

Cost As an Independent Variable
(CAIV)

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Agenda

- What is CAIV? (An Industry Perspective)
- The CAIV Process (Cost Management)
- Successful CAIV Implementation
- CAIV Vs. DTC
- Trade Studies
- Risk Analysis
- Summary

What is CAIV?

- ◆ **Same as Design-to-Cost?**
 - New OSD (A&T) Initiative
 - Cost Goals Based on Mission Affordability
 - Financial Incentives
- ◆ **Similar to Target Costing in Commercial World?**
 - Contain or Reduce Cost and Succeed in Marketplace
 - Price Goals Based on Market Surveys
 - Crucial to New Product Introduction
 - Sound Business Practice--Mercedes Benz
- ◆ **Cost no Longer Considered an Output**
 - Unit Cost is a Design “Input”

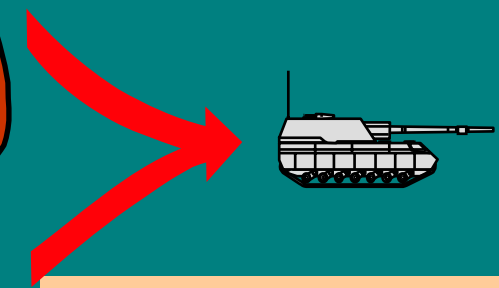
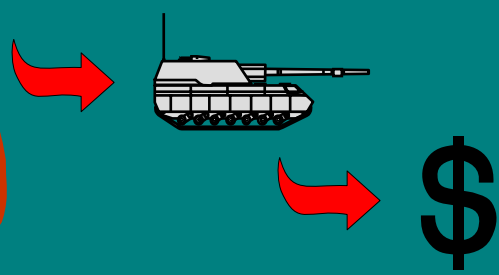
CAIV Objective

Old Paradigm

New Paradigm

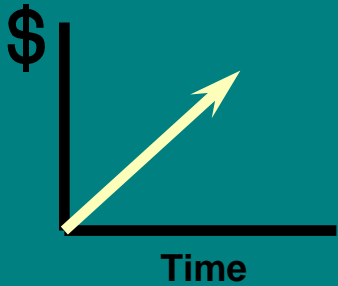
User Reqts

User Reqts



Performance Determines Design
THEN
Design Determines Cost

Performance *AND* Cost Goals
Determine Design



CAIV: Effective Cost Management, Earned Value Management, Design-To-Cost and Program Management

CAIV Aims and Policy

- ◆ **Change Cold War Culture from Maximum Performance at any Cost to “Best Bang for the Buck”**
- ◆ **Make Cost an Input (Requirement) to Process not an Output (Consrquence)**
- ◆ **DoD Equivalent of Best Commercial Practice**
- ◆ **Reduce Cost to Acquire and Operate Systems While Maintaining High Performance**
- ◆ **Scrub Program Goals for Marginal Performance Improvements that Drive Cost**

Paul Kaminski

4 Dec 1995

CAIV Tenets

- ◆ **Reduce Life Cycle Cost (Development, Procurement, O&S)**
- ◆ **Strong User Participation Throughout**
- ◆ **Conduct Timely Cost-Performance Tradeoffs**
- ◆ **set Early, Aggressive and Realistic Cost Targets and Continue to Refine**
- ◆ **Aggressively Manage Program to Achieve Cost Targets**
- ◆ **Incentivize Government and Contractor Team**

Cost Management... Today's Necessity

Effective Cost Management Is a Must Today

- ◆ **Affordability Demands by the Market Place**
- ◆ **Declining (Military) Budgets**
- ◆ **Increasing Emphasis on Lower Cost Commercial Products, I.E., COTS**
- ◆ **Opportunity to Manage Through Improved Cost Models and Cost Professionalism**
- ◆ **Emphasis on “Best Practices,” “Best Process,” and “Best Value”**
- ◆ **Crusader Is an Advocate of Integrated Product Development Teams and Other Acquisition Reform Initiatives, I.E., The Parametric Estimating Initiative (PEI)**

**Failure to Manage Costs in Every Program Phase
Risks Termination or Stretchout**

Cost Management Overview

- ◆ **Objective: Optimize Life Cycle Cost by Ensuring that Cost is Considered When Making Program Decisions**
- ◆ **Approach:**
 - **Implement Robust Design-to-Cost Program with Production Focus**
 - **Consider Cost Equal to Performance**
 - **Establish an Aggressive but Achievable Cost Target**
 - **Meet Negotiated Cost Target**
 - **Review Life Cycle Costs for Optimal Balance**
 - **Implement an Integrated Earned Value Management System for Dem/Val and EMD Focus**

**Objective Stays with the Program
For the Entire Life Cycle**

Integrated Cost Management Team

United Defense

Government

- Program Director
- Deputy Program Director
- Technical Director
- System Integration Manager
- Program Control Team Leader
- Business Manager

**Executive
Committee**

- Project Manager, Chair
- TSM - Cannon
- Deputy Project Manager
- Business Manager
- Systems Engineering

- Product Team Leaders
- Functional Team Leaders

- Product Managers
- Division Chiefs

- Program Control
- System Integration Manager

- Business Management
- Systems Engineering

**Steering
Group**

As-Needed

As-Needed

**Cost
Management
System Team**

**Trade
Study
Team**

**Cost
Reporting
Analysis Team**

**Design to Cost
Team**

Purpose is to Facilitate Cost Management Activities Across Entire Program by Providing Maximum Visibility Into the Cost Impacts of Design, Manufacturing, and Programmatic Decisions

CAIV Implementation

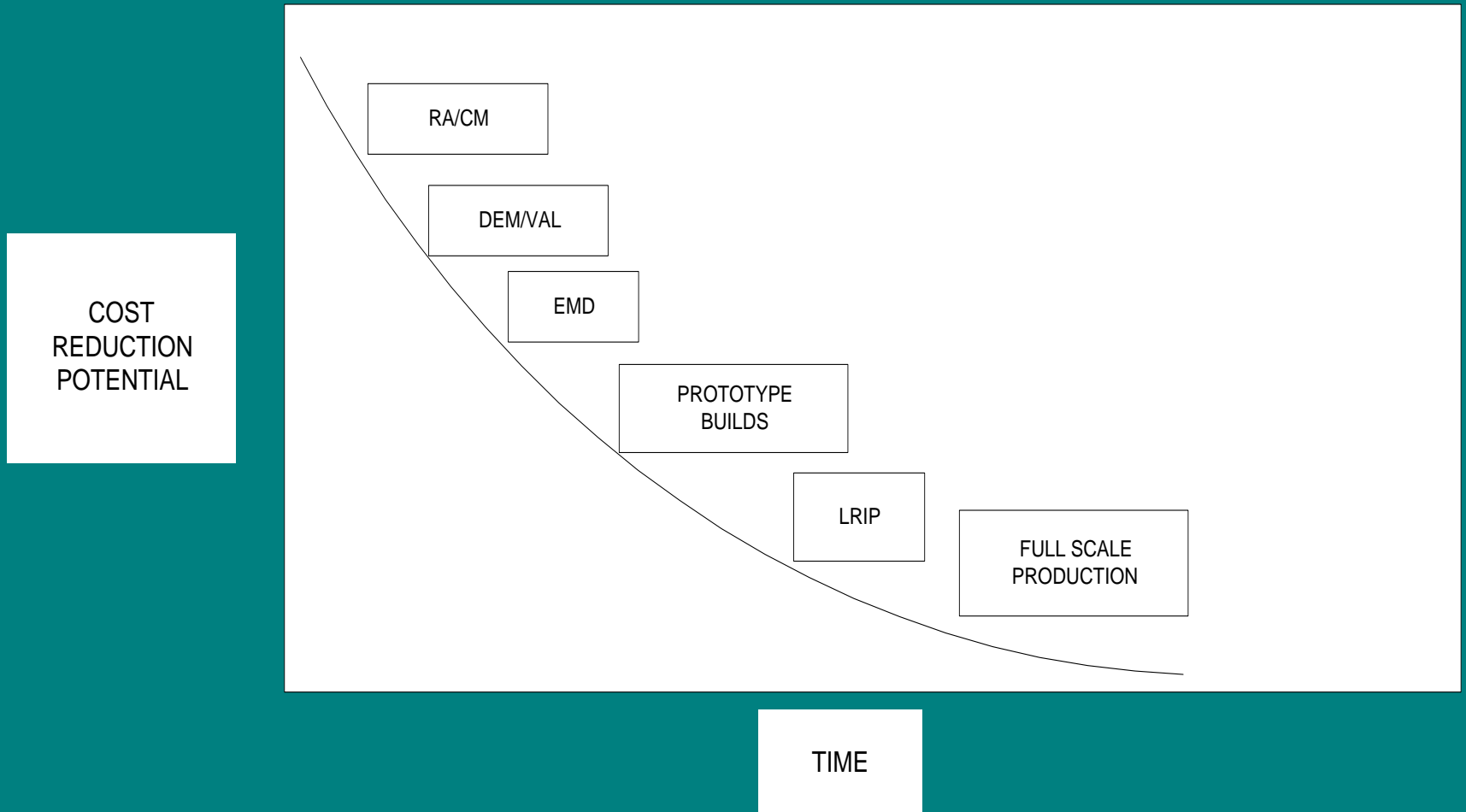
- ◆ **Objective: Establish Aggressive Design To Unit Rollaway Cost (DTURC) Goal**

- ◆ **Approach:**
 - **Allocate DTURC Targets by WBS to Product Development Teams (PDTs)...Then Manage to Targets**
 - **Implement the Cost Analysis Process That Supports DTC Objective**
 - **Cost Analysis Is the Cornerstone of CAIV/DTC**
 - **Use Effective Cost Analysis Tools**
 - **A Properly Trained Work Force**
 - **Identify Cost and Risk Drivers**
 - **Life Cycle Cost Management and Control**

How To Succeed With CAIV...

- ◆ **Early Development of Process and PDT Targets**
- ◆ **Heavy Involvement by PDTs to Ensure Buy-In**
- ◆ **Fully Calibrated Parametric Tools for Rapid Cost Analysis**
- ◆ **Top Level Management Support**
- ◆ **Cost Thinking Ingrained at the Engineer Level**
- ◆ **Documented System**
- ◆ **Training, Training, Training**
- ◆ **Well Defined Analytical Foundations for Trade Studies**
- ◆ **Incentivize for Achieving Goals**

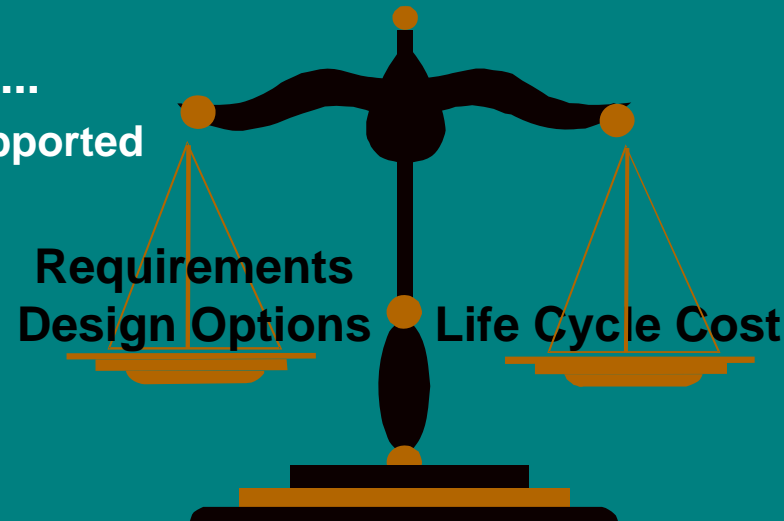
Window of Opportunity



Requirements for Success

◆ CAIV/Cost Management

- Singular Vision From the User, Program Office and the Contractor Team
- Management Buy In that Cost is Equal in Importance to All Other Variables
- A Sound Management System that...
 - Requires Goals be Analytically Supported
 - Develops the Expected Result
 - Tracks and Measures Results
 - Ensures Corrective Action
 - Places Early Focus on Trades



CAIV is a Philosophy: the Goal is to Achieve the Right Balance

Incentives

- ◆ Program Developed to Reward Contractor for Implementing CAIV Processes and Achieving Cost Goals--Evaluate and Reward Every 6 Months
- ◆ Sliding Scale
 - Early Dem/Val: Emphasis on CAIV Tools & Processes
 - Late Dem/Val: Emphasis on Achieving Cost Goals
- ◆ At End of Dem/Val, Meeting Base Goal (Aggressive but Achievable) Yields an Award Fee of 100%
- ◆ Beating Base Goal can Yield Award Fees up to 300%
 - Based on “Look Back” Provision of Contract
- ◆ Missing Base Goal Could Mean No Award Fee
- ◆ Goals, Targets, Incentives are Defined in Contract

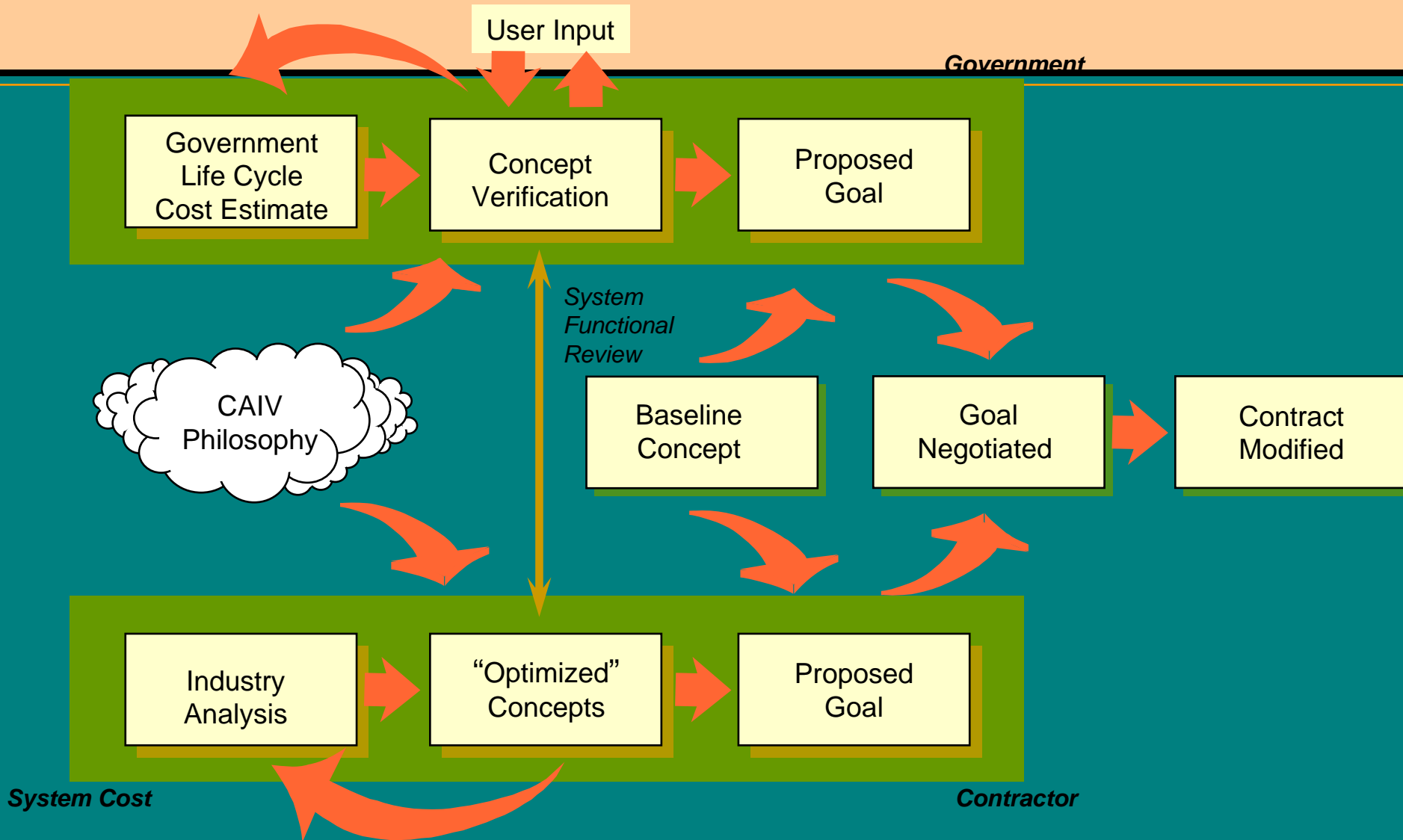
CAIV Vs. DTC

- ◆ **CAIV is More Current**
 - 1995 Policy for Cost Management
 - Replaces DTC as a Management Philosophy
- ◆ **CAIV is Broader**
 - Incorporates Cost/Performance PDT
 - *Requires* Participation by User
 - Includes Risk Analysis
 - Stresses Affordability
- ◆ **DTC is Well Established (Since 1975)**
 - Part of PDT Culture and (Sometimes) Design Guidance
 - Basis for Cost Tool Set
- ◆ **CAIV: The Mgmt. Philosophy--What Needs to be Done?**
- ◆ **DTC: The Defined Process--How do We Do It?**

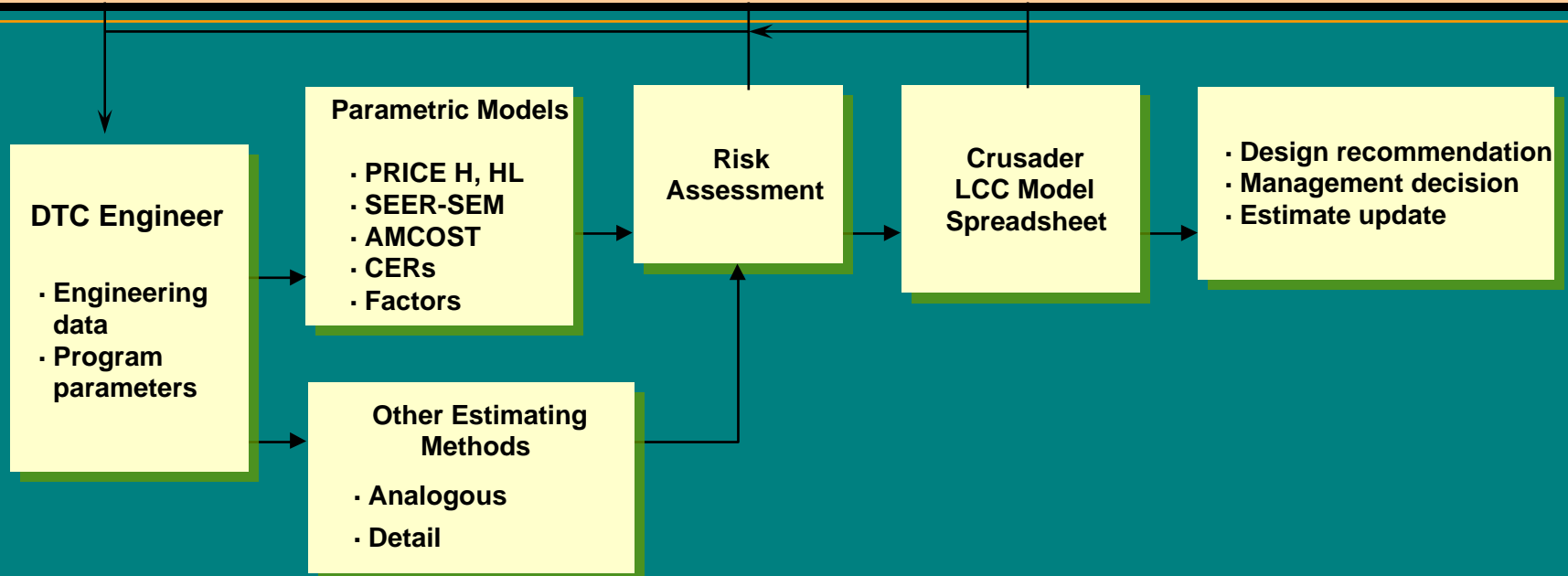
CAIV is More Than DTC

- ◆ **Carefully Examining Cost-Performance Tradeoffs**
- ◆ **Reducing Life Cycle Cost (Not Just Production)**
- ◆ **CAIV Impact is Greatest Early in Program Development**
- ◆ **CAIV is Continuous Cost Reduction Process--Not a Cost Tracking or a Cost Containment System**

DTC Target Setting



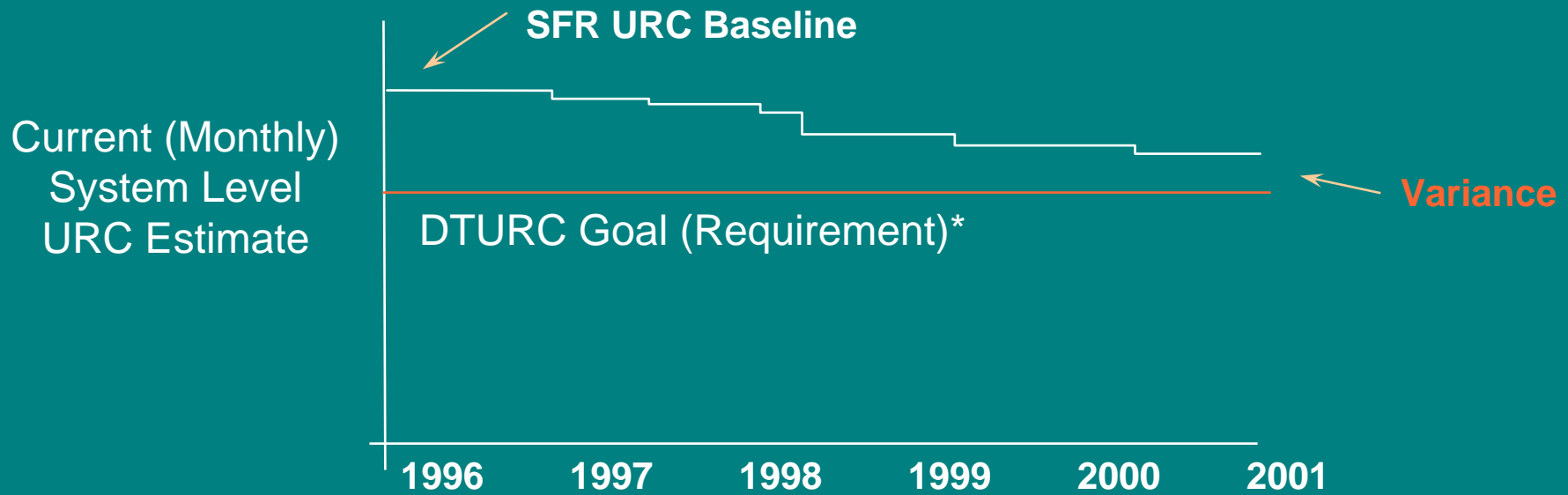
Estimating Toolset/Process



Calibrated Models and Baseline Afford Luxury of Rapid Estimating

DTURC Tracking and Reporting

- ◆ DTURC Tracking and Reporting Same Importance as Technical Performance Measures
 - Tracked and Reported Monthly
 - PDT Reporting to System Level
 - Subcontractors Report to PDTs



* Goal value depends on weight assumption and estimate confidence

CAIV Products

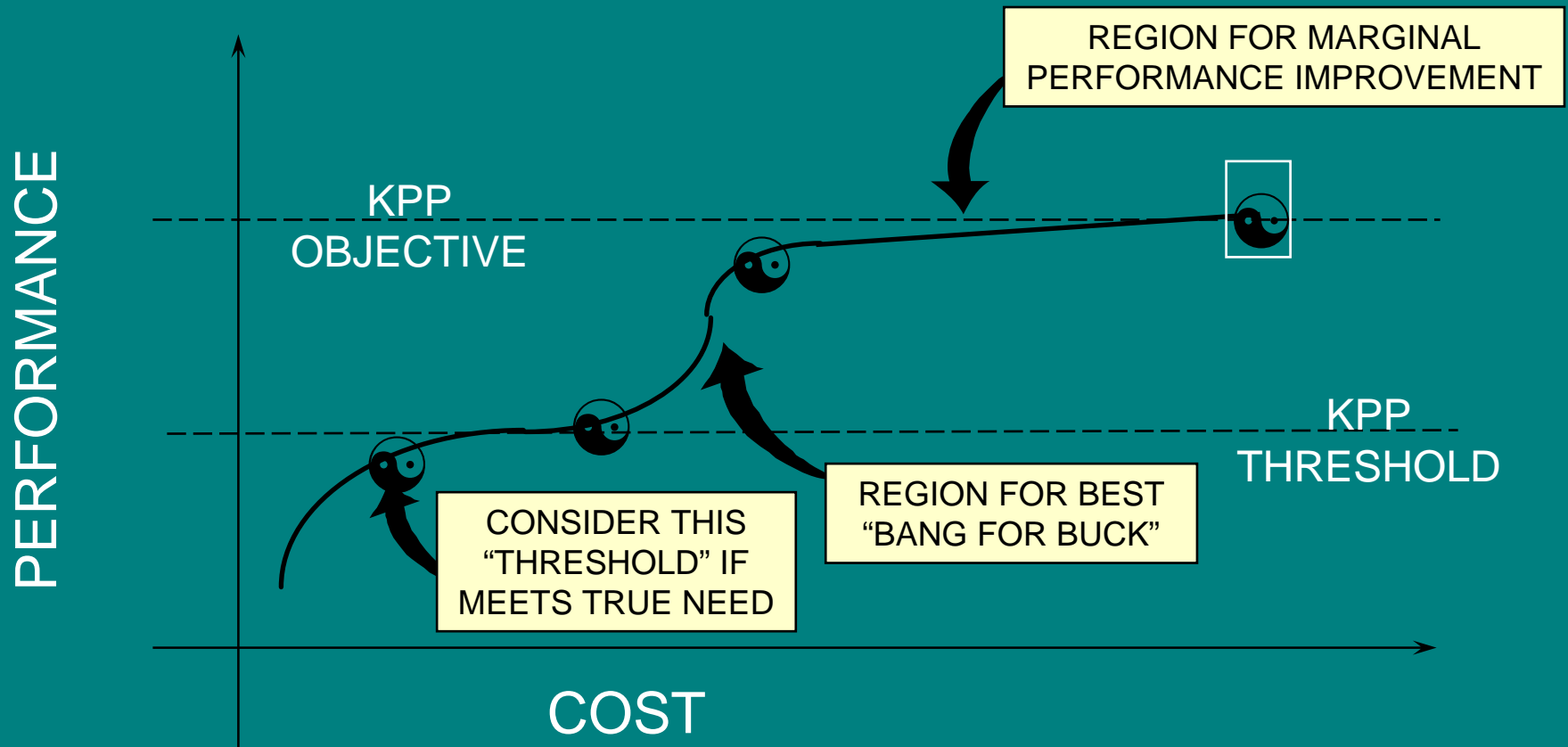
- ◆ **CAIV Plan**
- ◆ **Generic CAIV Plan**
- ◆ **CAIV Engineers' Handbook**
- ◆ **Trade Studies with Documentation**
- ◆ **Training Materials**
 - **PDT Course**
 - **Executive Course**
- ◆ **Life Cycle Cost Model**
- ◆ **Subcontractor Reporting Requirements Document**
- ◆ **Risk Analysis Procedure**
- ◆ **Cost Reporting Procedures**

Trade Study Overview

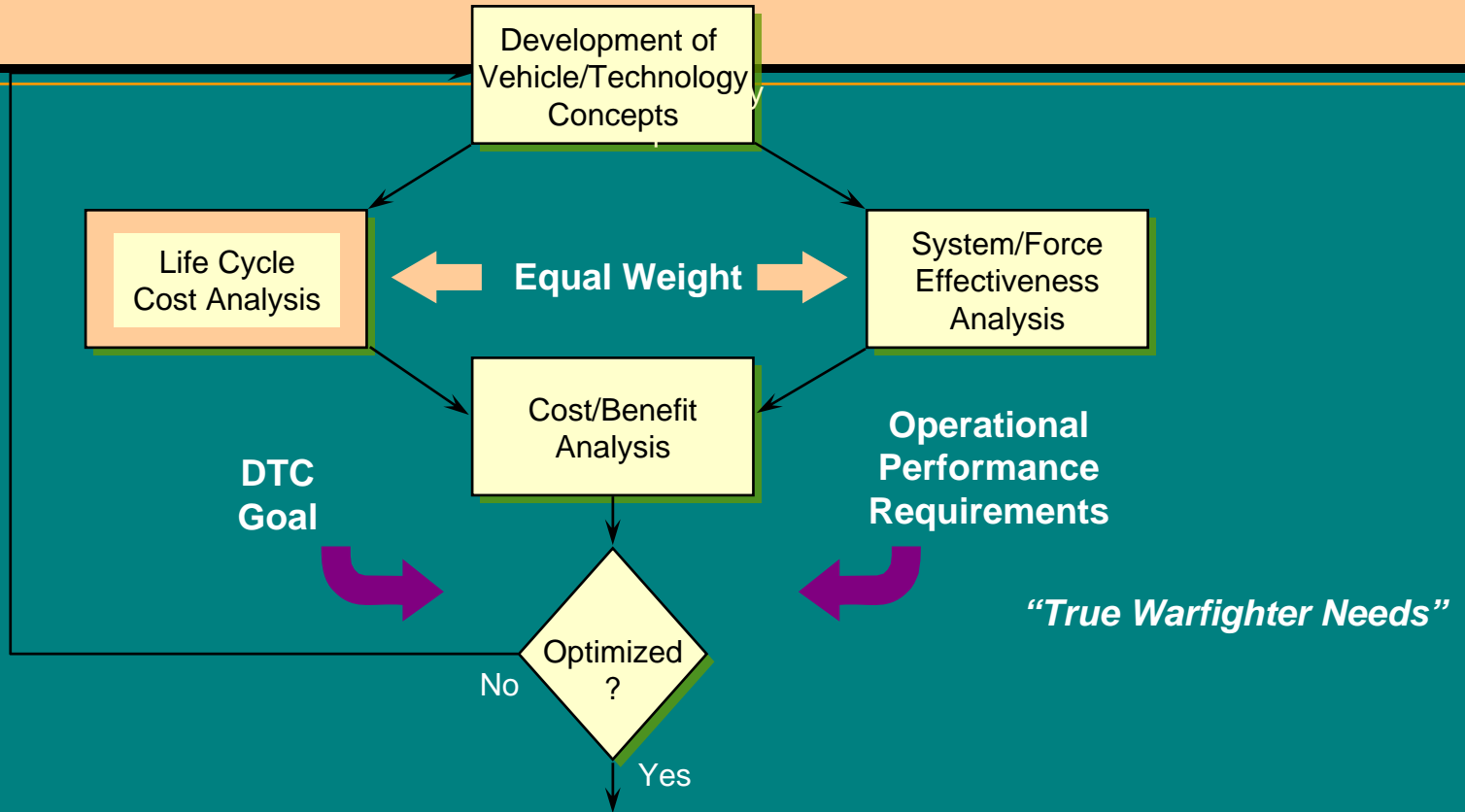
- ◆ **Purpose:**
 - Derive the most Cost Effective Design/Set of Requirements using CAIV Practices
- ◆ **Goal:**
 - To Identify the Low Cost Design Alternative Which Meets (not exceeds) the Performance Requirements
- ◆ **Focus:**
 - To Reduce Production/Rollaway Cost and Optimize LCC and Performance
- ◆ **Responsibility:**
 - PDTs... But the Cost Analyst Plays a Proactive Role

PDT Buy-In Is Key !!!

COST-PERFORMANCE TRADEOFF: Find the “Knees” of the Curve



Trade Study Process



Strategic Cost Management

Trade Studies Used As Design Tool Rather Than Confirmation Of Selected Concepts

Aggressive Cost Targets and Risk

Aggressive Cost Target Entails Higher Risk

**Risks are Obvious, But the Payoff is Great...
More Affordable, Executable Program**

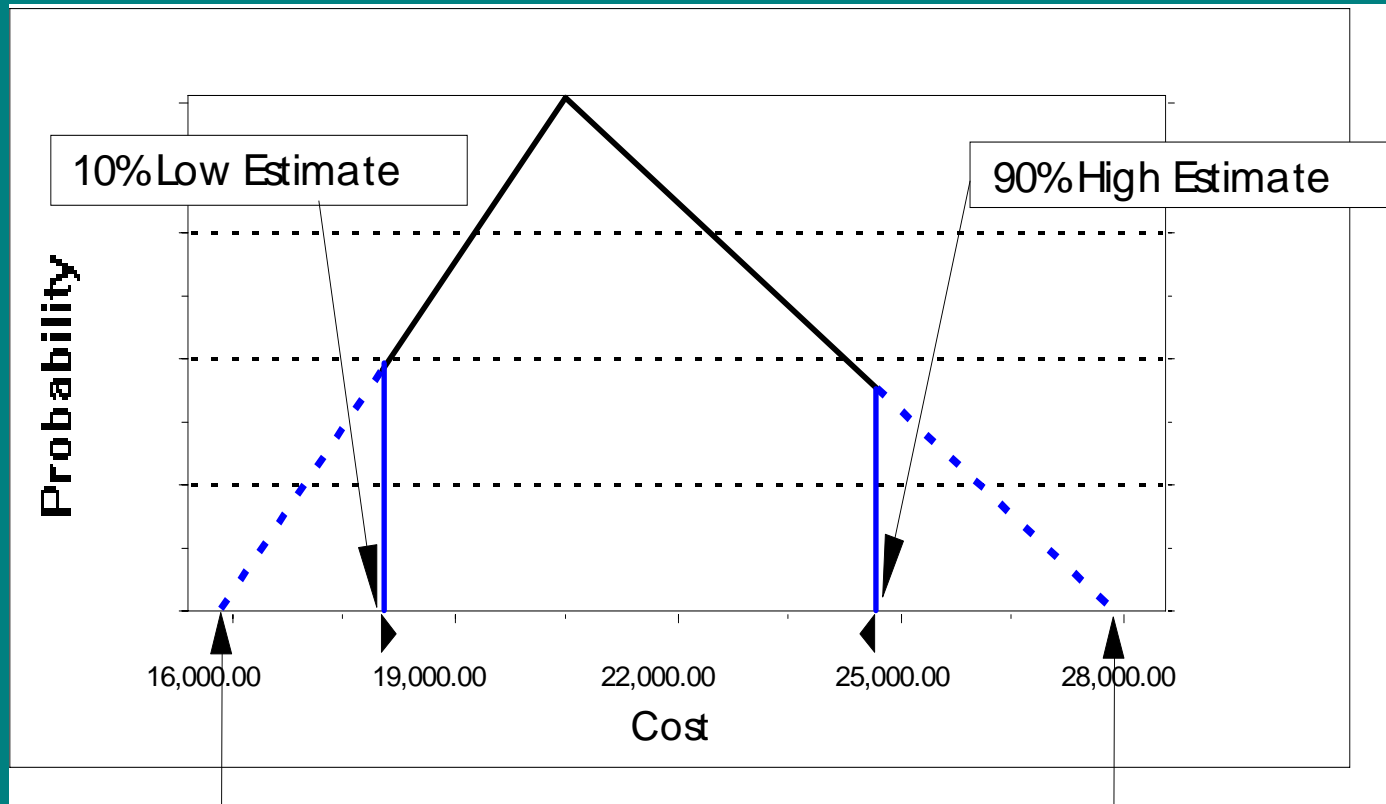
- ◆ **Risk Management:**
 - **Demonstrate Solutions Prior to Production**
 - **Define Metrics to Track Progress**
 - **Aggressive Management With Appropriate “Failure Tolerance”**
 - **Consider Process Maturity in Source Selection**

An Aggressive Target is Worth the Risk

Risk Assessment

- ◆ **Run Crystal Ball for Monte-Carlo Simulation**
 - Technical
 - Schedule
 - Cost Estimating
- ◆ **Interview Domain (PDT) Leadership**
- ◆ **Evaluate Crusader Program Risk and Quantify in Dollars**
 - Describe Risk Areas
 - Identify Consequences of Risk
 - Quantify Cost Impacts of Risk at Most Likely, 10/90 and 90/10 Levels
 - Prepare Three Estimates (Triangular Distribution)

Triangular Distribution



Derived Absolute Low Estimate

Derived Absolute High Estimate

Summary: CAIV Vs. DTC

◆ CAIV

- Focuses on LCC
- Requires User Input
- Is a Mgmt. Philosophy
- Cost is Equal in Program Decisions
- Mission Affordability Goals
- Cost/Performance PDT
- Mandates Incentives
- Includes Risk Analysis
- Overarches the DTC Process

◆ DTC

- Focuses on Prod. Cost
- No User Input
- Is an Engrg. Process
- Cost is Equal in Production Decisions
- No Mission Affordability Goals
- No Cost/Perf. PDT
- No Incentives
- No Risk Analysis

The Process Works!

Summary: CAIV Stumbling Blocks

- ◆ **Culture Change—Focus on Cost by Engineers**
- ◆ **Subcontractor Flow Down**
- ◆ **Differing Points of View on CAIV**
- ◆ **Evaluating Future Technology, Unknowns, Etc.**
- ◆ **Parametric Cost Credibility Vice Bottoms-up Estimates**

Summary: The Way Ahead

- ◆ **Revisit Cost-Performance Tradeoffs**
 - Document Rationale if Aggressive, Realistic, Validated
 - Work Further if Cost Driver Validation Uncertain
- ◆ **Modify Contracts Accordingly**
- ◆ **Define Metrics to Track Progress**
- ◆ **Employ Earned Value Management**
- ◆ **Report Progress to Management at Regular Intervals**

Recommendations

- ◆ **Commit to CAIV**
- ◆ **Train Your Workforce**
- ◆ **Highest Quality Estimating Tools**
- ◆ **Involve Everyone**
 - **Prime**
 - **Subs**
 - **Program Office**
 - **User**

**CAIV
Is Everyone's
Responsibility**