INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Specifying Affordability

INCOSE Affordability Working Group

Introduction

- The concept of affordability is straightforward.
- The difficulty arises when an attempt is made to specify and quantify the affordability of a particular system.
- Especially troublesome for the DoD.

Affordability Definitions

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- *Affordability means conducting a program at a cost constrained by the maximum resources the Department can allocate for that capability – Ashton Carter [Carter, Nov 2011]*

- *Affordability is the balance of system performance, cost and schedule constraints over the system life while satisfying mission needs in concert with strategic investment and organizational needs. - INCOSE Affordability Working Group (June 2011)*

Questions to Answer

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- How can we compare one affordable solution versus another for the purpose of a trade study or to make a contract award?
- How can affordability be expressed in quantitative terms that can be used to specify requirements?

Contexts

- Dr. Carter refers to:
  - Baseline Portfolio and/or Mission Area Definitions: … examples include: tactical wheeled vehicles …
  - Programs
- NDIA refers to:
  - Program
- INCOSE refers to:
  - System

Evolutionary System Acquisition

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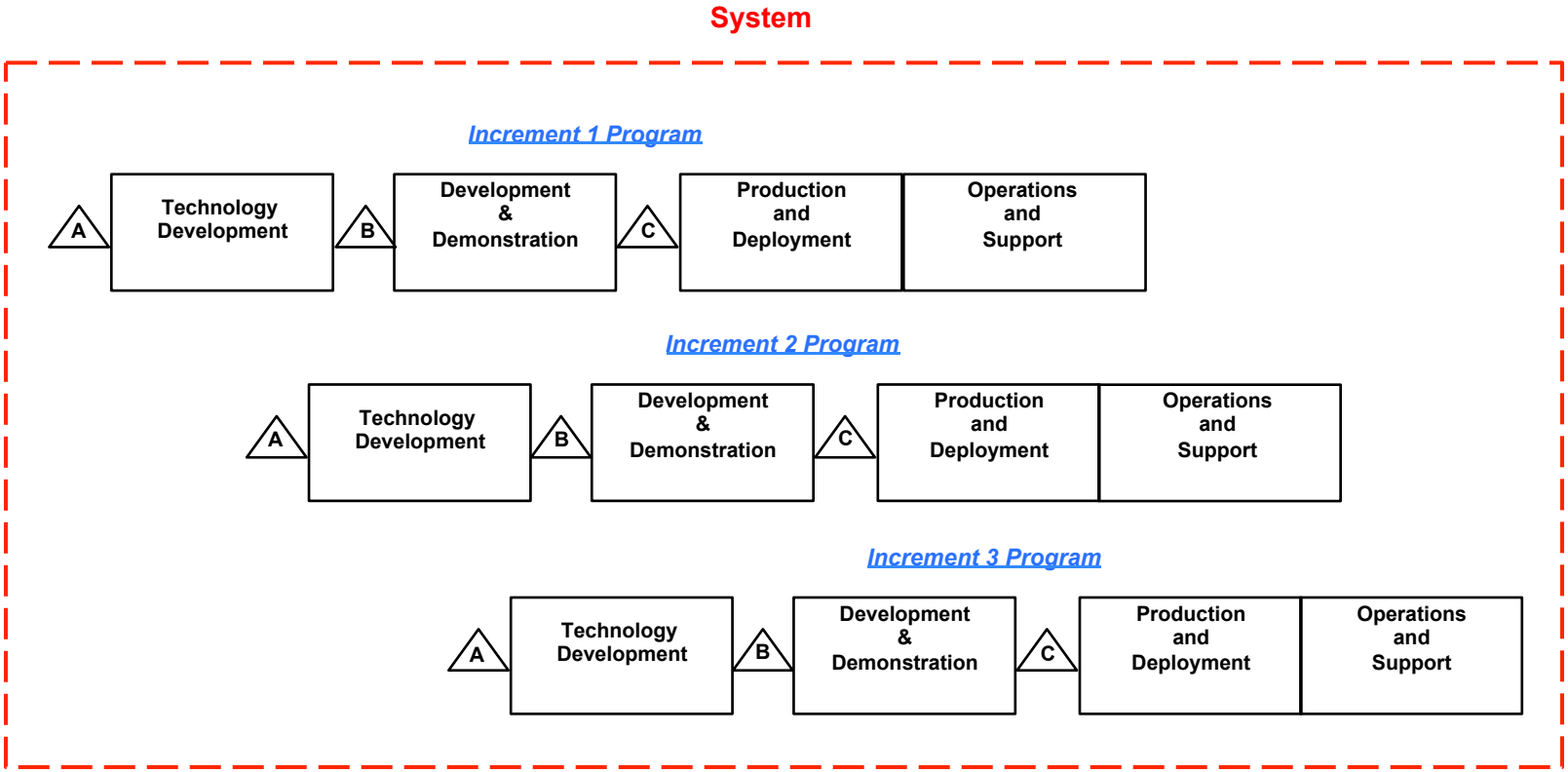

DoD Instruction 5000.02, Enclosure 2 – 2 Evolutionary Acquisition

Evolving Environment

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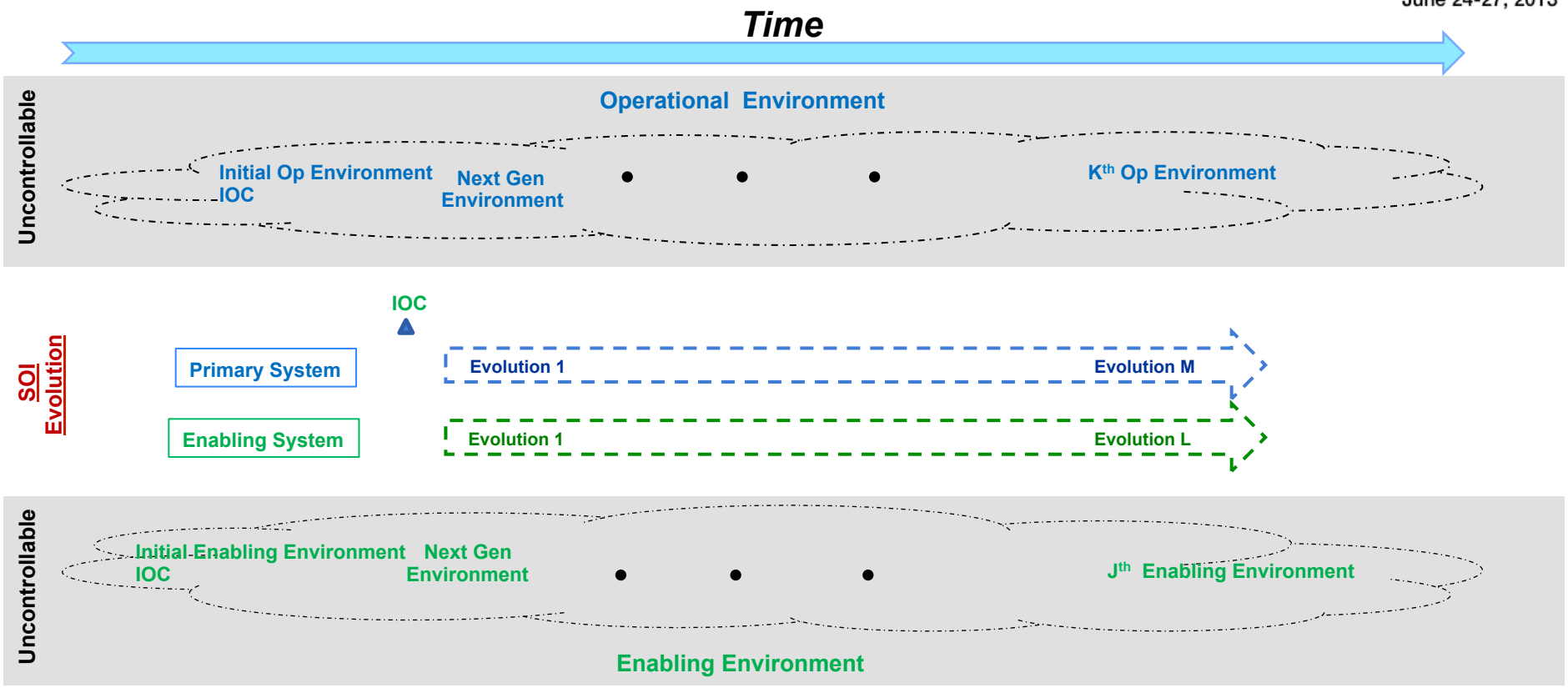
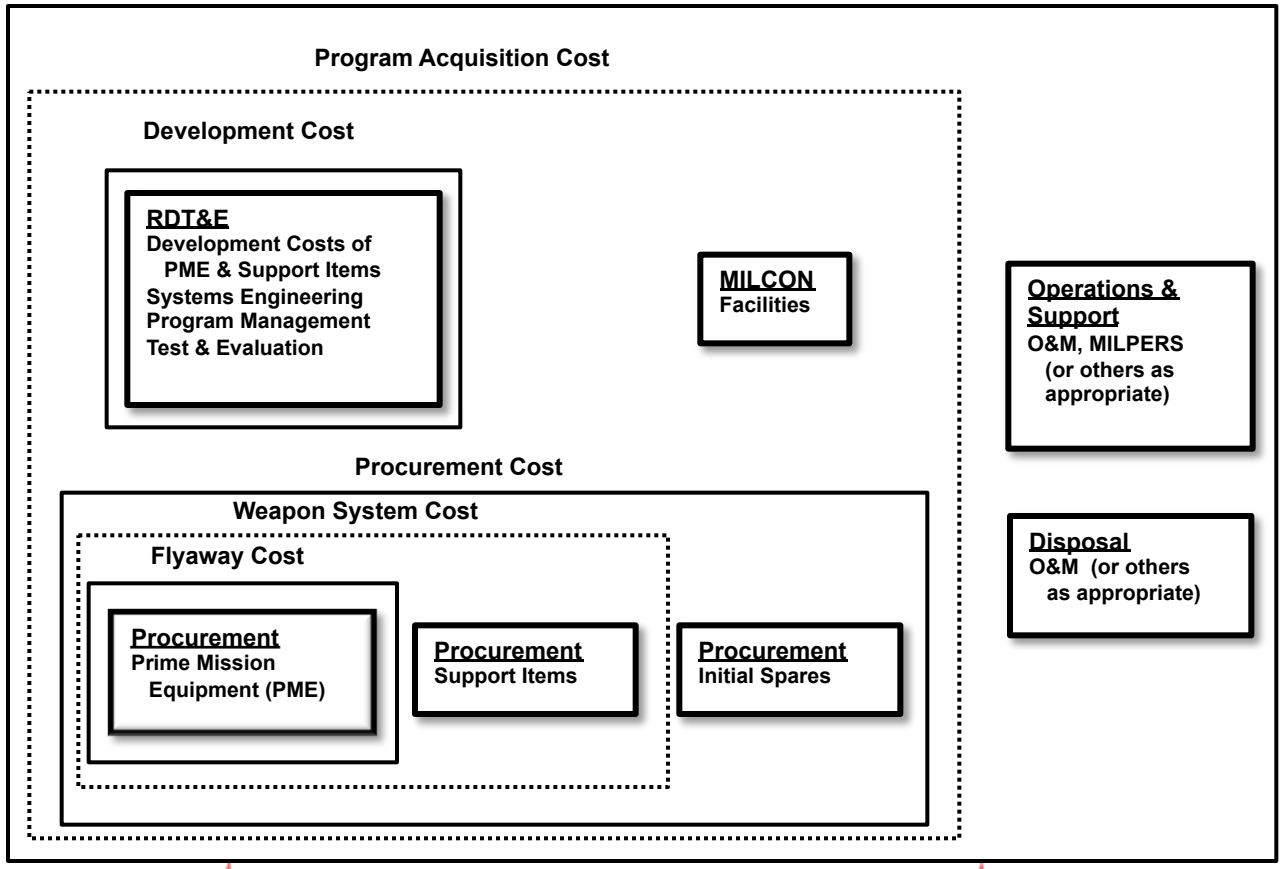


Life Cycle Cost Composition



Defense Acquisition University (DAU), Funds Management Platinum Card, January 2011

Cost Calculations

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Increment or a single program cost:

$$Cost = \sum_{i=1}^{5} B_i$$

$Where$:

$B_1 = RDT\&E\ Cost$

$B_2 = Procurement\ Cost$

$B_3 = Milcon\ Cost$

$B_4 = Operations\ \&\ Maintenance\ Cost$

$B_5 = Military\ Personnel$

Cost of SOI composed of multiple Program Increments

$$System\ Cost = \sum_{i=1}^{N} Cost_i$$

$Where$:

$Cost_i$
$= Cost\ of\ the\ ith\ Program\ Increment$

$N = the\ number\ of\ Program\ Increments$

Specifying Affordability

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1. **Required Capabilities (i.e., what does the system contribute to the mission, e.g., search, detection, rescue, transport.)**
   - ***Identify the required capabilities and the time phasing for inclusion of the capabilities***
2. **Required Capabilities Performance (i.e., How well must the system perform the required capability, e.g., defeat X% of the threats, detect Y% of the targets, or top speed of N knots.)**
   - ***Identify and specify the required Measures of Effectiveness (MOEs) for each of the capabilities***
   - ***Define time phasing for achieving the MOEs.***
   - ***Identify and specify Measures of Supportability (MOSs).***
   - ***Define time phasing for achieving the MOSs.***
3. **Budget (resources available to provide the capabilities and needed performance)**
   - ***Identify the budget elements to include in the affordability evaluation.***
   - ***Time phased budget, either***
     a. ***for each of the budget elements, or***
     b. ***as the total budget.***

Cost versus Performance

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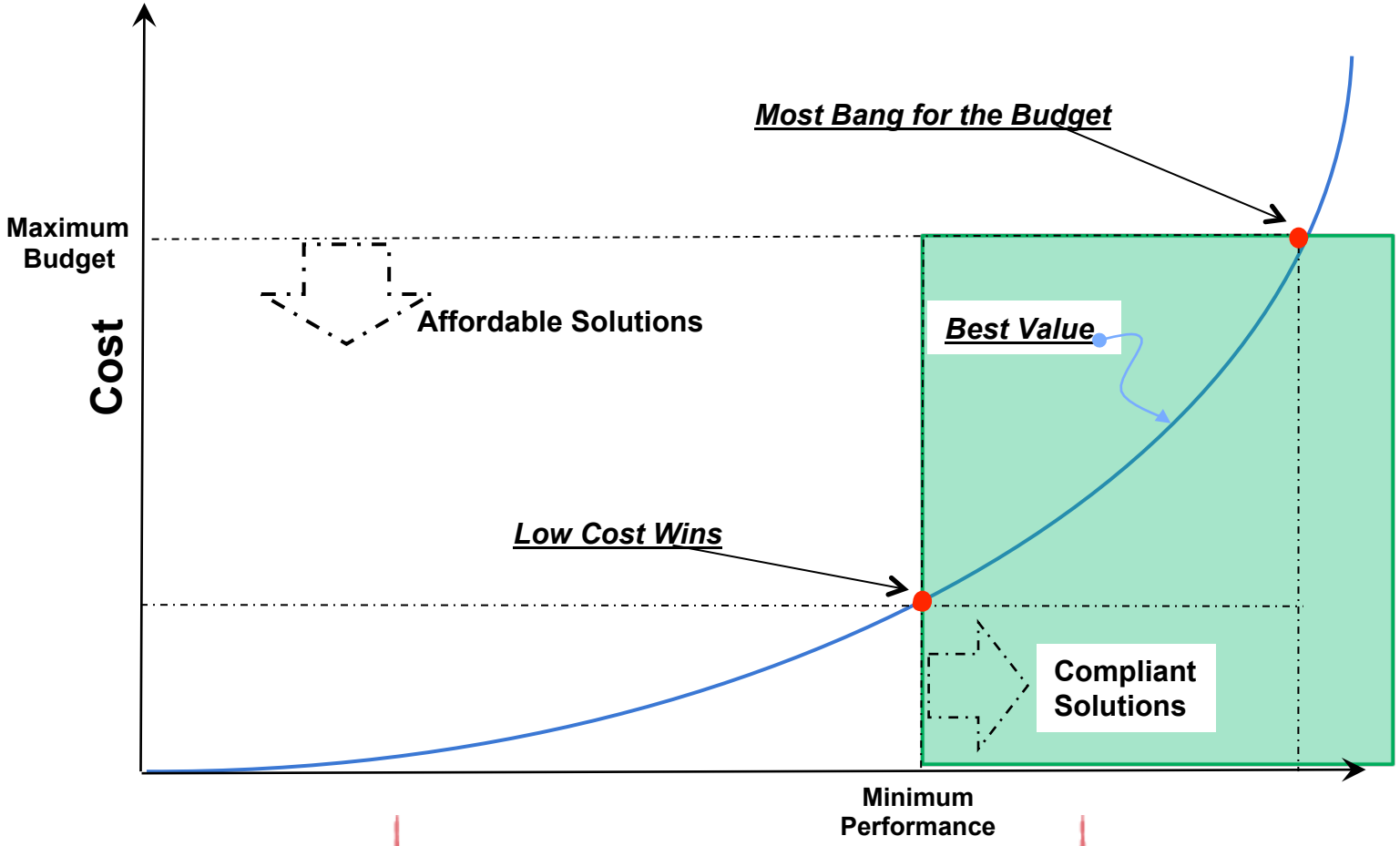

Generalized Cost Calculation

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$$System\ Cost\ B_i = \sum_{j=1}^{N} B_{i,j} \qquad (1.3)$$

$Where$:

$B_{1,j} = RDT\&E\ Cost\ of\ Increment\ j$

$B_{2,j} = Procurement\ Cost\ of\ Increment\ j$

$B_{3,j} = Milcon\ Cost\ of\ Increment\ j$

$B_{4,j} = Operations\ \&\ Maintenance\ Cost\ of\ Increment\ j$

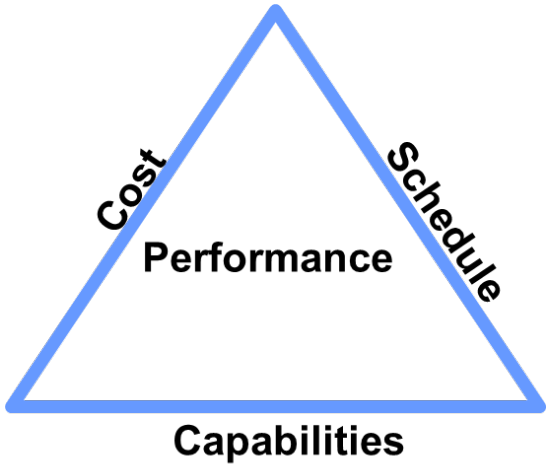
$B_{5,j} = Military\ Personnel\ of\ Increment\ j$

$i = 1, 5$

$N = the\ number\ of\ Program\ Increments$

Specification Usage

- The relationship among Capabilities, Performance, Schedule and Budget can be depicted as a triangle analogous to the Project Management Triangle



- Risk is identified as the inability to close one of the sides of the triangle
- Affordability can be accounted for within the normal trade study framework by
  - Extending the time horizon and
  - Including all cost elements

Summary

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- **Differentiated between System and Program affordability and included the Enabling System in the SOI affordability as TOC**

- **Derived an approach for specifying an affordability requirement, similar to a KPP, and showed that a specification resulting from this method**
  - **supports affordability comparisons between two systems; and**
  - **fits affordability trades into the standard trade study framework.**

- **Demonstrated that affordability considerations can be included directly into the trade study methodology.**

Survey

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Back-ups

SOI Life Cycle

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