Advatech Pacific

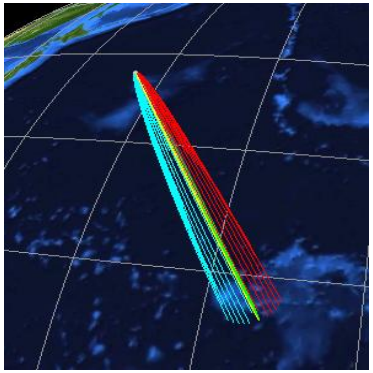
Changing The Way Engineering Is Conducted™

Early Development Planning Leads to Affordable Systems

presented at

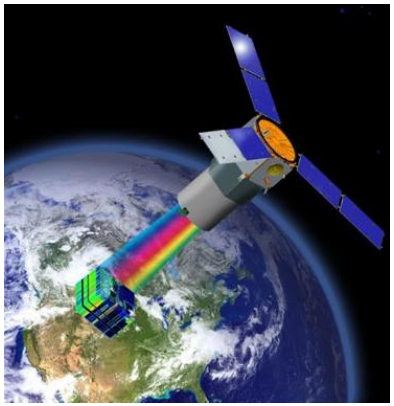
NDIA 14th Annual Systems Engineering Conference

Track 4 – Early Systems Engineering



October 25-28, 2010

Chuck Kondrack
David Peterson
Advatech Pacific Inc.



Overview

- Cost and Affordability in Context
- Early Systems Engineering, Early Developmental Planning and Affordability
- Early Planning & Development Challenges of Complex Systems
- Early Systems Engineering, Integrated MS&A Tools and Affordability
- Integrated MS&A Tool Example - Integrated System and Cost Modeling (ISCM) Tool Suite
- Affordability Goals vs Should Cost and Cost Growth Containment
- Early Developmental Planning Affordability Assessment Example
- Early Developmental Planning and Affordability Assessments Application “Foot Print”
- Summary

Affordability in Context – Defense Acquisition Guidebook

- ***Affordability:*** *The degree to which the life-cycle cost of an acquisition program is in consonance with the long-range modernization, force structure, and manpower plans of the individual DoD Components, as well as for the Department as a whole*
  - DoD Directive 5000.01, E1.1.4. Cost and Affordability, states: All participants in the acquisition system shall recognize the reality of fiscal constraints. They shall view cost as an independent variable, and the DoD Components shall plan programs based on realistic projections of the dollars and manpower likely to be available in future years. To the greatest extent possible, the Milestone Decision Authority (MDA) shall identify the total costs of ownership, and at a minimum, the major drivers of total ownership costs. The user shall *address affordability in establishing capability needs.*

Reference: Defense Acquisition University, DEFENSE ACQUISITION GUIDEBOOK, Chapter 3 -- Affordability and Life-Cycle Resource Estimates

Cost and Affordability in Context - DODI 5000.02

- ***Cost:*** "… prepare an *AoA study plan* to assess preliminary materiel solutions, identify key technologies, and *estimate life-cycle costs*." …. "The *AoA* shall *focus on* identification and analysis of alternatives, measures of effectiveness, *cost*, schedule, concepts of operations, and overall risk." …. "At *Milestone A*, the DoD Component shall *submit a cost estimate for the proposed solution(s) identified by the AoA*."

- ***Affordability:*** *"An affordability determination results from the process of addressing cost during the requirements process and is included in each CDD using life-cycle cost or, if available, total ownership cost." Required at Milestone B upon entry into the EMD Phase.*

So currently, Cost and Affordability are NOT required until the AOA (Cost) and Milestone B (Affordability) …… well after Early System Engineering and Early Developmental Planning

Reference: DODI 5000.02, "Operation of the Defense Acquisition System", 8 December 2008

Cost And Affordability in Context – Current DoD Direction

"Should Cost"
≠
"Affordability as a Requirement"

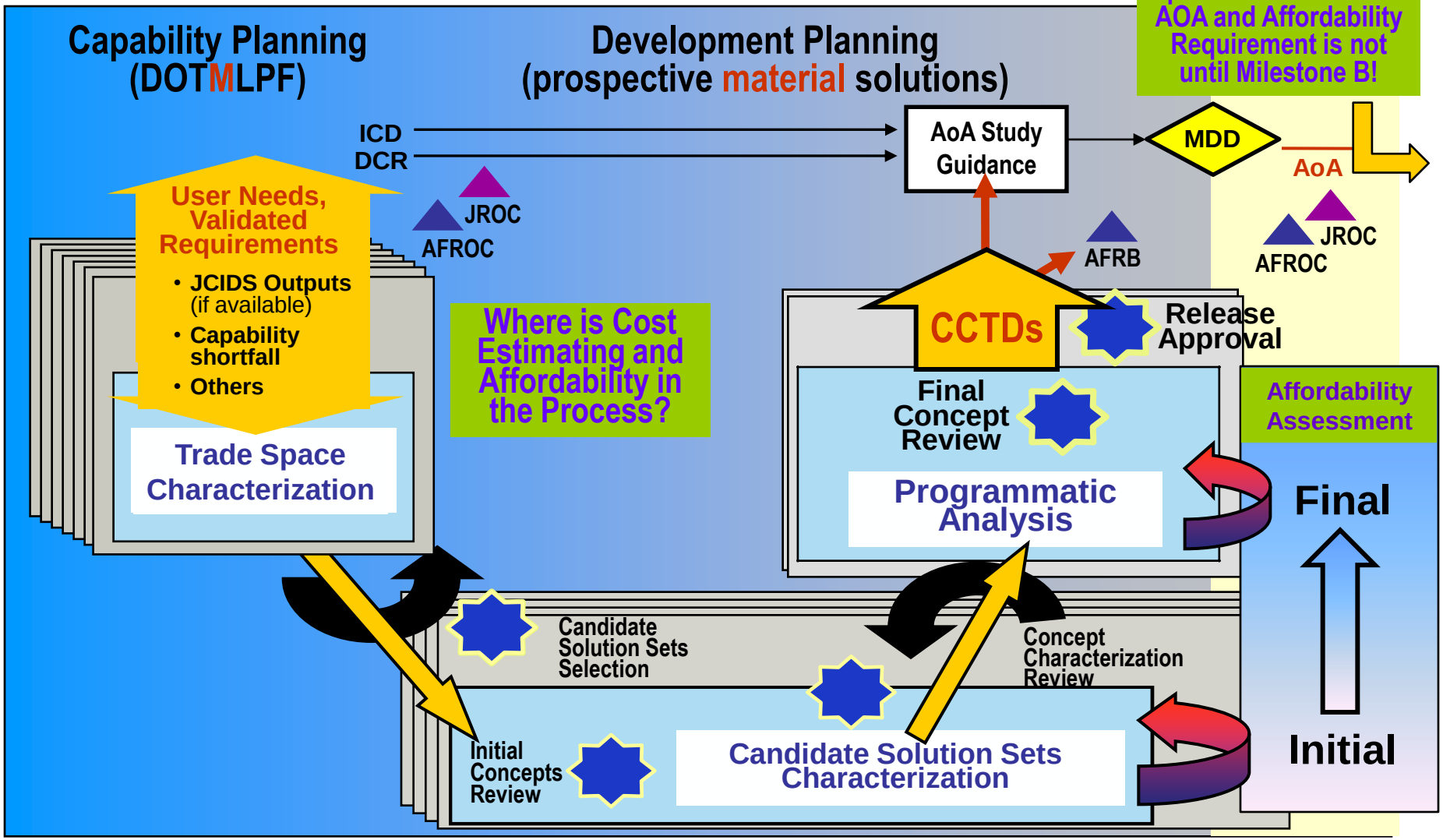
- ***"The two are compatible, but they must be balanced differently across the product life cycle. The emphasis prior to Milestone B should be on defining and achieving affordability targets. Past this point, the emphasis shifts to defining and achieving should-cost estimates."***

- ***"Affordability as a requirement …… establish quantified goals for unit production cost and sustainment costs for our products, driven by what the Department or Service can pay ….. set these goals early and use them to drive design trades and choices about affordable priorities."***

- ***"Affordability analysis is based upon the budgets we expect to have for the product over its life cycle and provides a design constraint on the product we will build, procure, and sustain."***

Reference: Ashton Carter, USD/AT&L Memo, "Should-cost and Affordability", Dated 24 August 2011

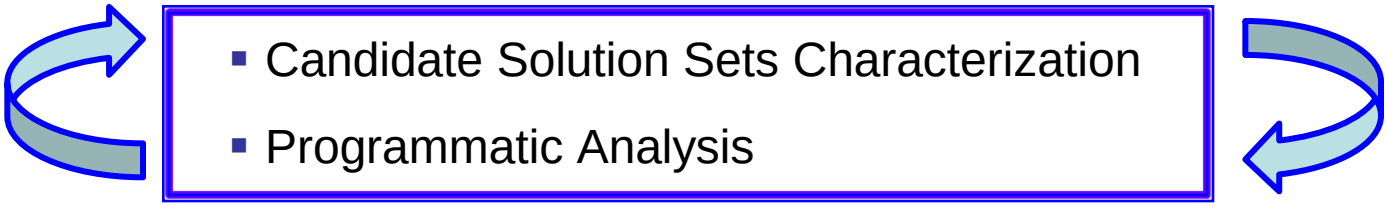
Air Force Early Systems Engineering and Affordability



Based on Information Presented at 12th Annual NDIA Systems Engineering Conference, San Diego, CA Oct 2009 - Jeff Loren SAF/AQRS, G. Richard Freeman AF Center for Systems Engineering

Affordability Assessments during Early Developmental Planning

- **Air Force Early Systems Engineering Process**
  - Trade Space Characterization
  - Candidate Solution Sets Characterization
  - Programmatic Analysis



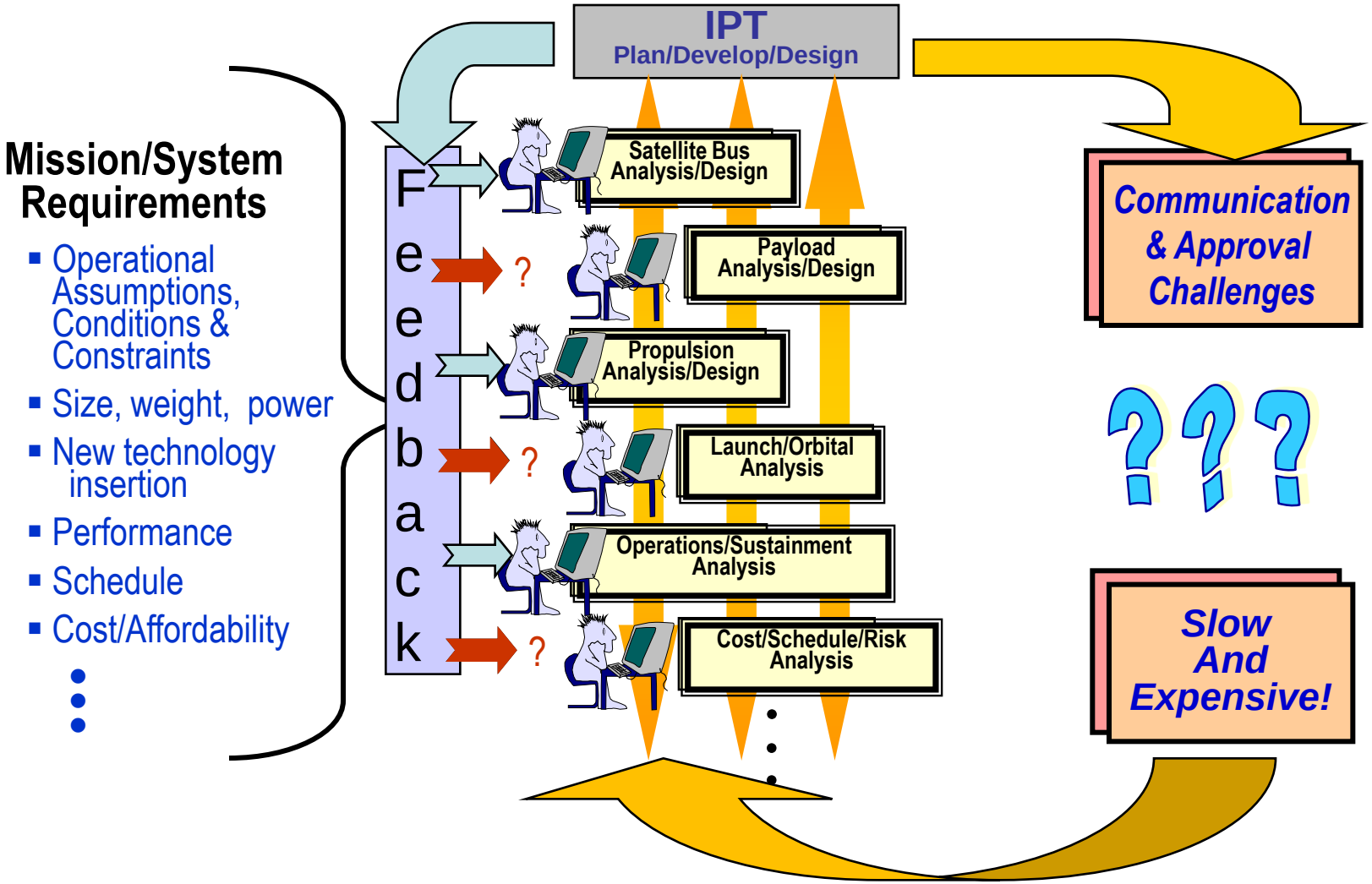
Iterative Affordability Assessments

- **Early, Concurrent, Iterative Affordability Assessments**
  - Part of the Early Systems Engineering Process and Developmental Planning combined w/ Modeling, Simulation & Analysis (MS&A)
  - Integrated and Iterative MS&A Tools with Collaborative Environment
    - System (and Subsystem) Performance, Cost, Schedule, and Risk
    - Historical and Knowledge Databases with Information Analytics
    - Ongoing, Transparent MS&A Information Control
    - Programmatic and Technical Accountability
  - Connect and Integrate: ***PEOPLE – PROCESS – TOOLS***

Traditional Planning, Development & Design Approach

Early Planning & Development Challenges of Complex Systems

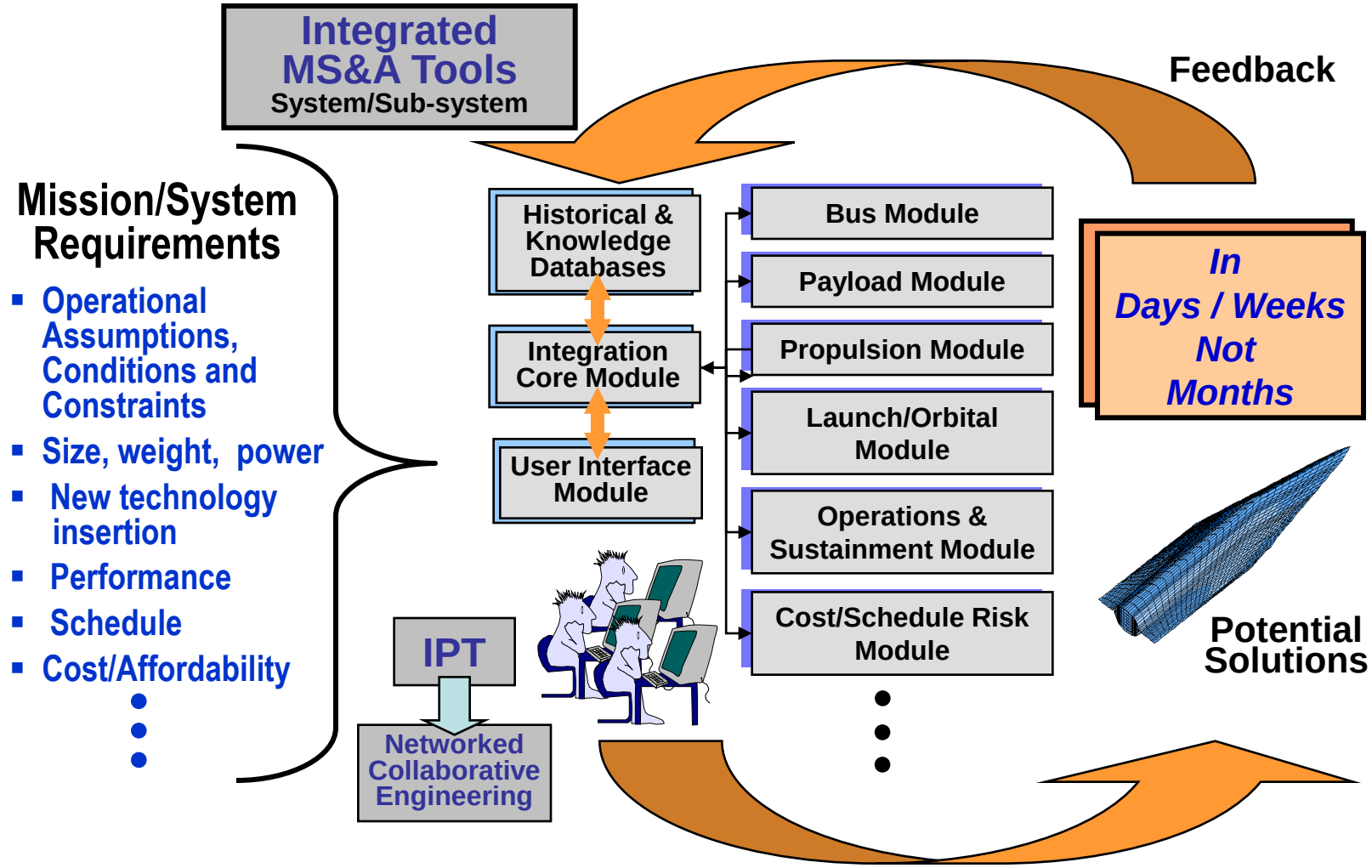
What is the current planning, development & design process?



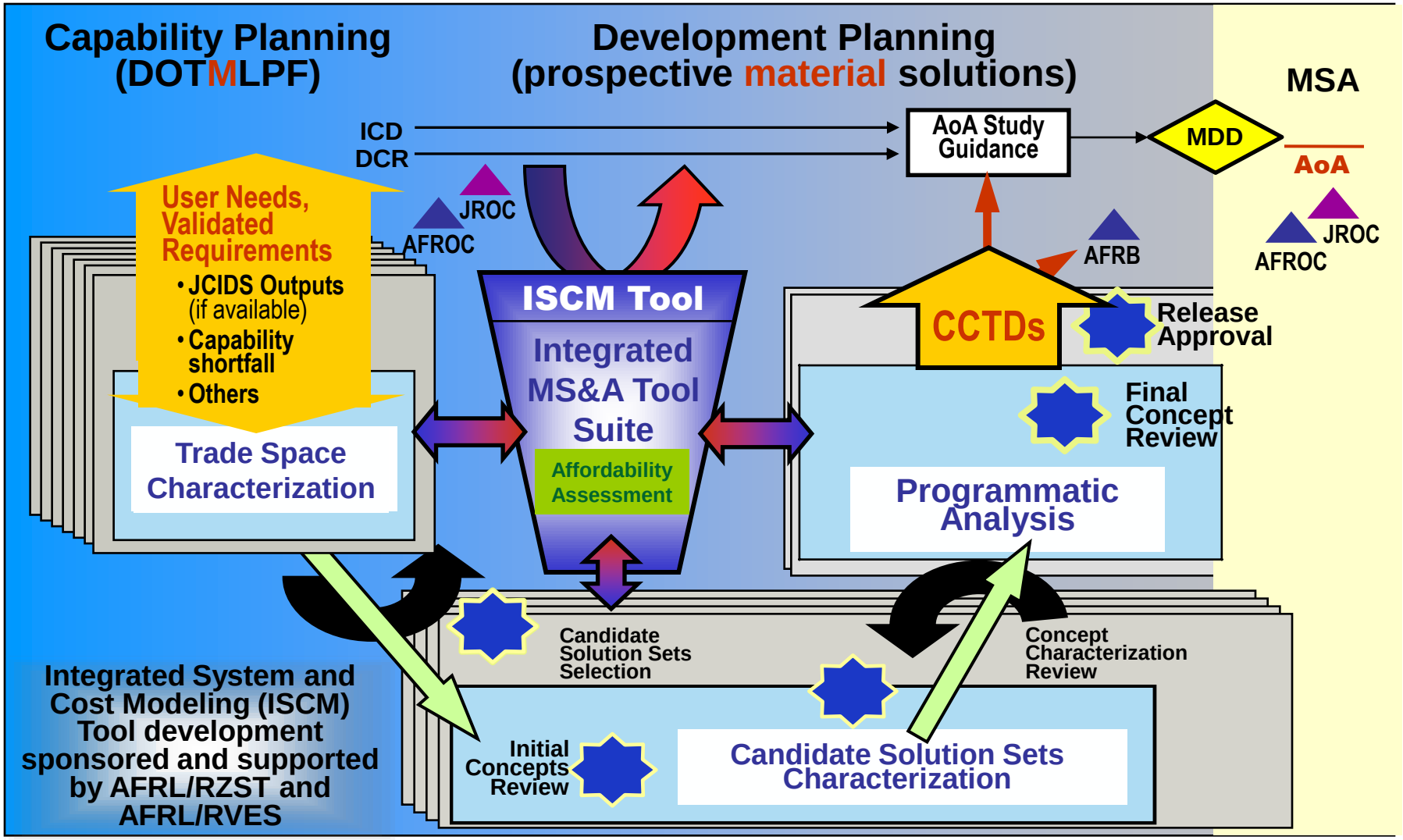
Integrated Planning, Development & Design Approach

Improvement to Early Planning & Development Challenges of Complex Systems

Integrated iterative MS& A tools provide:



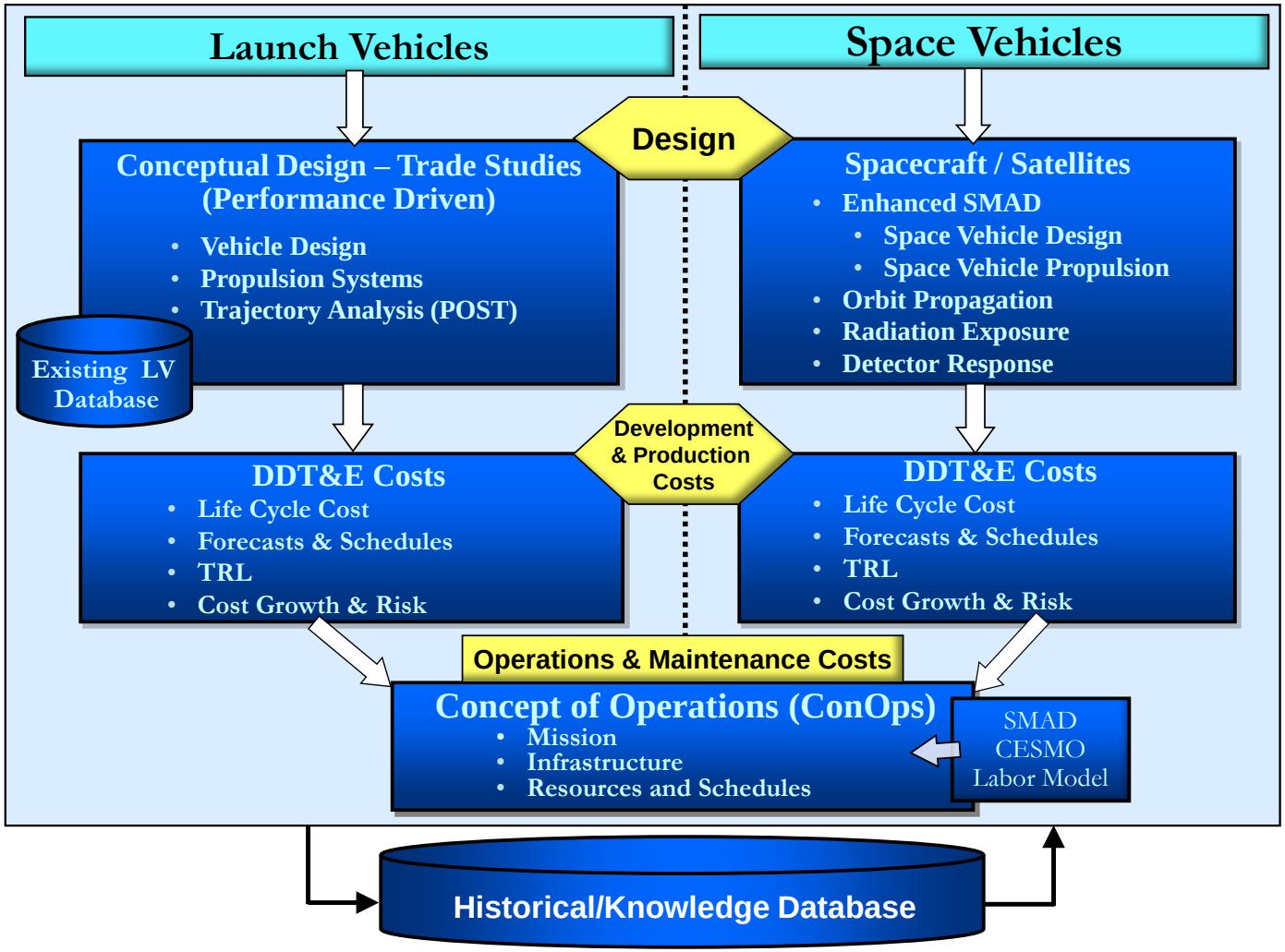
Early Systems Engineering, Integrated MS&A Tools and Affordability



Based on Information Presented at 12th Annual NDIA Systems Engineering Conference, San Diego, CA Oct 2009 - Jeff Loren SAF/AQRS, G. Richard Freeman AF Center for Systems Engineering

Integrated System and Cost Modeling (ISCM) Tool Suite Overview

Rapid Trade Space Optimization for the Complete Life-cycle in Days / Weeks

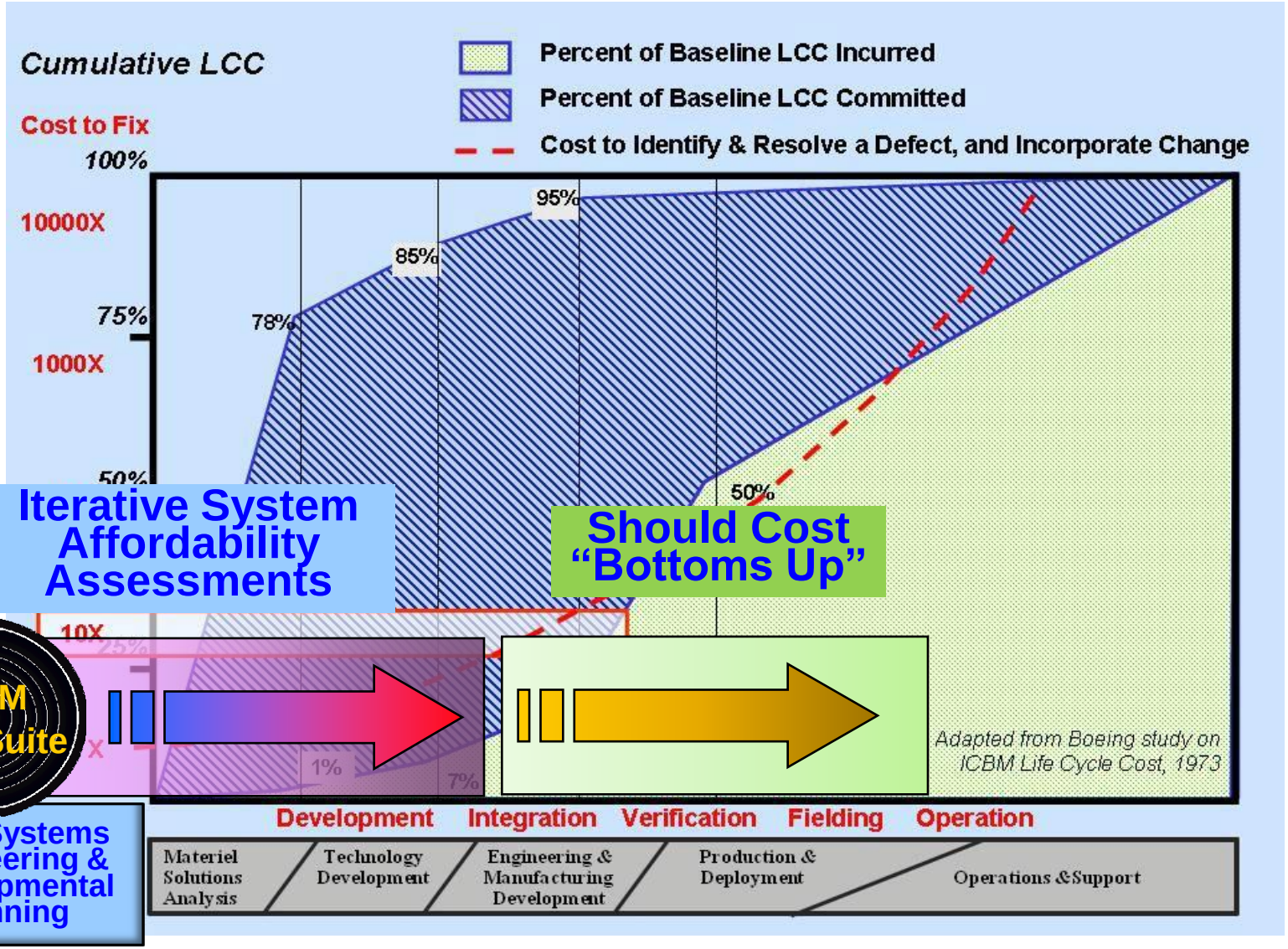


Integrated & Iterative Affordability Assessments through ISCM Tool Suite

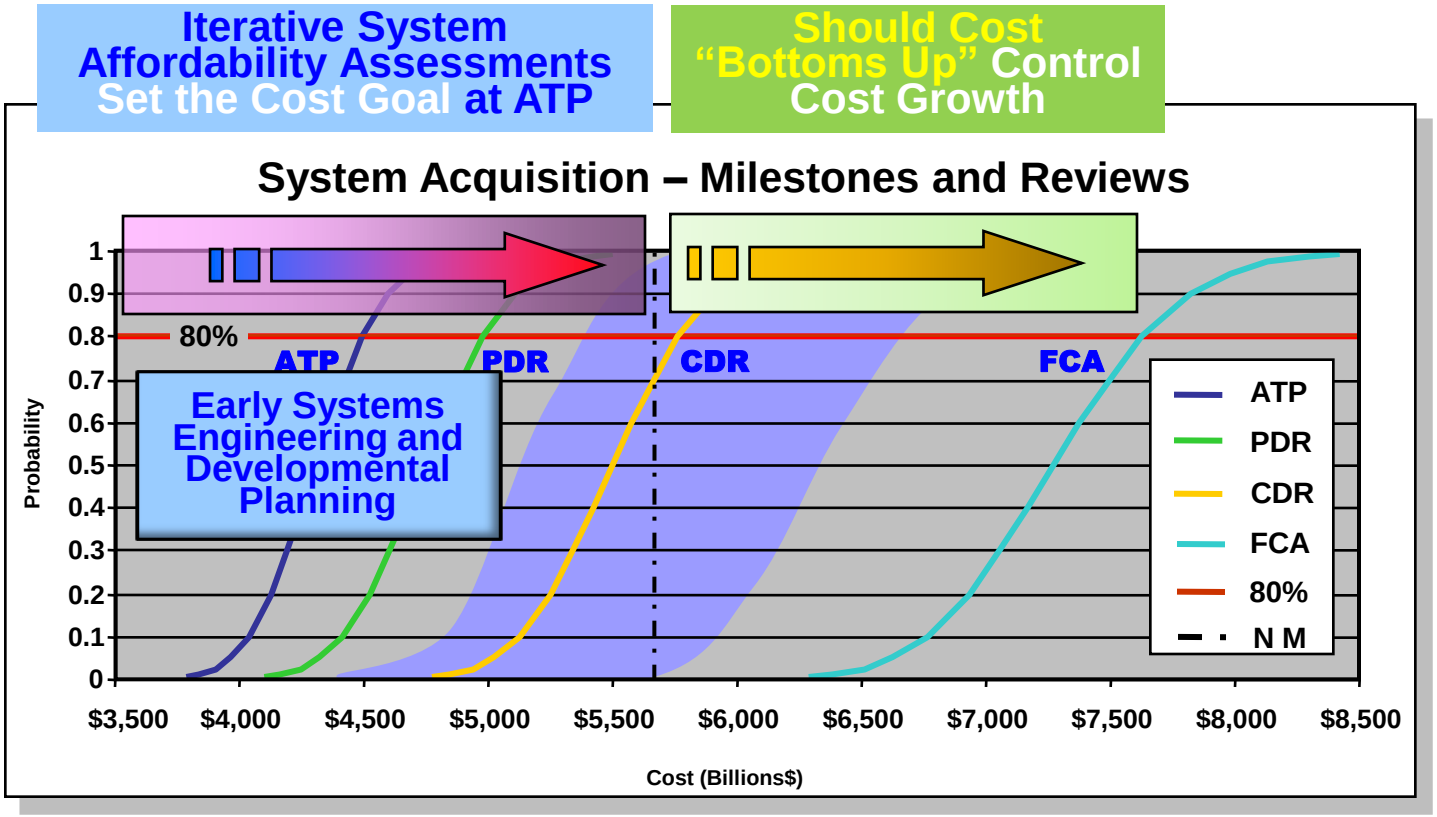
Performance - Cost - Schedule - Risk

- **Links system performance with total Life Cycle Cost estimates**
- **Provides trade study traceability so that process is repeatable**
- **Addresses the principal cost/affordability drivers**
  - Technology maturity and cost growth
  - System design and complexity
  - Mission requirements and constraints
  - Design, Development, Test and Evaluation (DDT&E) concepts
  - Operations and Sustainment (O&S) concepts
  - Change in Production Quantities Ordered
- **Addresses key aspects of a system acquisition and management**
  - Planning & Development
  - Technology (existing and proposed)
  - Engineering, Design & Manufacturing
  - Production
  - Operations & Sustainment
  - Disposal
- **Level of risk identified with each estimate**

Affordability, Should Cost and the Decision-Cost Curve



Affordability Goals vs Should Cost and Cost Growth Containment

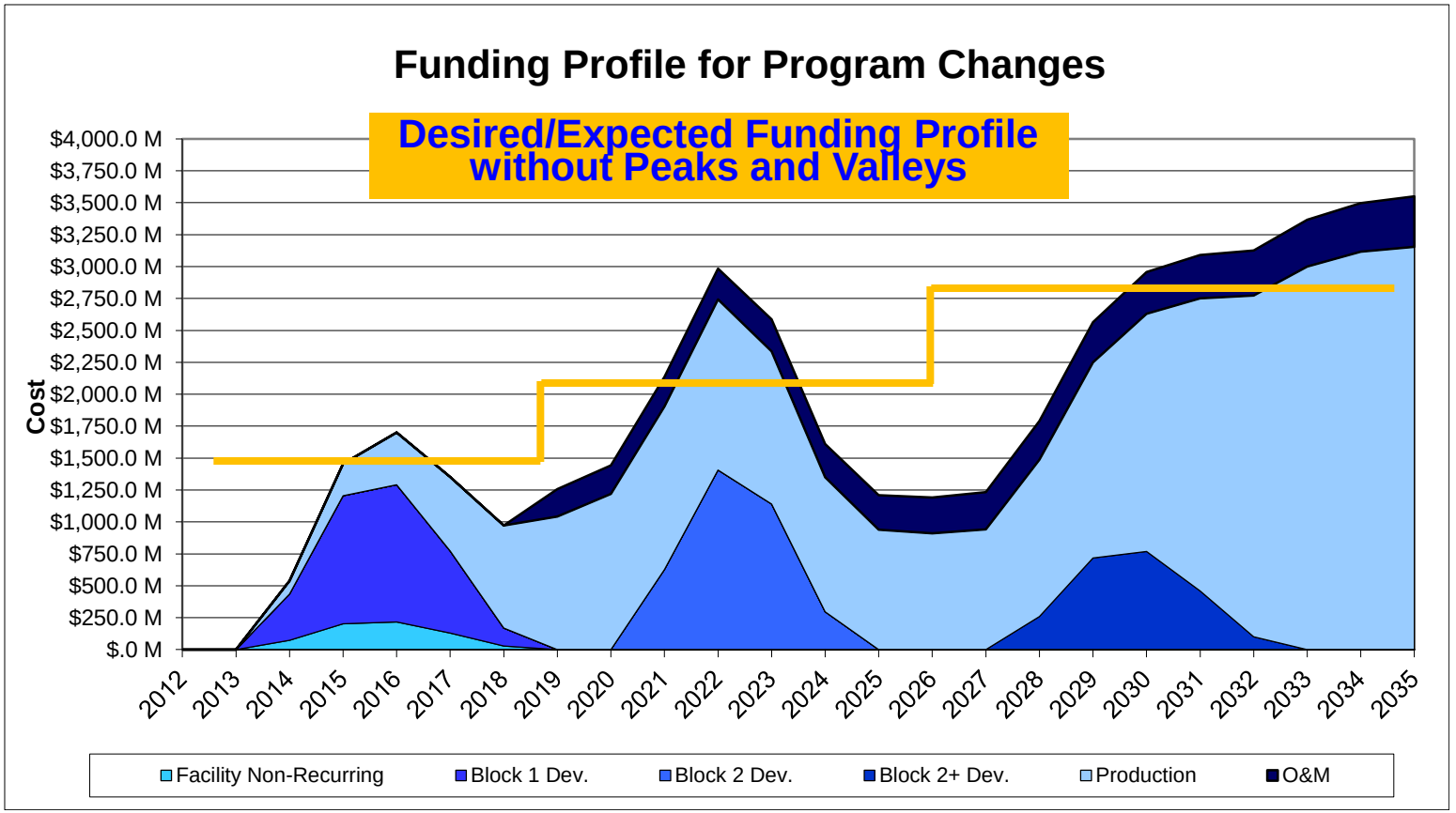


Nunn-McCurdy (NM)

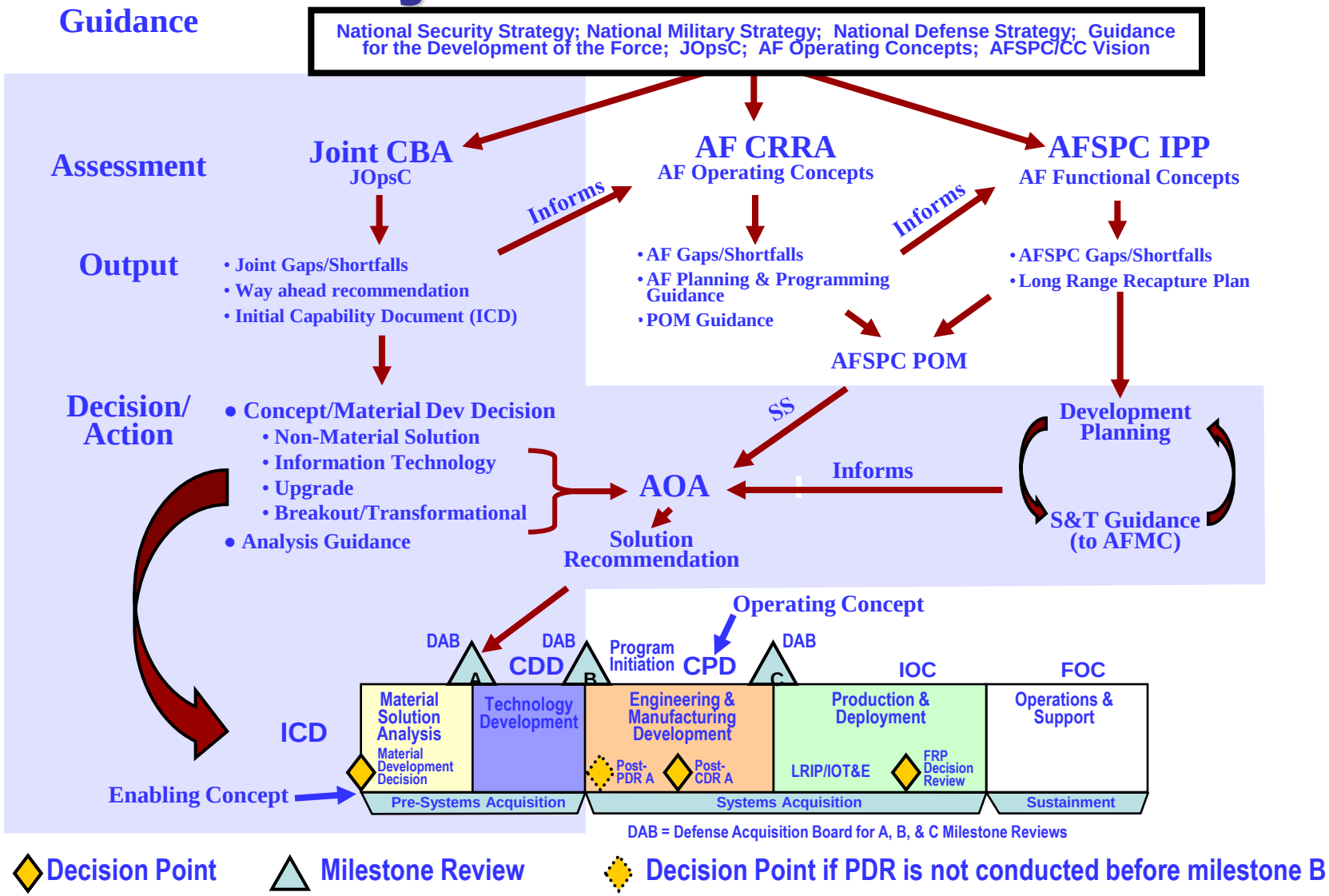
- Current and past Initial Cost Goals at ATP have resulted in unacceptable Cost Growth
- Need to establish a more realistic Cost Goal at ATP w/ Affordability Assessments
- Collapsing the curves reduces overall Cost Variability (Growth) for more manageable acquisition programs (Added Benefit: Potentially eliminates Nunn-McCurdy violations)

Early Development Planning Affordability Assessment for System Block Upgrades

- Iterative Affordability Assessment using ISCM Tool Suite provided real time input for Early Development Planning



Developmental Planning and Affordability Assessments "Foot Print"



Ref: AFSPC, High Frontier – The Journal for Space, Cyberspace & Missile Professionals, Volume 6, Number 1, November 2009, "Requirements Generation: The Crucial First Step to Delivering Warfighter Capability", Col Jay A. Moody, USAF, Deputy Director of Requirements, HQ Space Command.

Summary

- ***Currently, Cost and Affordability are NOT required until the AOA (Cost) and Milestone B (Affordability) …… well after Early System Engineering and Early Developmental Planning***
- ***DoD (Ashton Carter) Direction: "Emphasis prior to Milestone B should be on defining and achieving affordability targets. Past this point, the emphasis shifts to defining and achieving should-cost estimates."***
- ***Affordability Assessments combined w/ Integrated MS&A Tools can provide significant insight during Early Systems Engineering and Developmental Planning to establish System Affordability Targets***
- ***The ISCM Tool Suite is an example of an integrated MS&A Tool currently in use that is supporting Early Systems Engineering And Developmental Planning***
  - *ISCM Tool Suite details presented by Dr. Deganit Armon during Track 5 - Modeling & Simulation in Acquisition on Wednesday (26 October 2011) at 10:50 am*

Contact Information

Name: ***Charles Kondrack***

Company: ***Advatech Pacific Inc.***

Phone Number: ***909.307.6218 Ext 230***

Email: ***kondrack@advatechpacific.com***