COMPASS was designed to determine steady state, full deployment LORA and SORA	COMPASS enables supportability optimization prior to fielding. COMPASS can also be used as a source of repair analysis (SORA) model. A SORA model determines how each item is cost effectively repaired. COMPASS can be used to compare the total costs associated with government depot repair versus contractor depot maintenance in achieving the same Ao goal. A best value analysis would apply to non-core depot work.

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				decisions by comparing the net present value logistics cost estimates that vary by maintenance policy. COMPASS requires information about the line replaceable units (LRUs) used to restore the end item and higher failure rate shop replaceable units (SRUs) used to repair LRUs. It has the fidelity to permit a RAM analysis of the detailed design to show life cycle support cost impacts associated with each item modeled in the equipment. Support costs associated with design improvements can be compared to the baseline design to assess the improvement's potential to reduce life cycle support costs. This helps supportability analysis to become an integral part of systems engineering.	
13	Computerized Optimization Model For Predicting and Analyzing Support/ Structure (COMPASS)	Chris Waltsak 732-427-5936	LOGSA	The Computerized Optimization Model for Predicting and Analyzing Support Structures or COMPASS is an Army approved, PC-based computer model, sponsored by the U.S. Army Logistics Support Activity (LOGSA), and is designed to assist analysts in conducting a	We are using LCET as one of the tools to help us develop our Type II Business Case Analysis in pursuit of a Performance Based Logistic, Life Cycle Sustainment program for our target DCGS-A Mobile System.

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				variety of system support studies. The objective of COMPASS is to simultaneously optimize both the maintenance concept and supply while achieving a given operational availability goal. The COMPASS mode provides quantitative analysis of the different hardware product support strategies.	
14	Computerized Optimization Model For Predicting and Analyzing Support/ Structure (COMPASS)	Mark D. Patrizi 256-955-6310, mark.patrizi @conus.army .mil	LOGSA	Level of Repair Analysis (LORA) model which provides the optimal, least cost maintenance policy for a weapon system. Utilizes system part specific information such as reliability, availability, and maintainability data to determine best repair locations and resources required (spares, repairmen, and support equipment).	COMPASS is utilized by many programs to determine optimal maintenance policies. Recently, the software was used to perform LORA on systems such as the AH-64A, CH-47D, CROWS, and Prophet. 2200 (CECOM, TACOM, AMCOM, AMSAA, AEC, KEM PO, MEADS PO, GMD Joint PO, JPM Lightweight Howitzer, Precision Fires PO, PEO CBD, Naval Aviation Weapons Center, PM Multi-Spectrum Sensors, PM Prophet, Others)
15	Computerized Optimization Model For Predicting and Analyzing Support/ Structure (COMPASS)	PM Utility Helicopter for UH-60M PM Cargo Helicopter for CH-47F. POC: Joe	LOGSA Logistics and Engineering Center	Analytical methodology used to determine the maintenance level where the removal and replacement, repair, or the discard of an item should be performed.	Program: UH-60M, CH-47F, AH-64D, Apache Block III, Sky Warrior, JCA Purpose: Availability, O&S Cost estimation

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
		Ketron, 256-955-0238 PM Apache Attack Helicopter for AH-64D and Apache Block III 256-313-4988 PM Aviation Systems, PD Joint Cargo Aircraft Mike Tesi, 256-313-3745			
16	Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)	ATEC-AEC-ILSED Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil	LOGSA	Level of Repair Analysis (LORA) model that determines the optimal system level maintenance policy to meet a weapon system/end item operational performance target.	Used on numerous programs to conduct Level of Repair Analyses (LORA) and to evaluate system maintenance concepts.
17	Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)	Vincent DiNicola 732-532-4565 DSN 992-4565 Vincent,dinicola@us.army.mil	US AMC – Logsa: Logistic Support Activity.	COMPASS is a model designed to assist the analyst in conducting a Level Of Repair Analysis (LORA) study and is the Army's approved system-level LORA model. The COMPASS program will identify the most cost effective maintenance concept.	LORA is an analytical methodology used to establish the maintenance level at which an item will be replaced, repaired or discarded. These decisions are based upon operational readiness requirements. LORA determines the most cost effective maintenance concept for a

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
					system.
18	Computerized Optimization Model For Predicting and Analyzing Support Structure (COMPASS) Level of Repair Analysis (LORA)	Terri Schwierling, 256-876-3561, terri.schwierling@us.army.mil		COMPASS is a PC based computer model designed to assist in conducting a Level of Repair Analysis (LORA). LORA is an analytical methodology used to determine the maintenance level where the removal and replacement, repair, and/or discard of an item should be performed. COMPASS is the Army approved system level LORA model.	Multiple Programs
19	Cost Analysis Strategy and Assessment Model (CASA)	Terri Schwierling, (256) 876-3561, terri.schwierling@us.army.mil		Life Cycle Cost (LCC)/Total Ownership Cost (TOC) decision support tool. CASA covers the entire life cycle of the system, from initial research cost to those associated with yearly maintenance, as well as spares, training cost and other expenses.	Multiple Programs
20	Cost Analysis Strategy Assessment (CASA)	Phil Paschel, 256-955-9922, phillip.paschel@us.army.mil	LOGSA	Life cycle cost model and systems engineering decision support tool that calculates total cost of ownership from initial design until disposal with a focus on the detailed cost elements over the operational life of a system. Extensive trade off and sensitivity analysis capabilities for "gaming" cost impacts of support concepts, spares provisioning, reliability	CASA is used by many PMs throughout DoD and their support contractors to evaluate the life cycle cost impacts of different design and support alternatives and to identify cost drivers in accordance with sound systems engineering guidance. 1400 registered users from many different PMs and support organizations (e.g., CECOM, TACOM, AMCOM, PM FCS, PM

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				growth, availability, production rates, etc.	Blackhawk, Joint GMD, Navy, Air Force, NASA)
21	Joint Integrated Analysis Tool	Daniel L. Schwartz (703) 601-4183daniel.schwartz@hqda.army.mil	Office of the Deputy Assistant Secretary of the Army – Cost and Economics (HQDA – ASA(FM&C)	The Joint Integrated Analysis Tool (JIAT) concept is an architecture that allows models in the functional areas of cost estimating, engineering design, requirements, capability, and performance analysis to be linked together. JIAT provides a near realtime cost estimating capability to the acquisition, requirements modeling and simulation (M&S) and communities. JIAT provides the capabilities for cost and requirements analysts to develop cost estimates and perform cost performance trades at the system level with the limited amounts of data available early in a program's lifecycle.	Users of JIAT will be able to perform life cycle cost analysis which can include early design concept data such as performance and capabilities based costing. JIAT incorporates various analytical models to perform trade-off analysis with optimization techniques. JIAT will also benefit requirements analysts and engineers in developing cost estimates.
22	Laser HELLFIRE Integrated Flight Simulation (IFS)	Jim Utterback 256-876-4618 Jim.Utterback@us.army.mil	Lockheed Martin & U.S. Army	Life cycle system analysis tool used to evaluate performance of the Laser HELLFIRE system throughout the system lifecycle from product improvements, operations and maintenance and end of the system.	Used on the Laser HELLFIRE Missile System to support product improvements, testing, system analysis, and assessment of system performance.
23	Logistics Analysis Model (LOGAM)	PM Utility Helicopter Lowell	SPARTA, Inc., endorsed by LOGSA	Forecast logistics support parameters and operating and sustainment costs associated with	Program: UH-60M Purpose: O&S cost estimation

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
		Bidwell 256-313-1616		the system's evolving design when supported by alternate envisioned maintenance concepts.	
24	Logistics Cost Estimating Tool (LCET)	Bill Colon	Government	LCET estimates logistics costs for a weapon system. The logistics costs are broken into 25 cost categories listed on their website. LCET can be used to establish a logistics cost baseline and to quantify cost savings resulting from improvements and changes to the weapon system and the way it is supported.	LCET uses operating hours and mean time between failures (MTBFs) to calculate some of the logistics costs. It can also be used to evaluate a weapon system's logistics costs associated with different proposals in a source selection.
25	Logistics Cost Estimating Tool (LCET)	Chris Waltsak 732-427-5936	Gov. Provided Software	The CECOM Logistics Cost Estimating Tool (LCET) is an estimating tool for weapon systems, was used in conjunction with COMPASS to assist in time phased analysis and display of data. The Logistics Cost Estimating Tool (LCET) estimates the logistics costs for a weapon system. The logistics costs are broken into 25 cost categories, which are shown below: 1. Military Operators 2. Energy (Batteries/Petroleum) 3. Field Support (Material Fielding & Logistics Assistance) 4. Organic Repair Labor * 5. Contractor Repair and Other Contractor	We are using LCET as one of the tools to help us develop our Type II Business Case Analysis in pursuit of a Performance Based Logistic, Life Cycle Sustainment program for our target DCGS-A Mobile System

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				Logistics Support * 6. Warranty Costs 7. Scheduled Maintenance and Overhaul 8. Initial Provisioning Spares * 9. Replenishment Spares * 10. Inventory Holding Costs * 11. Support Equipment * 12. Test Program Sets * 13. Training 14. Training Material 15. Post Deployment Software Support 16. Technical Documentation * 17. Transportation ** 18. Integrated Material Management ** 19. Post Production Project Management 20. System Hardware Changes 21. Facilities/Site Activation 22. System Specific Base Operation 23. Leases 24. Demilitarization and Disposal 25. Industrial Readiness LCET consists of two modules: Time Phased (TP) COMPASS and the Logistics Cost Spreadsheet. You may use the Logistics Cost Spreadsheet in conjunction with Time Phased COMPASS or as a stand alone tool. Using it in conjunction with Time Phased COMPASS requires more detailed data but will provide a better cost estimate than using it as a stand alone tool. The	

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				Army's Automated Cost Estimating Integrated Tools (ACE-IT) is an integrated tool suite designed to facilitate cost estimating. ACE-IT is an integrated tool suite of several software products specifically designed for the cost estimating community. Core features include a database to store technical and (normalized) cost data, statistical package specifically tailored to facilitate cost estimating relationship (CER) development and a uniquely designed spreadsheet that promotes structured, systematic model development, and built in government approved proven inflation, learning, time phasing, documentation, sensitivity, what/if, risk and other analysis capabilities. ACE-IT integrates all the necessary cost estimating functions but allows you to enter the process at any level.	
26	Logistics Cost Estimating Tool (LCET)	Bill Colon	Government	LCET estimates logistics costs for a weapon system. The logistics costs are broken into 25 cost categories listed on their website. LCET can be used to establish a	LCET uses operating hours and mean time between failures (MTBFs) to calculate some of the logistics costs. It can also be used to evaluate a weapon system's logistics

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				logistics cost baseline and to quantify cost savings resulting from improvements and changes to the weapon system and the way it is supported.	costs associated with different proposals in a source selection.
27	Logistics Cost Estimating Tool (LCET)	Chester Shadovitz 732-532-1222 DSN: 992-1222	LCMC-G3/5, Systems Analysis Division	LCET estimates the logistics costs for a weapon system. The logistics costs are broken into 25 cost categories.	LCET can be used to establish a logistics cost baseline and to quantify cost savings resulting from improvements and changes to the weapon system and the way it is supported. It can also be used to evaluate a weapon system's logistics costs associated with different proposals in a source selection.
28	Longbow HELLFIRE Simulation	Jim Utterback 256-876-4618 Jim.Utterback @us.army.mil	U.S. Army	Life cycle system analysis tool used to evaluate performance of the Longbow HELLFIRE system throughout the operations and maintenance and end of the system lifecycle phases.	Used on the Longbow HELLFIRE Missile System to support testing, system analysis, and assessment of system performance.
29	Minitab	Members of ARDEC Reliability Mgmt Branch POC is RMB Chief, Dr. Jason Cook, Jason.Cook1 @us.army.mil 973-724-3930	Minitab, Inc.	Statistical SW package for DoE and other statistical analysis methods	Used for DoE, LSS, SPC, and similar. Not unique to any specific system type.
30	Multi-Attribute	Chuck Wong	LCMC –	MADM is an analysis approach	Its objective is to evaluate the

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
	Decision Methodology (MADM)	732-532-5170 DSN: 992-5170	G3/5 Systems Analysis Division	based on Decision Theory that evaluates multiple decision criteria including cost on the same scale.	combined results of cost savings and other non-cost related evaluation criteria to determine the Best Value alternatives in support of decision making.
31	Operation & Support Management Information System (OSMIS)	Used throughout the Army	Tecolote	A tracking tool of operation and support needs and costs for various Army Weapon programs	Tool can be used by using actual data as a means to estimate future costs.
32	Optimum Stock Requirements Analysis program (OSRAP)	ATEC-AEC-ILSED Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil	AMSAA	Stock computation model that uses Readiness Based Sparing to provide a package of spare parts optimized on cost, weight or volume while targeting operational availability. Handles multiple systems, is less data intensive than SESAME, and supports wartime environment.	Used for virtually any set of end items to conduct footprint analysis, primarily for Class IX, but can be expanded to include other classes of supply.
33	Optimum Stock Requirements Analysis Program (OSRAP)	Charlotte Evering 410-278-4980 charlotte.evering@us.army.mil	AMSAA	Stock computation model that uses Readiness Based Sparing to provide a package of spare parts optimized on cost, weight or volume while targeting operational availability. Handles multiple systems, is less data intensive than SESAME, and supports wartime environment.	Used for virtually any set of end items to conduct logistics footprint analysis, primarily for Class IX, but can be expanded to include other classes of supply. Model outputs include a recommended parts list, overall summary of the unit, cost drivers, weight and volume drivers, and additional "plus up" quantities needed for the unit to sustain the target readiness rate. Other analyses can be performed based on sensitivity to readiness, cost, weight,

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
					or volume. OSRAP is incorporated into the war reserve process (LMP) through its requirements determination module (RDM). OSRAP is used to calculate the Army Prepositioned Stocks, OPLAN sustainability analyses, Deployment Stock Packages (DSP) where the input parts file is tailored specifically to the unit's past demands, Customer Support Requirements Lists (CSRL), and logistics footprint and concept exploration analyses in assessing Analysis of Alternatives (AoA) of conceptual systems against current unit force structures.
34	OV Parser	Pat Degroodt 732-532-8229 pat.degroodt @us.army.mil	General Dynamics C4 Systems 400 John Quincy Adams Rd. Taunton, MA 02780-1069	The Government Furnished Software (GFS) OV parser outputs a spreadsheet containing utilization and throughput metrics based on tiers and resources. Information such as tier utilization (ground to ground), resource utilization, and average tier throughput (ground and space) are presented in the spreadsheet. Tier utilization is a percentage of how much of the ground tier is being utilized. Resource utilization is a percentage of how much each non CI resources are being used in the	PM WIN-T uses the OV parser to provide information that is extremely valuable and helps to determine how to best optimize the network. If the ground tier is over utilized, the plan can be modified to relay traffic using other tiers (space) to help alleviate the ground network and vice versa.

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				scenario. The average tier throughput indicates how many bps each tier is handling.	
35	Port Operational Performance Simulator (POPS)	Arthur Murray DSN 770-5191 Arthur.J.Murray@us.army.mil	Surface Deployment and Distribution Command Transportation Engineering Agency	POPS is an equation based calculator of the throughput capacity of an ocean terminal. POPS performs a weakest link analysis of port cargo movement in which each subsystem is analyzed separately and then compared to find aggregate seaport throughput.	POPS is used across the full spectrum of planning and programmatic mobility studies.
36	Port Simulation Model (PORTSIM)	Kaye Aldrich DSN 770-5206 Kaye.Aldrich@us.army.mil	MYMIC 200 High Street, Suite 308 Portsmouth, Virginia 23704-3721 USA	PORTSIM models the reception, staging, and ship loading of military equipment at seaports of embarkation (SPOE) and ship offloading, staging, and port clearance of military equipment at seaports of debarkation (SPOD).	PORTSIM can be used across the full spectrum of both planning and programmatic mobility studies.
37	PRICE-S	Dave Leciston		Future M&S Tool	Software life cycle modeling of the DCGS-A program
38	ProcessWizard	Bob Daniell bob.daniell@us.army.mil 732-861-1487	Xelocity	Business Process development using the SCOR, DCOR and CCOR business process reference models to address PBL, Systems Engineering and the Industrial Base	We use this tool to build models addressing physical and logical mappings, functional decompositions, RASCI, disconnect analysis along the life cycle of a weapons system or commodity. Very helpful in establishing PBL configurations. It incorporates the SCOR, DCOR and CCOR models to provide standardized nomenclature,

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
					metrics, best practices across TLCSM
39	ProcessWizard	Mark Barboza, Jenna Romatowski, Chris DeVries, Roberto Flores, Allison Waltsak 732-532-9129	Xelocity	Designed to support and fast track business transformation projects, ProcessWizard complements project methodologies like Value Chain Excellence. ProcessWizard allows you to capture your analysis in a packaged, robust and reusable business improvement.	ProcessWizard is a process modeling and enterprise architecture tool containing de facto standard industry frameworks. ProcessWizard is particularly powerful for Supply Chain (SCM), Design Chain (PLM), Customer Chain (CRM) and Value Chain (VCM)
40	Proprietary	R. Giuntini Business Process development using the SCOR®, DCOR and CCOR business process reference models to address PBL, Systems Engineering and the Industrial Base	SRA	Uses Activity Based Costing (ABC), similar to Earned Value, in identifying all the cost drivers and their resources; this technique is viewed as best practice in commercial world. All findings and conclusions are validated in proprietary data base. *SCOR® is a registered trademark of the Supply Chain Council, Inc.*	Has been used for Army Future Warrior, GD, LM, DynCorp, and others

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
41	RAPTOR	R. Kaminski	ARINC	RAPTOR is a Monte Carlo simulation program used to model reliability and availability of complex systems with extensive interdependencies.	RAPTOR is used to model system reliability and availability and conduct trade studies and predict reliability and availability performance.
42	RELEX	R. Kaminski	RELEX	RELEX is a multisuite toolset for performing a wide variety of reliability, maintainability, and availability analyses.	RELEX is used to perform reliability prediction, FMECA, and maintainability analysis.
43	RGA	Members of ARDEC Reliability Mgmt Branch POC is RMB Chief, Dr. Jason Cook, 973-724-3930 Jason.Cook1 @us.army.mil	Reliasoft	Develop plans for and analyze data from reliability growth testing.	To determine reliability of system and determine test and management methods required to achieve reliability targets
44	Scenario Manager	Pat Degroodt 732-532-8229 pat.degroodt @us.army.mil	General Dynamics C4 Systems 400 John Quincy Adams Rd. Taunton, MA 02780-1069	The Scenario Manager tool runs inside OPNET Modeler as a customized feature. Any topology variations can then be made directly to OPNET modeler. The tool reads the force structure file and outputs node information (positions, trajectories, etc.) and then it determines the links for the scenario based on user selectable link creation algorithms. Rain effects along with various	

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				blockage algorithms, as well as hardware policies based on the node's mobility state can be used to affect the links.	
45	Scenario Manager Path Trace Tool	Pat Degroodt 732-532-8229 pat.degroodt @us.army.mil		Produces route information for each communicating pair of nodes in a scenario.	Generates inputs to WAN Path Reliability Tool.
46	SEER/SEER - H	DASA-CE Sean Vessey 703-601-4150 TACOM Cost & Systems Ron Dicesare	Galorath Incorporated	This software is an estimating tool used to create independent manufacturing cost estimates, sanity checks, and to analyze contractor estimates.	SEER is primarily used in support of FCS C4ISR manufacturing estimates, and sanity checks. It is being evaluated to see if we can use it to support JLTV depending on the software requirements for JLTV. Our office also needs SEER to communicate with other organizations like CECOM that use SEER as their primary estimating methodology.
47	SEER for Hardware, Electronics, & Systems (SEER HW)		Galorath Incorporated	SEER for Hardware, Electronics, & Systems (SEER HW) is a decision support tool that reliably and accurately estimates the total cost of ownership for new product development projects.	
48	SEER for Manufacturing (SEER MFG)		Galorath Incorporated	SEER for Manufacturing (SEER MFG) focuses on manufacturing project and process options, and can be used to model virtually any manufacturing operation.	
49	SEER-RateMaker		Galorath	SEER-RateMaker™, a calculation	

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
			Incorporated	tool used for generating labor and machine tool rates for individual and manufacturing processes across organizations continents. SEER-RateMaker is designed to generate labor and machine cost rates to assist the estimating process, helping to control costs and maintain both supplier and purchaser companies' profitability.	
50	Selectable Essential Item Stock and Availability Method (SESAME)	PM Utility Helicopter for UH-60M : Lowell Bidwell, 256-313-1616 PM Cargo Helicopter for CH-47F: Joe Bogema 256-876-4625	AMSAA is the proponent. Contact: apgr-amsa-sesame-support@conus.army.mil	Decision tools on budgeting and stocking to achieve a system Operational Availability (Ao) performance goal at the least cost, and identify the initial provisioning requirement for spares prior to production to determine what items should be placed at which support levels when fielding of the systems.	Program: UH-60M, CH-47F, AH-64D, Apache Block III, Sky Warrior, JCA Purpose: see functional description
51	Selected Essential item Stockage for Availability Method (SESAME)			SESAME model minimizes the initial provisioning cost for spares to meet an Ao requirement or maximizes Ao to a budgeted cost. SESAME can also estimate an end item Ao based on proposed sparing; experienced, contracted or proposed logistics response times; and experienced or proposed reliability and	

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				maintainability. If item level data is attainable, the acquisition community can potentially use SESAME to evaluate the end item Ao proposed in source selections. The Test and Evaluation community can also evaluate Ao from experienced test results.	
52	Selected Essential Item Stockage for Availability Methodology (SESAME)	Terri Schwierling, (256) 876-3561, terri.schwierling@us.army.mil		Multi-Echelon, Multi-Indenture Inventory Model that determines the Optimal Range & Depth of Spares/Repair parts at all locations in order to meet either a Weapon System/End Item Budget Constraint or Operational Performance Target. AR 700-18 Provisioning of US Army Equipment mandates use of SESAME for Initial Provisioning Requirement Determination.	Multiple Programs
53	Selected Essential Item Stockage To Availability Method (SESAME)	Julio Tejeda 732-532-8903 DSN: 992-8903	U.S. AMSAA Attn: AMSRD-AMS-LL 392 Hopkins Rd. APG, MD 21005; DSN: 298-9309 or 298-4359	SESAME is the Army's approved tool for determining the initial spares needed to support a weapon system that is being fielded. SESAME determines the optimal (i.e., least cost) quantities of spares that will achieve desired operational availability (Ao) for the weapon system.	The output of SESAME tells you the optimal quantities and cost of retail spares at each maintenance shop to achieve your Ao. It also gives you quantities and cost of wholesale spares.

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54	Selected Essential Stock for Availability Method (SESAME)	Charlotte Evering 410-278-4980 charlotte.evering@us.army.mil	AMSAA	Multi-echelon, multi-indenture level inventory cost model that determines the optimal range and depth of spares and repair parts at all locations in order to meet either a weapon system/end item budget constraint or operational performance target.	Used on numerous programs to conduct provisioning analyses and to determine lists of initial provisioning for systems to be fielded. Can be used to answer provisioning issues, such as, "How much should I pay to reduce OST?", “How can I evaluate the added value of a warranty?", "Does commonality affect the level of spares required?", "What happens if OPTEMPO changes?", "What operational availability can I achieve with my limited budget?", "How does improved reliability affect my spares budget?", and "What support structure works best for me?" Mandated for use for initial provisioning in AR700-18 and AR700-127.
55	Selected Essential Stock for Availability Method (SESAME)	ATEC-AEC-ILSED Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil	AMSAA	Inventory model that determines the optimal range and depth of spares and repair parts at all locations in order to meet either a weapon system/end item budget constraint or operational performance target.	Used on numerous programs to conduct provisioning analyses and to determine lists of initial provisioning for systems to be fielded.
56	Selected Essential Stock for Availability Method (SESAME)	Bill Colon	Government	The Selected Essential-item Stock for Availability Method (SESAME) model is the Army standard initial provisioning	SESAME's readiness goal is achieved at a minimum cost or the maximum amount of readiness is bought for an initial provisioning

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
				model that optimizes the mix and placement of spares to achieve an end item Ao requirement or the maximum Ao for a dollar goal input.	budget. To use SESAME, the maintenance concept for each essential item must be known or proposed. SESAME can also be used in an evaluation mode to estimate the Ao being proposed or experienced. This Ao is based on the proposed sparing of items, their demand rate and logistics response times associated with their support concept. The Assistant Secretary of the Army for Acquisition, Logistics and Technology strongly encourages using SESAME to determine initial spares requirements.
57	Selected Essential Stock for Availability Method Life Cycle Cost Model (SESLCC)	Charlotte Evering 410-278-4980 charlotte.evering@us.army.mil	AMSAA	Computer model that uses SESAME calculated initial stock lists, deployment schedules, and reliability and maintenance data to compute the expected initial issue spares and repair parts, replacement of consumed parts, repair of reparable items, transportation costs, and retrograde costs portion of the weapon system's life cycle costs throughout its useful life.	Computes the expected life cycle costs for the enterprise's supply and maintenance system (the service supply chain) that will be supporting a weapon system/end item throughout its useful life. Outputs can be used directly to evaluate alternative equipment, reliability improvement, and/or service supply chain decisions or as input to actionable Total Cost of Ownership analyses. Can aid in evaluating the tradeoff between spare and repair part reliability improvements and the associated reduction in the life cycle service supply chain costs. Can be

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
					used for virtually any end item or weapon system to all estimate significant O&S costs that are reliability driven.
58	Selected Essential Stock for Availability Methodology Life Cycle Cost Model (SESLCC)	ATEC-AEC-ILSED Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil	AMSAA	Computer model that uses SESAME calculated initial stock lists, deployment schedules, and reliability and maintenance data to compute the expected life cycle costs of a system's supply and maintenance that will be supporting a weapon system throughout its useful life.	Can be used for virtually any end item or weapon system to all estimate significant O&S costs that are reliability driven.
59	SIMPROCESS	Natalie Palm 732-532-0425 DSN: 992-0425	CACI International Inc. 1100 North Glebe Rd. Arlington, VA 22201	SIMPROCESS is a hierarchical and integrated process simulation tool developed by CACI International Inc. It combines the simplicity of flowcharting with the power of simulation, statistical analysis, Activity Based Costing (ABC), and animation. It is designed to analyze varied scenarios and to mitigate the risk associated with dynamically changing environments. SIMPROCESS builds a model describing how a system works.	The software can be used for analysis of process reengineering changes, six sigma analyses, and also for the PBL Analyses of metrics.
60	Support Enterprise Model (SEM)	Peter Haniak 586-574-8671 Peter.Haniak@us.army.mil	Sandia National Laboratory	A logistics modeling, analysis, optimization, and decision support tool	PEO-GCS is assessing utility of the tool. Provides integrated modeling of supply chain and repair chain activities for a worldwide support

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					system
61	System of System Availability Model (SoSAM)	John Conolly 410-278-5720 john.conolly @us.army.mil	AMSAA	SoSAM is discrete event based model, developed using ARENA simulation software that produces operational availability, based on reliability failures, of ground and aerial assets in a future force scenario.	SoSAM simulates the mission profile and generates reliability failures for each asset. Through simulation, downed assets are recovered, required parts are obtained, repairs completed and the asset is returned to duty. Principle outputs of the model are the instantaneous and average availability over the scenario, instantaneous and average number of failures, and average mechanic utilization by system and/or class. Outputs can be used directly to evaluate system availability based on proposed reliability and perform "what/if" analyses based on reliability improvement programs. Can be used for virtually any end item(s) in various unit structures (FBCT, HBCT, IBCT) and scenarios.
62	System of Systems Analysis Tool Set (SoSAT)	Peter Haniak 586-574-8671 Peter.Haniak @us.army.mil	Sandia National Laboratory	SoSAT is a suite of software tools designed to provide a capability to analyze performance and interrelationships of a System of Systems and it's various subsystems using State Object Models	Used by PEO-GCS fleet wide. Used for System of System Analysis of Brigade Combat Teams
63	System of Systems Analysis Tool Set	ATEC-AEC-ILSED	Sandia National Labs	Dynamic, time step simulation tool designed to perform platform,	Designed specifically to perform a wide range of sustainability analyses

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	(SoSAT)	Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil ATEC-AEC-RAM		family and system of system sustainability analysis for the Future Combat System (FCS).	for the Future Combat System (FCS).
64	System of Systems Availability Model (SoSAM)	ATEC-AEC-ILSED Wayne Patterson 410-306-0357 wayne.patterson@us.army.mil	AMSAA	Discrete event based flow diagram model, written in ARENA software, to estimate operational availability based on reliability of assets.	Model logic was written specifically for the FCS program, but can be modified to for other systems.
65	Transportability Analysis Reports Generator (TARGET)	Joyce Banovz DSN 770-5803 Joyce.Banovz@us.army.mil	Argonne National Laboratory	TARGET is a group of models and programs that provide the capability to detail unit movement requirements at the individual item level of detail (level 6). The TARGET system merges force structure databases with equipment characteristics for either Army or Marine Corps units.	TARGET can be used across the full spectrum of both planning and programmatic mobility studies.
66	True Planning/PRICE Estimating Suite	DASA-CE Sean Vessey 703-601-4150 TACOM Cost & Systems	PRICE Systems	This software is an estimating tool used to create independent manufacturing cost estimates, sanity checks, and to analyze contractor estimates.	True Planning is used primarily in support of FCS MGV and C4ISR manufacturing estimates, and sanity checks. It is being evaluated to see if we can use it to support JLTV as

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
		Ron Dicesare			another tool to sanity check our ACEIT cost estimate. Our office also needs PRICE to communicate with contractors that use PRICE as their primary estimating methodology.
67	UNIfied Probabilistic Assessment Software System (UNIPASS)	Members of ARDEC POC is RFFF APO and Rel. Egr. Competency Dean Mr. Bob Kuper 201-572-4085 robert.kuper @us.army.mil	PredictionProbe, Inc.	Perform system or component modeling. Quantify Risk, Reliability, Safety thru Uncertainty Quantification and Modeling. Provides Robust Design Analysis, Optimization, etc.. Easily integrates with any computational engine like Finite element, thermal analysis, Computational Fluid Dynamics (CFD), etc. Provides most likely outcomes (MPP), computes probabilities (CDF/PDF, inverse probability, Robust Design, quantitative Risk analysis, IDs key process drivers, etc. Contains libraries of 61 math functions, 15 probability distributions, Goodness of Fit tests; numerous methods for parameters estimation etc.	This model is used on many weapon and ammo life cycle programs inclusive of Tech base through development and production, Operational life, etc.
68	Visual Growth	Dr. David Mortin david.mortin @us.army.mil	AMSAA	Contains AMSAA reliability growth models for planning, tracking, and projection.	Used by multiple contractors and government organizations to develop reliability growth plans and assessments.
69	WAN Path	Pat Degroodt	General	Includes three tool subsets which	Utilized as input to the HyPerformix

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
	Reliability Tool	732-532-8229 pat.degroodt @us.army.mil	Dynamics C4 Systems 400 John Quincy Adams Rd. Taunton, MA 02780-1069	take information from various OPNET Simulation Outputs and uses this information to create the Wide Area Network (WAN) module and connectivity sampling events used in the Transmission Link Reliability Experiment.	File Generator Tool
70	Weibull++	Members of ARDEC Reliability Mgmt Branch POC is RMB Chief, Dr. Jason Cook, Jason.Cook1 @us.army.mil	Reliasoft	Develop component or failure mode specific reliability estimates	Analyzing life data of any system type
71	WIN-T Inc 2/3 OPNET Models – OPNET Modeler Latest Released Versions:Inc2 CDR OPNET Modeler ver 11.5 Inc3 PDR OPNET Modeler ver 11.5 Potential migration to OPNET Modeler ver 14.5	Pat Degroodt 732-532-8229 pat.degroodt @us.army.mil	OPNET Technologies, Inc. 7255 Woodmont Avenue Bethesda, MD 20814 Node models and Process models are custom tailored for PM WIN-T	OPNET Modeler® accelerates network R&D, reduces time to market, and improves product quality. Using simulation, network designers reduce research costs and ensure optimal product quality. OPNET Modeler's cutting edge technology provides an environment for designing protocols and technologies as well as testing and demonstrating designs in realistic scenarios prior to production. OPNET Modeler is used to enhance the design of	PM WIN-T uses the OPNET simulation environment to model the WIN-T Inc 2 and Inc 3 networks. The following is a list of Node Models and Process Models that were developed in OPNET specifically for the WIN-T networks: ● Node Models ● WAN Router Model ● Satellite Node ● Network Topology File Based Interface (NTFBI) ● WIN-T Config Node (Scenario Manager)

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
			by General Dynamics C4 Sy	network devices, technologies such as VoIP, TCP, OSPFv3, MPLS, IPv6, and much more.	● QED (QoS Edge Device) Node ● Traffic Generator Node Process Models ● Highband Networking Waveform (HNW) Radio ● Fixed Rate Radio (FRR) ● Network Centric Waveform (NCW) Radio ● Multi-Link Radio Child (used within both HNW and NCW Radio models) ● OPNET Router – LAN and WAN ● Traffic Generator Model ● IP (Internet Protocol) Model ● Open Shortest Path First (OSPF) Protocol (OSPF_v2) ● Network Blockage Infrastructure (formerly Physics) ● WIN-T Position Updater ● WIN-T Process Model ● QED Sensor
72	WIN-T INC 2/3 System Network Reliability Models – Hyperformix Workbench Discrete Event Simulator Latest Released Versions:	Pat Degroodt 732-532-8229 pat.degroodt @us.army.mil	HyPerformix, Inc. 4301 Westbank Drive Building A, Suite 300 Austin, TX 78746-6564	Hyperformix Workbench is a discrete event simulation tool that is used to create the Network reliability model. As a founding simulation product of HyPerformix, SES/workbench is used worldwide to solve hardware, software and networking problems, particularly	The PM WIN-T Network Reliability Model is used for all network reliability experiments, which are designed to support the architecture design and the development of sparing and maintenance strategies. The model is used to compute the WIN-T Network Reliability values for both on the move (OTM) and at-

Army	Model Name	Government POC (users)	Company/ Supplier	Functional Description	Programs and Purpose
	Inc3 PDR		Office: 512.328.5544	performance and resource allocation problems. It is the ultimate product for solving architectural and design problems involving all three elements: hardware, software, and network. Study is ongoing whether workbench can support simulation of force size comparable to Major Theater of Operations.	the-halt (ATH) configurations.The WIN-t NW Reliability Model is built around the Hyperformix Workbench tool.

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
1	Aging Aircraft Model	AFCAA	Scenarios to be predicted	A Rough Order of Magnitude (ROM) Model that can be used to explore the economic and capability conditions needed to justify a recapitalization decision. In house tool developed in Microsoft® Excel
2	Air Force Total Ownership Cost (AFTOC)	AFCAA	Transportation Supply Maintenance Readiness Munitions	Used to track consumption of assets for Cost Per Flying Hour (CPFH). Air Staff directed in support of SRRB process.
3	Airborne Laser On-Station Availability Model (ABL OSA)	AFMC	Operational/Maintenance Readiness	ABL OSA is a simulation model developed at OAS to estimate the on station availability of the ABL. The

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				model considers laser fuel support equipment availability, inventory levels, ABL deployment scenarious as well as ABL mission parameters.
4	AIRCAT Center Wing Box Management Tool	WR-ALC	Maintenance	Used to predict C-130 equivalent baseline hour consumption based on ops tempo in order to forecast when the aircraft will reach its grounding point. Essential in managing flying hours so aircraft don't ground prior to scheduled center wing box replacement date.
5	Aircraft Sustainability Model	AFMC	Supply	Computes optimized quantity requirements for deployable aircraft spares kits given a flying hour scenario. Also assesses readiness spares kits for Status of Resources and Training System (SORTS) in terms of predicted aircraft availability.
6	ASC Logistics Composite Model (LCOM)	HQ AF/A9	Part of the Air Force Standard Analysis Toolkit (AFSAT), general logistics related questions at AF/A9	Sustainment simulation tool used to assess weapon system availability and effects of reliability, maintainability, and supportability including failure rates, repair times, spares and manpower levels, maintenance concepts, etc.
7	Base Support and Expeditionary (BaS&E) Planning Tool	HQ AF/A4L	Transportation Supply Maintenance Readiness Munitions	Employment driven, information technology planning tool suite supporting the AF Expeditionary Site Survey Planning (ESSP) Process;

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				Identifies resources and combat support requirements at potential deployment locations; Operates on both unclassified and classified networks; Capability to assess an employment locationsвЂ™ ability to support operations based on available resources and projected operations tempo; Allows rapid capability and limiting factor (LIMFAC) identification and facilitates force tailoring decisions
8	COLT (Customer Oriented Leveling Techniques)	AFMC	Supply	Algorithm to provide optimized supply levels for Defense Logistics Agency managed consumable spare parts. Contractor managed.
9	Combat Forces Assessment Model (CFAM)	HQ AF/A9	An AF Toolkit model to determine the impact of budget, attrition, force structure, targeting decisions, and munitions inventories on war fighting capabilities in a theater scenario.	An AF Standard Analysis Toolkit model to determine the impact of budget, attrition, force structure, targeting decisions, and munitions inventories on war fighting capabilities in a theater scenario.
10	Crystal Ball	ASC	Risk Analysis tool	Monte Carlo Simulations
11	EADSIM	HQ AF/A9 EADSIM model manager (owner) is Jim Watkins,SMDC-FW-SM,Voice: (256) 955-1681 (DSN: 645).	EADSIM is used by AF/A9, ACC/A9, and others. See http://www.eadsim.com/ for additional users. EADSIM is part of AFSAT (Air Force Standard Analysis Toolkit).	The Extended Air Defense Simulation (EADSIM) is a many on many simulation of air, missile and space warfare. EADSIM is used for scenarios ranging from few on few to many on many. It represents all the missions on both sides. It is unique in the scope of modeling at such a

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				level of detail, where each platform (such as a fighter aircraft) is individually modeled, as is the interaction among the platforms. It includes an extensive functional and statistical representation of perception feeding perception based C3. It models the Command and Control (C2) decision processes and the communications among the platforms on a message by message basis. Intelligence, surveillance, and reconnaissance is explicitly modeled to support offensive and defensive applications. EADSIM provides a robust reliability, availability, and maintainability (RAM) modeling, to include multiday scenarios. This RAM modeling allows specified components of a system to fail based on a mean time to failure statistical distribution. Each component has a mean time to repair, also specified by a statistical distribution, and a user specified inventory of spare components that can be drawn from as a remove and replace (R&R) process. R&R times are also specified as a statistical distribution. In all cases where distributions are used, the type of statistical

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				representation is user selectable. Depot ordering with shipping delays for individual components is also captured in the RAM modeling.
12	Enhanced Trade Space Tool	AF/A8XP, Walters, Stephen Col AF/A8XP, 703-697-4202	Supports the AFCS with tradespace analysis	Life Cycle Costs (Procurement, RDTE, O&M, MILPERS) for various force structures. In house tool developed in Access and Microsoft Excel.
13	Enterprise Knowledge Management System (EKM)		Maintenance	Used to extract/capture monthly maintenance performance indicator data from the Integrated Maintenance Data System .
14	F100 Engine Production Models	OC-ALC	Models developed for LEAN Cell manufacturing and production of F100 Engine Systems	One per cell – Est. 30+ models
15	Fuels Automated System (FAS) otherwise known as Purple Hub	DLA, multiple AF users	Transportation Supply Maintenance Readiness	Used to track and bill fuel consumption for CPFH program. Air Staff directed in support of CPFH program.
16	GCCS/JOPES	HQ AF/A5X	Readiness	JOPES is used by Combatant Commanders as a planning and execution tool that catalogs Unit Personnel and Cargo movement information and as a programming function to ensure timely unit and personnel movement.
17	Global Ammunition Control Point/AMST	OO-ALC	Munitions	AMST has a complete round analyzer in it to a allow us to compile all assets to give us the complete round to complete a

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				munitions item.
18	Hephaestus	HQ AF/A9	Used for multiple systems to estimate how much a given force structure will cost over its life cycle	Spreadsheet cost model. In house tool developed in Microsoft® Excel.
19	iGraphx	OC-ALC	Simple to use. Low cost.	Process and shop flow modeling
20	JFAST	USTRANSCOM/J4	Transportation Readiness	Transportation tool used for flow of supplies and transportation analysis
21	Joint Analysis System (JAS)	AFAMS	Theatre Logistics Constructive Modeling	JAS is a constructive, stochastic, C4ISR centric, joint (campaign level) model with integrated Strategic Mobility, Theater Logistics, and Joint Operations encompassing a broad range of military operations (ROMO).
22	Joint Semi Automated Forces (JSAF)	AFAMS	Constructive Modeling	Joint Semi Automated Forces (JSAF) is a computer generated forces constructive simulation.
23	JSF Spares Requirements Support	AFMC-XPS	Logistics Spares Modeling	Provided spares requirements lists to the Program Office for an assesment of mission capability. Based on the results and description of the model, the JSF selected the Air Force Aircraft Sustainability Model for calculation of initial spares quantities
24	KC-X Organic FAA Posture	ASC	KC-X Tanker	Analysis of sustainment issues and processes: The KC-X will be an FAA procured and organically sustained weapon system program. The USAF does not currently have the requisite infrastructure in place

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				for an organically supported and maintained FAA certified weapon system of this magnitude (179 aircraft), such as FAA certified repair facilities (i.e., ALC's), FAA-trained depot maintenance personnel, O level maintainers trained on commercial manuals, etc. The stand up of these capabilities will be articulated, documented, and pursued during the SDD phase and implemented/transitioned during the ICS phase. The sustainment simulation would complement our planned SDD efforts to fully document and understand the complexities of planning and posturing for, and implementation of, an organically supported FAA certified and maintained weapon system over a 40 year life cycle.
25	Logistics, Installations, Mission Support-Enterprise View (LIMS-EV)	HQ AF/A4I	Expeditionary Combat Support System	Enables information exploitation to facilitate decision making, tracking of metrics and performs proactive activities across all A4/7 business areas.
26	Logistic Simulation (LOGSIM)	ESC	Logisitics simulation.	Airbase Logistic Operations constraining effects of aircraft maintenance on air operations
27	Logistics Sustainment	SPACECOM	Maintenance and Logistics Sustainment Model	Our LSPA effort uses state of the art, Commercial Off The Shelf (COTS),

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
	Predictive Analysis (LSPA)			industry standard technology. ReliaSoft's BlockSim™ software application provides a comprehensive platform for complete system failure analysis utilizing RBDs for system definition and allows complex system analysis both analytically and through discrete event simulation. In addition to reliability information, the user can implement BlockSim™ to define the characteristics for simulating corrective maintenance, preventive maintenance, and/or inspections for each component.
28	LOGMOD	AF/A4R	Logistics Module (LOGMOD), used for deployment of Unit Type Codes (UTCs)	Logistics Module B (LOGMODB) provides Joint Command and Air Force Warfighters with unprecedented ability to plan, execute, accelerate, or redirect to a higher priority location the deployment of Air Force combat units for accomplishing realtime combat operations anywhere in the world. LOGMODB is an enterprise IT system that enables logisticians to rapidly and accurately execute deployment of preplanned or tailored combat capabilities packages, then sustain the tempo of combat operations by commensurately

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				supporting the Air Force units equipment, manpower, and materiel. LOGMODB enables the Air Force to increase its combat sortie production capability while also decreasing its mobility footprint and cost of operations.
29	PRICE	ASC	Mulit program cost estimation tool.	Software and hardware cost and schedule estimating tool
30	Proactive Demand Levelling algorithm	HQ AF/A4L	Supply, used by all ALCs	Allocate low demand parts across the CAF and prevent grounding MICAP incidents.
31	Process Sequence Model		Transportation Supply Maintenance Readiness Munitions	Process Sequence Models (PSM) are developed to depict key process flows and form the quantitative foundation for the Air Force Capability Review and Risk Assessment (CRRA). They are used to perform critical path analysis and determine likely points of failure based on Monte Carlo simulation (performed with Crystal Ball software). PSMs have been developed for the following mission areas that relate directly/indirectly to logistics: Open and Establish Operating Locations, Generate the Mission, Equip Forces, Sustain Operating Locations, Training, and Protect Forces.
32	Prometheus	HQ AF/A9	Used across systems to predict net	Spreadsheet cost model. In house

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
			present value calculation in support of recapitalization efforts.	tool developed in Microsoft® Excel
33	Propulsion Requirements System	ASC	Supply Maintenance Readiness	The PRS model computes the number of whole spare engines needed to support planned peace and wartime flying hour programs. Requirements are computed for bases, CRFs, and depots.
34	RAPTOR	ASC	Multi system tool used to estimate the system's availability, reliability, support issues, etc.	Simulation uses reliability, maintenance, logistics, and operational characteristics of a system's parts to determine the system's availability, reliability, support issues, etc.
35	Readiness Based Leveling (RBL)	AFMC, HQ AF/A4L	Supply Readiness	RBL is used to allocate levels of reparable spare parts among AF bases worldwide. A new computation is run semiannually to relevel among AF bases, as well as on other occasions, to see what standing up a base at a new location will do to the rest of the world, or how much it would degrade support to the rest of the AF to send extra spares to a given base.
36	Reliability Maturity Index (RMI) Balanced Score Card	ASC	Microsoft® Excel spreadsheet questionnaire to evaluate the maturity and completeness of a system/component's Reliability Program	User rates elements of the reliability program on a scale of 1 to 4 or Yes/No. The model assigns value and weighting to determine overall rating for the status.
37	ReliaSoft Block Sim		Maintenance Other	Used to identify potential

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
	7 and Wiebull ++			reliability/supportability issues lead time away to support planning and decision making to implement corrective actions as necessary. Also used to support resource decisions to ensure resources are applied/timed to maximize effectiveness of when they are applied. Funding and other resources are limited and the tool helps to quantify the most effective time to invest in a particular system or program. Data is also used to direct maintenance and repair improvements to address declining reliability where possible.
38	RMLS Maintenance and Ground Ops (Arena)	ASC	Simulation for rocket based launch systems.	Arena based simulation for determining fleet size, turn time, manpower requirements, and maintenance for rocket based launch systems.
39	Scalable Integration Model for Objective Resource Capability Evaluations (SIMFORCE)	AFRL	Desktop Decision Support Tool	SIMFORCE is a desktop decision support tool that predicts resource utilization using simulation/modeling technology. It calculates probable maintenance resource (people, equipment, facilities, and parts) needs based on Air Force Wing operational taskings.
40	Scenario Space Model	HQ AF/A8	Measures how the addition of one more platform of a given type will affect the outcome of a campaign	One can add one more asset (e.g., F-16) at the beginning of a campaign and measure how much it effects the

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
			in a specified scenario. Information can be used to develop ratios of per platform capability contribution for new (e.g., F-35) versus legacy (F-16) platforms	outcome. One can also add one more asset on each day of the campaign and see how the outcome of the campaign is affected if the asset arrived on the second day, the third day, etc. And you can do this for different types of assets (e.g., F-16s and F-35s). In house tool developed in Access and Microsoft Excel.
41	SEER	ASC	Used by multiple programs to aid in the estimation of hardware development, production, operations & support, and system level cost analysis.	Software and hardware cost and schedule estimating tool
42	Spares Requirement Review Board (SRRB) tool	HQ AF/A4L	Supply Maintenance Readiness	Used to determine sustainment requirements for the Depot Level Reparables (DLR). Air Staff directed for use in developing DLR rates.
43	Standard Utilization Model		Maintenance	Excel spreadsheet used to predict a unit's maximum sortie/flying hour capability based on the limiting factors of aircraft and personnel availability. Used at the AMU level during the initial first look phase of annual flying hour program planning.
44	System Effectiveness Data System (SEDS)	AFMC-AFFTC	R&M Model	SEDS is the Reliability and Maintainability (R&M) modeling system used at the Air Force Flight Test Center, Edwards AFB, CA.
45	UNISYS SBSS Test Gangs	HQ AF/A4L	Supply	Two SBSS test gangs which allow us to process complete mission changes,

Air Force	Model Name	Government POC (users/owners)	Programs and Purpose	Functional Description
				and actually see the influence of the data before the actual load. We also use the databases to test new software before it is loaded in the production environment. The test databases also allow for scenarios to be processed over and over again, which highly assist in training.

Appendix E – Glossary of Terms

Analysis of Alternatives (AoA): The AoA assesses potential materiel solutions to satisfy the capability need documented in the approved Initial Capabilities Document (ICD). It focuses on identification and analysis of alternatives, measures of effectiveness, cost, schedule, concepts of operations, and overall risk, including the sensitivity of each alternative to possible changes in key assumptions or variables. The AoA also assesses Critical Technology Elements (CTEs) associated with each proposed materiel solution, including technology maturity, integration risk, manufacturing feasibility, and, where necessary, technology maturation and demonstration needs.

Business Case Analyses (BCA): The evaluation of alternative solutions for obtaining best value while achieving operational requirements balancing cost, schedule, performance, and risk.

Capabilities Development Document (CDD): A document that provides the operational performance attributes, including KPPs, necessary for the acquisition community to design a proposed system and establish a program baseline, normally using an evolutionary acquisition strategy. The CDD outlines an affordable increment of militarily useful, logistically supportable and technically mature capability that can be effectively developed, produced or acquired, or deployed and sustained. The CDD supports the Milestone B acquisition decision.

Capabilities Production Document (CPD): A document that addresses the information necessary to support production, testing and deployment of a specific affordable and supportable increment of an acquisition program. The refinement of performance attributes and KPPs is the most significant difference between the CDD and CPD. The CPD must be validated and approved before the Milestone C decision review.

Cost Analysis Improvement Group (CAIG): Organization established to conduct independent cost estimates for MDAPs and to serve as the principal advisor to the appropriate Milestone Decision Authority on matters of program life cycle cost. Reports to the Office of the Secretary of Defense (OSD), Director for Cost Assessment and Program Evaluation.

Integrated Product Support Elements (IPS Elements): the package of support functions required to deploy and maintain the readiness and operational capability of major weapon systems, subsystems, and components, including all functions related to weapon systems readiness.

Cost Estimating Relationship (CER): A mathematical relationship that defines cost as a function of one or more parameters such as performance, operating characteristics, physical characteristics, etc.

Key Performance Parameters (KPP): Those minimum attributes or characteristics considered most essential for an effective military capability. They characterize the major drivers of operational suitability, interoperability, supportability, schedule, technical progress, and cost.

Key System Attributes (KSA): System attributes considered most critical or essential for an effective military capability but not selected as Key Performance Parameters (KPPs). KSAs provide decision makers with an additional level of capability prioritization below the KPP but with senior sponsor leadership control (generally four star, Defense agency commander, or Principal Staff Assistant).

Life Cycle Cost (LCC): The total cost to the government of acquisition and ownership of that system over its useful life. It includes the cost of development, acquisition, operations, and support (to include manpower), and where applicable, disposal.

Life Cycle Sustainment Plan (LCSP): Initially prepared for Milestone (MS) B and updated for Milestone C and the Full Rate Production Decision Review (FRPDR). It contains the results of life cycle sustainment planning accomplished during the Material Solution Analysis (MSA) phase and the Technology Development (TD) phase and spans the system's entire life cycle from Materiel Solution Analysis (MSA) to disposal. (DoDI 5000.02)

Memorandum of Agreement (MOA): In contract administration, an agreement between a Program Manager (PM) and a Contract Administration Office (CAO), establishing the scope of responsibility of the CAO with respect to the Earned Value Management System (EVMS) criteria surveillance functions and objectives, and/or other contract administration functions on a specific contract or program.

Memorandum of Understanding (MOU): De facto agreement that is generally recognized by all partners as binding even if no legal claim could be based on the rights and obligations delineated therein.

Milestone B (MS B): The point at which a recommendation is made and approval sought regarding starting or continuing an acquisition program, i.e., proceeding to the next phase. MS B approval allows entry into the Engineering and Manufacturing Development (EMD) phase. SDD has two major efforts: System Integration and System Demonstration. The entrance point is MS B, which is also the initiation of an acquisition program.

Milestone C (MS C): The point at which a recommendation is made and approval sought regarding continuing an acquisition program, i.e., proceeding to the next phase. MS C approval allows entry into the Production and Deployment phase. MS C authorizes entry into Low Rate Initial Production (LRIP) (for MDAPs and major systems), into production or procurement (for non-major systems that do not require LRIP) or into limited deployment in support of operational testing for Major Automated Information System programs or software intensive systems with no production components.

Milestone Decision Authority (MDA): Designated individual with overall responsibility for a program. The MDA shall have the authority to approve entry of an acquisition program into the next phase of the acquisition process and shall be accountable for cost, schedule, and performance reporting to higher authority, including congressional reporting. (DoDD 5000.01)

Performance Based Logistics (PBL): PBL is an agreement, usually long term, in which the provider (organic, commercial, and/or public/private partnership) is incentivized and empowered to meet overarching customer oriented performance requirements (reliability, availability, etc.) in order to improve product support effectiveness while reducing TOC.

Product Support Arrangement (PSA): PSA is a contract, task order, or any type of other contractual arrangement, or any type of agreement or non-contractual arrangement within the Federal Government, for the performance of sustainment or logistics support required for major weapon systems, subsystems, or components.

Program Executive Office (PEO): A military or civilian official who has responsibility for directing several MDAPs and for assigned major system and non-major system acquisition programs. A PEO normally has no other command or staff responsibilities within the Component, and only reports to and receives guidance and direction from the DoD Component Acquisition Executive (CAE).

Program Manager (PM): Designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority (MDA). (DoDD 5000.1)

Research & Development (R&D) Costs: Those program costs primarily associated with R&D efforts including the development of a new or improved capability to the point where it is appropriate for operational use. These costs are funded under the Research, Development, Test and Evaluation (RDT&E) appropriation.

Total Ownership Cost (TOC): Includes all costs associated with the research, development, procurement, operation, logistics support, and disposal of an individual weapon system, including the total supporting infrastructure that plans, manages, and executes that weapon system program over its full life.

Appendix F – Acronyms

Alpha	
ACAT	Acquisition Category
AoA	Analysis of Alternatives
ASN RDA	Department of Navy Research, Development and Acquisition
Bravo	
BCA	Business Case Analyses
Charlie	
CAIG	Cost Analysis Improvement Group
CAPE	Cost Assessment and Program Evaluation
CDD	Capability Development Document
CER	Cost Estimating Relationship
CPD	Capability Production Document
CSA	Commercial Services Agreement
Delta	
DFAS	Defense Finance and Accounting Service
DMPS	Decision Matrix for Product Support
DoD	Department of Defense
DRRS	Defense Readiness Reporting System
DTM	Directive Type Memorandum
Echo	
EMD	Engineering and Manufacturing Development
Foxtrot	
FOC	Full Operational Capability
Golf	
GAO	Government Accountability Office
GR&A	Ground Rules and Assumptions
Hotel	
India	
ILA	Independent Logistics Assessment
IPS Elements	Integrated Product Support Elements
IRR	Internal Rate of Return
Juliet	
JSCA	Joint Supply Chain Architecture
Kilo	

KPP	Key Performance Parameters
KSA	Key System Attributes

Lima

LCC	Life Cycle Cost
LCSP	Life Cycle Sustainment Plan

Mike

MDA	Milestone Decision Authority
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding

November

NPV	Net Present Value

Oscar

O&S	Operations and Support
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense

Papa

PBA	Performance Based Agreement
PBL	Performance Based Logistics
PEO	Program Executive Office
PM	Program Manager
POA&M	Plan of Action and Milestone
POC	Point of Contact
PSA	Product Support Arrangement
PSI	Product Support Integrator
PSM	Product Support Manager
PSP	Product Support Provider

Quebec

Romeo

R&D	Research and Development
ROI	Return on Investment

Sierra

SME	Subject Matter Expert
SRL	Service Level Agreement

Tango

TOC	Total Ownership Cost

Uniform

USD AT&L	Under Secretary of Defense Acquisition Technology and Logistics

Victor

VCNO	Vice Chief of Naval Operations
VVA	Verified, Validated and Accredited

Whiskey

WSARA	Weapon System Acquisition Reform Act

Xray

Yankee

Zulu

Appendix G – Product Support BCA Policies, Statutes, and References

1. FY 2010 NDAA Sec. 805, Life Cycle Management and Product Support.

3. Product Support Manager (PSM) Guidebook

5. GAO 09-41: Improved Analysis and Cost Data Needed to Evaluate the Cost effectiveness of Performance Based Logistics, December 2008.

8. CJCSI 3170.01G Joint Capabilities Integration and Development Systems, March 1, 2009, https://acc.dau.mil/CommunityBrowser.aspx?id=267681.

9. Joint Supply Chain Architecture (JSCA) Performance Metrics and Benchmark Guide.

10. Department of Defense Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report Manual. 2009. Washington, DC: Office of the Secretary of Defense.

11. OMB Circular A-94, http://www.whitehouse.gov/omb/circulars/a094/a094.pdf.

13. Army Logistics Management College (ALMC), Operations Research/Systems Analysis (ORSA) Familiarization Course; http://www.almc.army.mil/. POC: Mr. Luis Castro luis.castro@us.army.mil or Mr. Robert Hanayik Robert.hanayik@us.army.mil.

14. USD AT&L Policy Memo, "Strengthened Sustainment Governance for Acquisition Program Reviews", DTD 5 Apr 10, https://acc.dau.mil/CommunityBrowser.aspx?id=360875&lang=en-US.

16. Defense Acquisition Guidebook, Oct 04 DAU Defense Acquisition Guidebook Homepage.

18. GAO-09-3SP Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs, March 2009.

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DoD 5000.1. The Defense Acquisition System, dated May 12, 2003, http://www.dtic.mil/whs/directives/corres/html/50001.htm.

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Army Regulation 11–18, Army Programs: The Cost and Economic Analysis Program, dated 31 January 1995, www.army.mil/usapa/epubs/pdf/r11_18.pdf.

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Air Force Manual 65-510 Business Case Analysis Procedures, dated 22 September 2008

Department of the Army Cost Analysis Manual, U.S. Army Cost and Economic Analysis Center, dated May 2002, http://www.asafm.army.mil/pubs/cdfs/cam/CAM.pdf.

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Army Regulation 25–400–2, Information Management: Records Management: The Modern Army Recordkeeping System (MARKS), dated 1 Oct 2001, https://134.11.61.26/ArchivePub/Publications/DA/AR/AR%2025-400-2%2020011001.pdf .

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Department of the Navy (DoN) Guide for Developing Performance Based Logistics (PBL) Business Case Analyses, DTD 6 Nov 07.