Integrating Sustainability into DoD Acquisition Programs

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Presented at the GreenGov Symposium, October 31 - November 2, 2011, Washington, DC

19a. NAME OF RESPONSIBLE PERSON

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18
The Vision

DoD developers, program managers, and prime contractors analyze alternatives for meeting mission requirements and make informed decisions that result in:

- Sustainable systems
- Lower Total Ownership Cost

How? Use Life Cycle Assessment Methods
Current Situation

- Some good practices & results exist
- But... Sustainability insufficiently considered across DoD
  - Examples: water use, noise, toxic chemical use
- Need better Total Ownership Cost estimates
  - Not all sustainability & ESOH life cycle costs are estimated and analyzed
  - Large operating & support (O&S) costs often passed to operators
  - New DoD O&S cost guidance will help
- Need a consistent, practical DoD methodology for analyzing life cycle sustainability & related costs
Sustainability in DoD Acquisition
From Development through Disposal

High Performance

Low Impacts

Low Costs

PERFORMANCE

HUMAN HEALTH & ENVIRONMENT

LIFE-CYCLE COSTS
Sustainability in DoD Acquisition
From Development through Disposal

Acquisition, Technology and Logistics

We can test & measure this

We need some criteria to weigh alternatives

We can calculate this – Need to do better
Potential Life Cycle Assessment Methods

- Process Life Cycle Impact Assessment (LCIA)…very data intensive…not all data available
- LCA “Light”…modified for less data intensity
- Economic Input-Output LCA…uses available aggregate industry sector financial and “output” data (e.g., Carnegie-Mellon Green Design Institute)
- Hybrid EIO-LCA…adds some detailed LCIA data for most sensitive outputs/impacts
Life Cycle Impact Assessment (LCIA)
ISO Standard 14040

Early Decisions Have Long Term Cost & Health/Environmental Implications
The Way Ahead

- Convene a DoD steering group...done
- Benchmarking study on methods & tools for analyzing sustainability...done
- Collect quantitative case studies...underway
- Adopt method(s) to DoD acquisition process...underway
- Pilot/test the process with DoD prime contractors
- Develop a Military Standard -- “Life Cycle Assessment for Sustainability in Acquisition”...working draft done
- Ensure sustainability related costs are included in life cycle cost estimates (include in OSD-CAPE\(^1\) guidance)

\(^1\) Office of the Secretary of Defense – Cost Analysis & Program Evaluation
Focus on 3 key acquisition stages:

• Analysis of Alternatives (AoA)...use an “LCA light” method or Multi-Attribute Analysis
• Development...more detailed analysis
• Design...as detailed as data availability & resources will allow
Focus on a few key “inputs” and “impacts”

Mission Impacts
- Energy, water, land, & material availability; Noise

Human Health Impact
- Cancer & non-cancer toxicity; Noise

Environmental Impact
- Air & water emissions; Waste (SW + HW); Land transformation

Life Cycle Costs

System Boundary
- Energy
- Chemicals & Materials
- Water Use
- Land Use
- Research & Development
- Production & Deployment
- Operation & Support
- Disposal
Establish a Hierarchy of LCA Methods

1) Process level LCA
   • Life cycle inventory
   • Life cycle impact assessment (LCIA)

2) Economic Input-Output LCA

3) Streamlined LCA
   • Modified process for DoD acquisitions
Streamlined LCA - Attributes for Assessment

- Energy
- Chemicals & Materials
- Water
- Land Use
- Physical Hazards
Measure of Performance (MoPs)

Energy

- System energy efficiency
- Support & sustainment energy efficiency
- Renewable energy use
- Energy source reliability
Measure of Performance (MoPs)

Chemicals & Materials

• Mass utilized
• Recovery & reuse potential
• Use of toxic & hazardous materials
• Exposure potential
• Chemical/material availability
Measure of Performance (MoPs)

Water

• System water efficiency (quantity)
• Water degradation (quality)
• Water availability (scarcity)

Land Use

• Land transformed (quantity)
• Land degradation (quality)
• Duration of use
Measure of Performance (MoPs)

Physical Hazards

• Noise -- Operator exposure, community exposure (adverse basing/operating potential), ecological exposure (e.g., marine mammals)

• Ergonomics

• Radiation – ionizing, non-ionizing, laser
Scoring the Measures of Performance (MoPs)

- **Quantitative Data Scale**
  - 50 mpg
  - 10 mpg

- **Qualitative Data Scale**
  - 5
  - 3
  - 1

- **Ordinal Ranking**
  - 1, 2, 3, 4, 5...

Scoring Method is based on what data is available
Displaying Outputs

• Bar graphs

• Spider-web diagrams

• Use of Data Envelopment Analysis (DEA)
  • Also called frontier analysis
  • Used in operations research & investing (portfolio theory)
  • Runs a series of optimization calculations…finds most efficient alternatives as compared to all others
Top Ten Alternatives

Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5

***Outer Rings = Worse***

Human Health Impacts

Misison Impacts

Environmental Impacts
Top Ten Alternatives

<table>
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***Outer Rings = Worse***

Human Health Impacts

- Radiation
- Exposure Assessment
- Use of Toxic & Hazardous Materials
- Noise Exposure
- Duration of Use
- Land Degradation (quality)
- System Water Degradation (quality)
- Renewable Energy Use
- Mass Utilized
- Land Transformed (quantity)

Environmental Impacts

- System Energy Efficiency
- Support & Sustainment Energy Efficiency
- Energy Source Reliability
- Recovery & Reuse Potential
- Chemical & Material Availability
- System Water Efficiency (quantity)
- Support and Sustainment Water Efficiency (quantity)
- System Water Availability (scarcity)

Mission Impacts

- Ergonomics

Color Legend:
- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5
Top Ten Alternatives

Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5

***Outer Rings = Worse***
Top Ten Alternatives

Human Health Impacts

Mission Impacts

Environmental Impacts

***Outer Rings = Worse***
Data Envelopment Analysis - Notional

Alternatives B, C, G & E are most sustainable
Formula for Success

LCA Framework + BCA + EO 13514 = MIL-STD for LCA in Acquisition

- ISO Standard 14040 as modified for DoD
- Business Case Analysis
  Required by Law
  Sustainability a Required Element
- Executive Order on Sustainability
  “Advance sustainable acquisition”
- Military Standard
  Sets a consistent assessment method
  LCA is tailored for DoD

Questions & Discussion

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Office of the Deputy Under Secretary of Defense
(Installations & Management)
Life Cycle Costs & ESOH Impacts Are Locked-In Early

Most Risks Occur Here
Current Paradigm

MATERIEL SOLUTION ANALYSIS
TECHNOLOGY DEVELOPMENT
ENGINEERING & MANUFACTURING DEVELOPMENT
PRODUCTION & DEPLOYMENT
OPERATIONS & SUPPORT

User Needs
Technology Opportunities & Resources

Identify & Mitigate ESOH risks by Milestone B & document in PESHE¹

¹ Programmatic Environmental Safety & Health Evaluation
Incorporate sustainability “up-front” starting in Analysis of Alternatives (AoA) & continuing through design
Current Thinking

Focus on 4 key life cycle stages:

- Research & development
- Production & deployment
- Operation & support (O&S)
- Recycling/demilitarization/disposal

Stages are consistent with DoD O&S Cost Estimating Guide
Bar Graph Display of Relative Sustainability
End Product

DEPARTMENT OF DEFENSE

LIFE CYCLE ASSESSMENT PROCESS FOR SUSTAINABILITY IN DOD ACQUISITIONS

DRAFT – Pre-decisional

NOT MEASUREMENT SENSITIVE

MIL-STD-XXX
as of 19 August 2010

Not for distribution outside the DoD Sustainability in Acquisition Working Group.