DEFENSE ACQUISITION GUIDEBOOK
Chapter 4 -- Systems Engineering

4.3.19.2. Sustainability Analysis

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The sustainability analysis, using a Life Cycle Assessment (LCA) method, is a tool to assist the Systems Engineer in designing more sustainable systems – those which use fewer resources over the life cycle, have fewer impacts on human health and the environment, and thus have a lower total ownership cost (TOC). The Program Manager should make sustainability considerations an integral part of both a robust trade space analysis and a comprehensive supportability analysis. These sustainability analyses can help reduce system TOC by uncovering previously hidden or ignored life-cycle costs, leading to more informed decisions earlier in the acquisition life cycle. They can also help make systems more affordable and improve the accuracy of life-cycle cost estimates.

Large military systems and platforms can have a life cycle of 30 years or more. To meet evolving mission needs far into the future, the system design should incorporate long-term sustainability considerations in order to reduce life-cycle costs. Without a full understanding of life-cycle impacts, significant costs may be unintentionally inserted during acquisition and later exposed by the logistics and operational communities.

"Sustainability" differs from "sustainment" in that it relates to the use of resources, and the associated impacts and costs over the system's life cycle. In contrast, sustainment is more concerned with the end user's ability to operate and maintain a system once it is in inventory and deployed. Both aspects need to be addressed in the design process.

Executive Order (E.O.) 13514, "Federal Leadership in Environmental, Energy and Economic Performance" dated October 5, 2009, establishes an integrated Federal Government strategy for sustainability. As required by the E.O., DoD generated a Strategic Sustainability Performance Plan (SSPP) that is updated annually. The SSPP identifies DoD goals for efficiency and reductions in energy, water, solid waste, and use of hazardous chemicals and materials.

A sustainability analysis examines and compares various system attributes associated with energy, water, solid waste, chemicals, materials, and land use. Outputs include decision diagrams (i.e., Kivat/spider-web diagrams) that compare alternatives according to their relative sustainability indicators and related costs. These diagrams can be used to develop system life-cycle cost estimates.

A sustainability analysis can support numerous acquisition activities, including:

- Analysis of Alternatives to compare conceptual alternatives
- Trade space analysis to compare how sustainability attributes (e.g., chemical or material choices, water or solid waste) affect life-cycle cost, TOC, performance, human health, and the environment

- Business Case Analysis using the LCA method to include sustainability as one of the elements in the analysis
- Preliminary design to select the most sustainable system that meets performance requirements and end-user needs
- Supportability analysis to help ensure the use of resources throughout the life cycle is considered and the system is supportable
- Detailed design to select the most sustainable components

The Streamlined Life Cycle Assessment Process for Sustainability in DoD Acquisitions is specifically for use in the DoD acquisition process. It combines LCA with multi-attribute analysis. It integrates a number of trade space and design considerations and provides a procedure to compare conceptual or detailed design alternatives. The streamlined LCA can be applied in a qualitative mode even when data are lacking, and can be accomplished with minimal resources. It is intended to ensure consideration of important downstream impacts and costs in trade-off and design decisions. The method is consistent, without duplication, with other considerations such as operational energy, supportability, and environment, safety, and occupational health (ESOH).