10th Annual Systems Engineering Conference

Strategic Focus: Reduction of Total Ownership Costs (R-TOC) and Value Engineering (VE)

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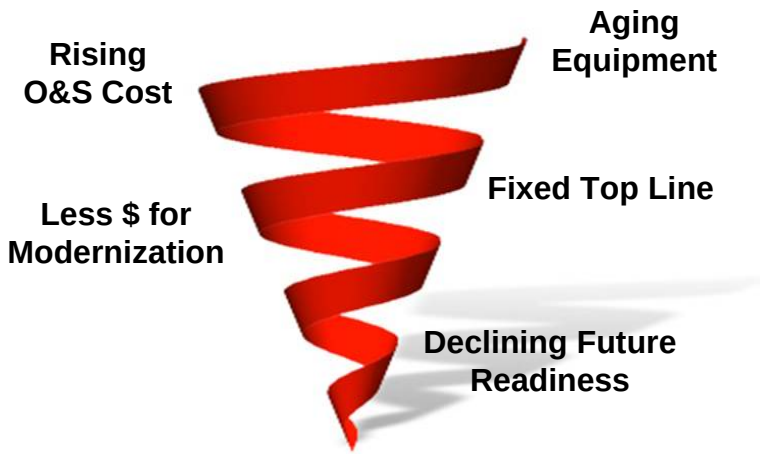
R-TOC Genesis

- Initiated in 1999 by the USD(AT&L) to address:
  - O&S cost growth at expense of force modernization and readiness
  - O&S budget constraints limit programs to near-term, critical solutions only
  - R-TOC program seeks to seed O&S cost avoidance solutions that have broader impact
  - Thirty Pilot Programs



DEATH SPIRAL

USD(AT&L) FY 2005 R-TOC Goal

- USD(AT&L) Goal: "…reduce the O&S cost of fielded systems (excluding manpower and fuel) by 20% (compared to current FY 1998 levels) by the year 2005."
- "Overall, each Service's O&S reduction plans will be based on tradeoffs among these three areas for savings:
  1. Reduced demand from weapon systems via reliability and maintainability improvements
  2. Reduced supply chain response times, leading to reduced spares, system support footprint, and depot needs
  3. Competitive sourcing of product support, leading to streamlining and overhead reductions"

FY 2005 O&S Savings

- FY 2005 cost avoidances exceeded $2.1B
- Projected life cycle cost avoidances will exceed $76B, for the R-TOC Pilot Programs

O&S Costs Can Be Reduced!!

Life Cycle Savings Provides a Focus on Long Term Benefits

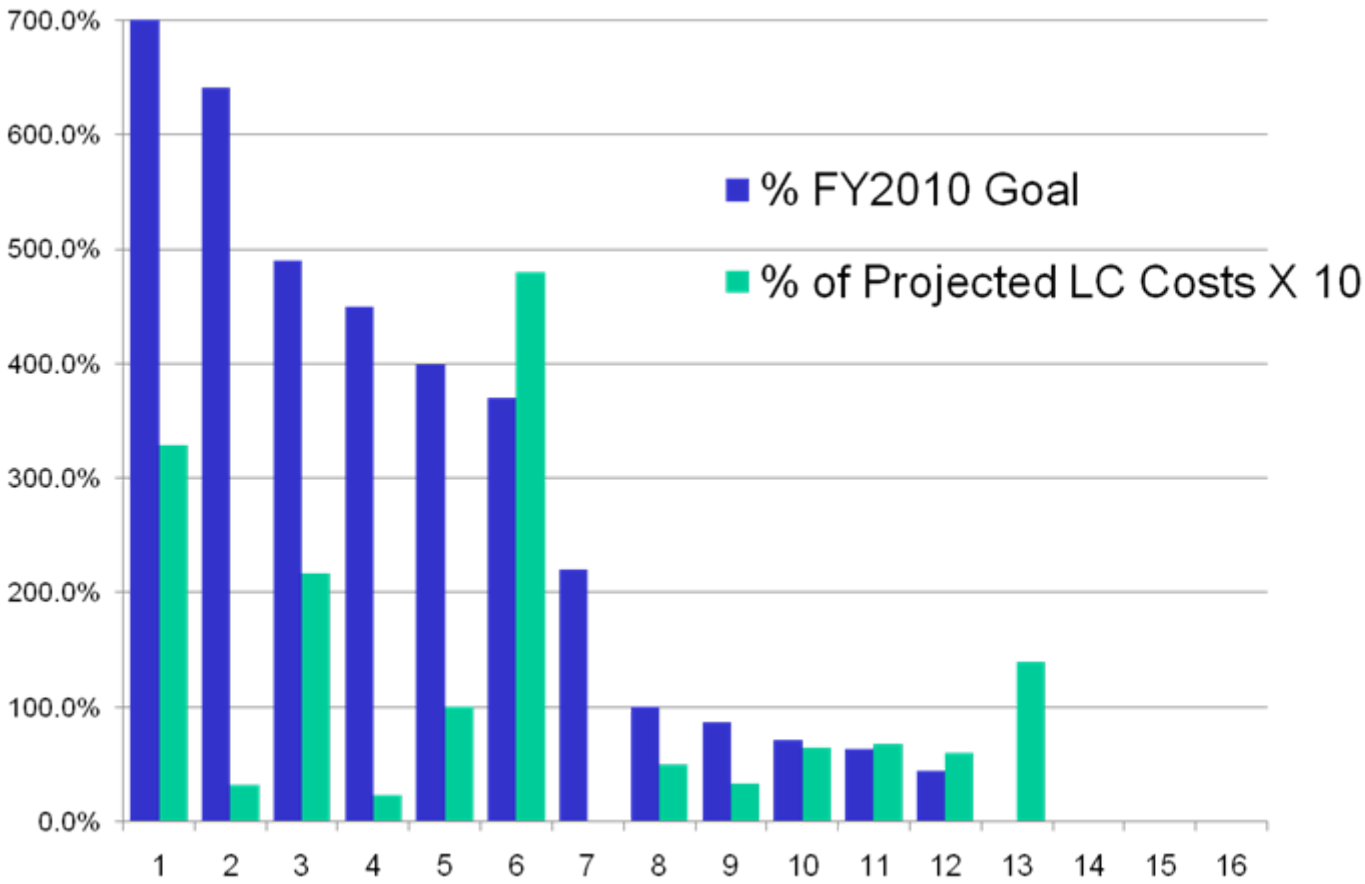
New Strategic Direction

- With the successful completion of the Pilot Programs FY 2005 goal, a new direction was needed
- Strategic Directions:
  - New goal for FY 2010
  - Focus on life cycle O&S cost reductions
  - Direct funding for long-term savings projects
  - Adoption of quantitative method for evaluating near-term vs. long-term projects

USD(AT&L) FY 2010 R-TOC Goal

- USD(AT&L) Goal: "Maximize cost avoidance on total defense systems FY 2010 O&S costs from an FY 2004 baseline, by offsetting 30% of predicted inflation."
  - Goal extends to all defense systems on program-by-program basis
  - 15 Special Interest Programs (SIPs) designated lead programs to "show the way" towards achieving the goal
  - SIPs are monitored through semi-annual reports and quarterly R-TOC Forums
  - Services will include this goal in their reviews
- Ultimately expand to all defense systems
- $25M/year R-TOC PE created

Status of R-TOC SIP Program Savings

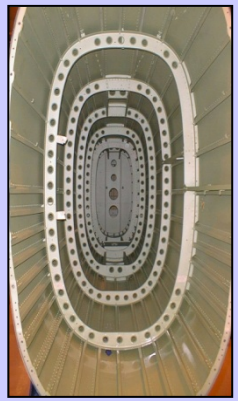


UH-60M Composite Tailcone

Program Description

Problem: The currently proposed metal tailcone for the UH-60M's, MH-60S's and MH-60R's are labor intensive to manufacture and require thousands of parts and fasteners.

Solution: Incorporate a composite tailcone into the UH-60M, MH-60S and MH-60R fleets.



Benefits

- Cost savings of $60,000.00 per new production aircraft.
- Fewer parts and fasteners
- No corrosion or fatigue maintenance
- Weight Reduction (50 pounds)

Investment/ROI

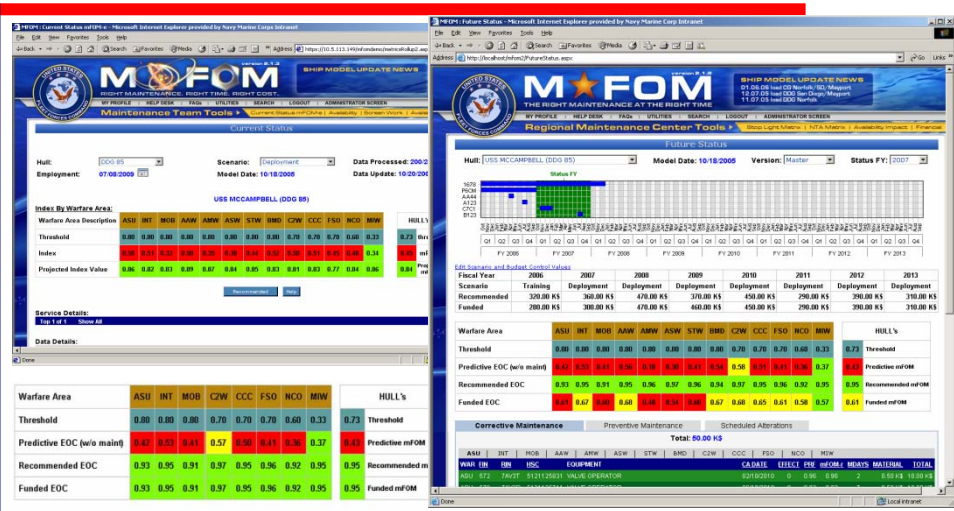
Investment: $2.35M

Life Cycle ROI: 33:1

Ship's Material Condition Model

Overview/Problem

- USN does not have a consistent objective method to determine material condition and its impact on mission / warfare area
- USN has multiple antiquated software tools and systems to validate, screen and broker work candidates depending on platform type and coast
- USN has no objective method to determine future material condition readiness when routine maintenance is not performed



Solution

- Model each ship using a hierarchical structure that will show the impact of each shipboard equipment on material condition readiness
- Provide a single validation, screening and brokering tool for use across all ship platforms
- Allow for a near term predictive nature in modeling accounting for failure to perform routine maintenance

Investment/ROI

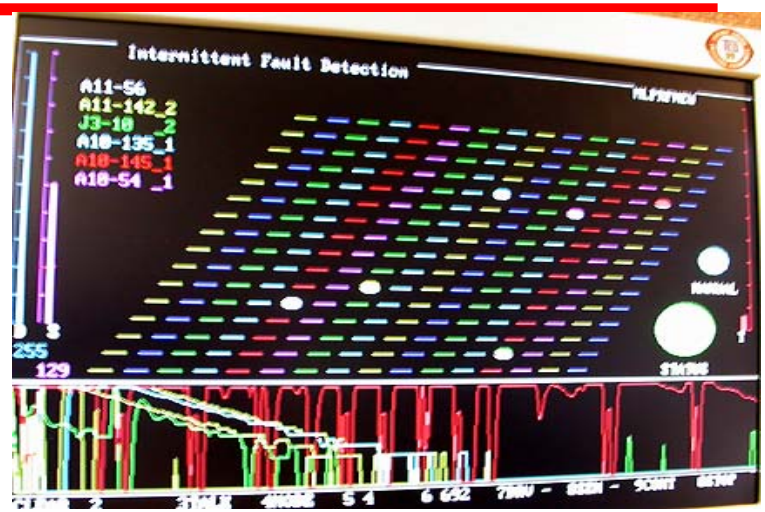
Investment: $0.5M

Life Cycle ROI: 34:1

Intermittent Fault Detection & Isolation System (IFDIS)

Overview/Issue

- Unable to duplicate discrepancy on No Fault Found (NFF) LRU's
- Bad Actor LRU's continued to be recycled through the repair cycle process



Solution

- Develop maintenance tool to augment traditional testing methods
- Will identify and isolate intermittent faults on end items
- Repeats Vigorous Test scenario

Investment/ROI

Investment: $2.20M

Life Cycle ROI: 22:1

R-TOC Project Funding vs. Savings

FY06-FY09 ($M)

	Funding	Reliability Life Cycle Savings	Maintainability Life Cycle Savings	Supportability Life Cycle Savings	Total Life Cycle Savings	Return On Investment
FY06	23.077	1,618	943	1,472	4,032	174:1
FY07	23.281	12	23	208	243	10:1
FY08	25.598	34	519	746	1,298	51:1
FY09	23.802	725	466	998	2,190	92:1
DoD Total	95.758	2,389	1,951	3,423	7,763	81:1

Initiatives Contributing to R-TOC

- Lean Enterprise Value
- Six Sigma
- Supply Chain Management
- DoD Manufacturing Technology (ManTech)
- Value Engineering
  - FAR provisions offer contractual incentives
  - Methodology offers approach to partner with industry

Definition

- **<u>Value Engineering</u> -** ***An organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality, and safety*****. OMB Circular A-131**

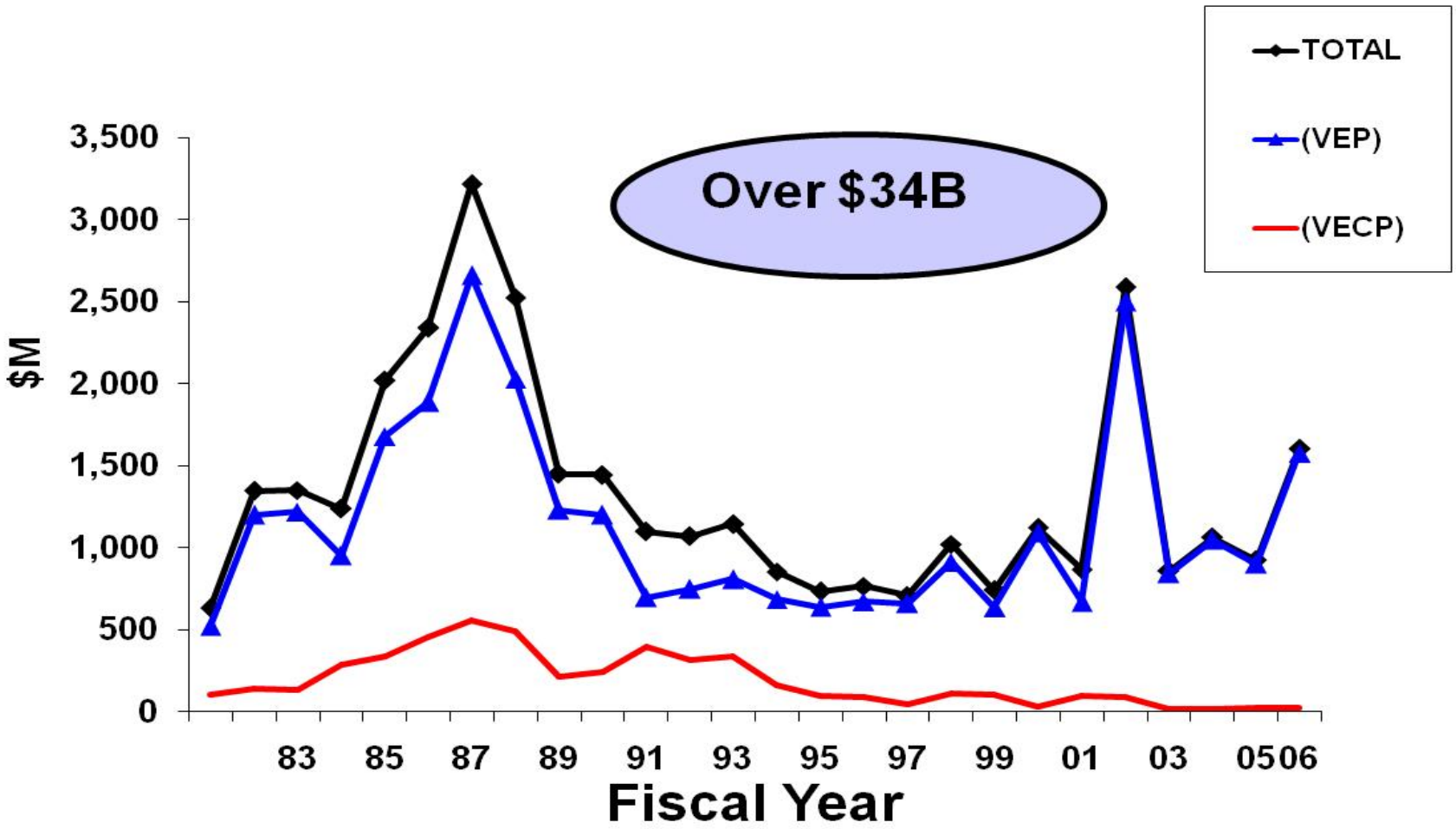
- **Bottom Line: Identify and Eliminate Unnecessary Cost**

Value Engineering is an R-TOC Best Practice

- VE provides:
  - Cost reduction (VEPs and VECPs)
  - Product or process improvement
    - Higher quality
    - Reduced cycle time
  - Better means and materials for maintenance
    - Increased reliability
    - Greater safety
    - Less environmental impact

VE Goal: Lower the government's costs for goods and services & provide cost effective solutions to problems in design, development, fielding, support, & disposal

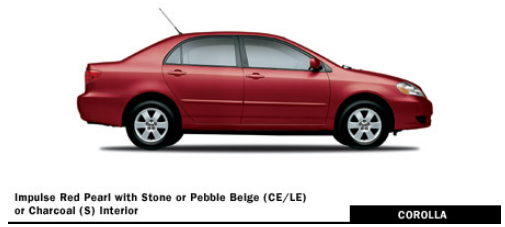
DoD VE Savings & Cost Avoidance



VE – An Industry Example

1998 Toyota Corolla - VE Project

- **Problems: Increased material costs, production time issues**
- **Objective: Correct problems using VE**
  - **Lighter by 10%**
  - **25% Fewer engine parts**
  - **Faster production**
  - **Better fuel economy**
  - **Decreased emissions**
  - **15% Horsepower increase**
  - **Costs $1,000 less to make than in 1997**



VE in Systems Engineering

- **VE methodology is an effective tool for making systems engineering decisions**
  - Reduce cost
  - Increase productivity
  - Improve quality related features

  While…meeting or exceeding functional performance capabilities
- **VE is applicable at any point in the life cycle**

  How…making SE trades

VE and R-TOC in Systems Engineering

- **VE and R-TOC Early in the Life Cycle – Concept Refinement**
  - Analysis of Alternatives – evaluate functions vs. requirements
  - Challenge needs/ensure requirements are valid
  - SE trades
    - Develop cost of alternatives
  - Consider life cycle cost implications – (R-TOC)

Savings For All Production Units

VE and R-TOC in Systems Engineering

- **VE and R-TOC During Technology Development**
  - Analyze value of requirements/specifications
    - Can these be tailored?
  - Cost as an independent variable
  - Compare function, cost and worth of technologies
  - Consider life cycle cost implications of new technologies – R-TOC

VE and R-TOC in Systems Engineering

- **VE and R-TOC During Systems Development and Demonstration**
  - Identify technical approaches
  - Eliminate unnecessary design restrictions
  - Estimate cost of functions
  - Identify alternatives
  - Evaluate design concepts – O&S life cycle concepts (R-TOC)
  - Search for new technologies
  - Simplify designs

VE and R-TOC in Systems Engineering

- **VE and R-TOC During Production and Deployment**
  - Evaluate and improve manufacturing processes, methods and materials
- **VE and R-TOC During Operations and Support**
  - Analyze advances in technologies
  - Evaluate modifications
  - Reduce repair costs
  - Analyze packaging requirements
  - Improve RM&S – R-TOC
  - Analyze/Improve supply chain/logistics footprint – R-TOC
  - Implement CBM – R-TOC
  - Reduce manpower – R-TOC

SUMMARY

- R-TOC and VE provide savings/cost avoidances for DoD
- VE is a tool for Systems Engineering
- R-TOC provides a focus on life cycle design considerations
- VE supports SE trades
- Three new VE documents: 1) VE Contractor's Guide, 2) VECP Contracting Guide, and 3) VE Handbook
- VE revitalization effort in-work – USD(AT) memo on OMB Circular A-131
- R-TOC is driving towards institutionalization of O&S cost reductions across all programs
- R-TOC/VE websites: http://rtoc.ida.org or http://ve.ida.org

- R-TOC / VE Points of Contact: David Erickson: David.Erickson@osd.mil - Danny Reed: dreed@ida.org

BACKUP

History

- **VE emerged from the industrial community.**
- **The VE concept is a by-product of material shortages during WW II where alternative approaches often worked as well or better and cost less.**
- **DoD established its VE Program in 1963.**
- **VE has proven to be a successful cost reduction/product improvement tool for over 40 years!**

VE Application Areas

Examples: How VE can be used:

- **Improve/streamline operations**
- **Improve quality**
- **Increase the use of environmentally-sound and energy-efficient practices and materials**
- **Simplify logistics**
- **Reduce maintenance**
- **Increase availability**
- **Improve durability**
- **Reduce cost**

VE Authority

- **Office of Federal Procurement Policy Act 41 USC 432 – Each executive agency shall establish & maintain cost-effective VE procedures & processes**
- **Public Law Implemented by OMB Circular A-131**
- **All Agencies Will:**
  - **Establish and maintain a VE Program**
  - **Develop annual plans**
  - **Budget for VE**
  - **Encourage VECPs**
  - **Encourage VEPs**
  - **Identify and report**
  - **Train in VE**
- **OMB Circular A-131 implemented by the DoD VE Strategic Plan, December 2003**

Definition of Terms

- **<u>Value Engineering Change Proposal (VECP)</u>:**

  A proposal submitted by a contractor that changes the contract and saves the government money

- **<u>Value Engineering Proposal (VEP)</u>:**

  A government generated change that adds value

VE – A Systematic Approach

1. Information - frame the problem
2. Function Analysis
3. Speculation - generate ideas based on function
4. Evaluation of ideas
5. Development of ideas
6. Verification
7. Reporting - present business case
8. Implementation - Use Champions & follow-up

Provides planned systematic approach that is more productive than undisciplined or opportunistic approach

Why Optimization May Not Have Been Achieved

- Shortage of time
- Requirements are technically beyond capability
- Lack of insight into costs
- Change in technology (hardware & processes)
- Lack of knowledge of actual requirements
- Fixation with previous designs
- Presence of bad information/failure to fully communicate
- Habits and attitudes
- Temporary circumstances
- Honest but wrong beliefs

VE Savings Proposals
In-house (VEP) Example

Value Engineering Proposals (VEP) –
In house proposals generate the majority of savings & cost avoidances

PA125 Ammo Container

Before

Sold as scrap

Govt Savings totaled $7.155 M over 3 years

After

Saved for refurbishment and reuse

DoD VE Strategic Plan

- DoD VE Strategic Plan signed by USD(AT&L)
  - Improve value for defense systems
  - Align industry and government value
  - Increase VE expertise
- Strategic Plan
  - Establishes a goal of VE cost savings and avoidances of 1.5% of TOA by FY06 for all the Services and other DoD Agencies – Difficult Stretch Goal
  - At least 500 people will have completed VE continuous learning module by FY06 – Currently over 1100
  - 90% of VECPs should be fully processed within 180 days by FY06 - Accomplished
  - VECP Community of Practice (CoP) - Accomplished

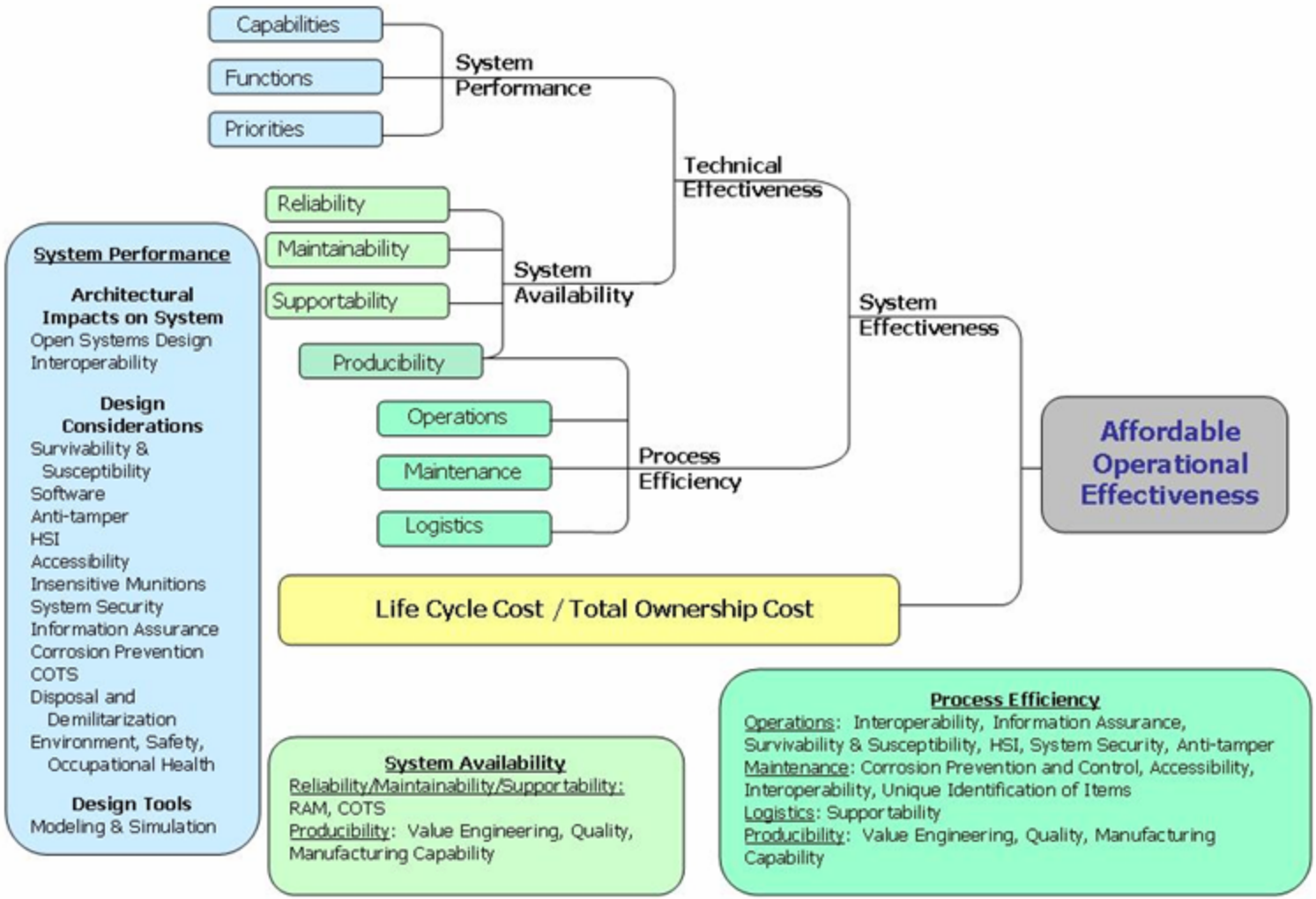
Quantitative Method for Project Evaluation

- Projects submitted for R-TOC funding are selected based on 11 criteria, five objective and six subjective
- Highest values are placed on Return on Investment (ROI) over the FYDP and over the Life Cycle of the system (using OMB discount values) and on a subjective evaluation of improvements in Operational Readiness
- ROI calculations are performed automatically by use of a calculation template

Lessons Learned

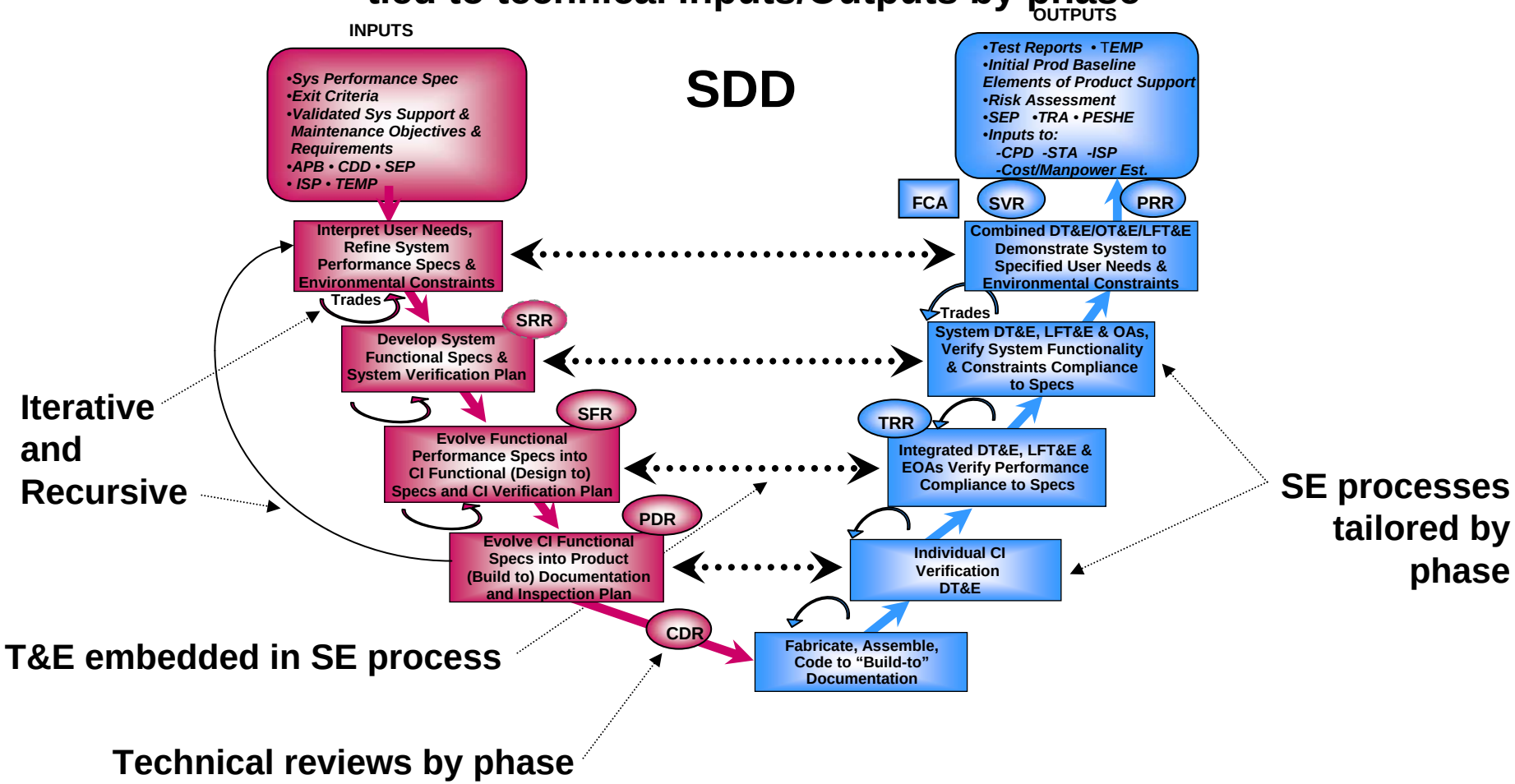
- Most Pilot Programs focused on “reduced demand” via Reliability, Maintainability and Supportability (RM&S)
- A few programs were able to sign long-term contracts for product support (“competitive sourcing”), which produced O&S savings while at the same time increasing readiness and availability
- Both approaches provided savings in the second listed area for savings – reduced response times

Important Design Considerations

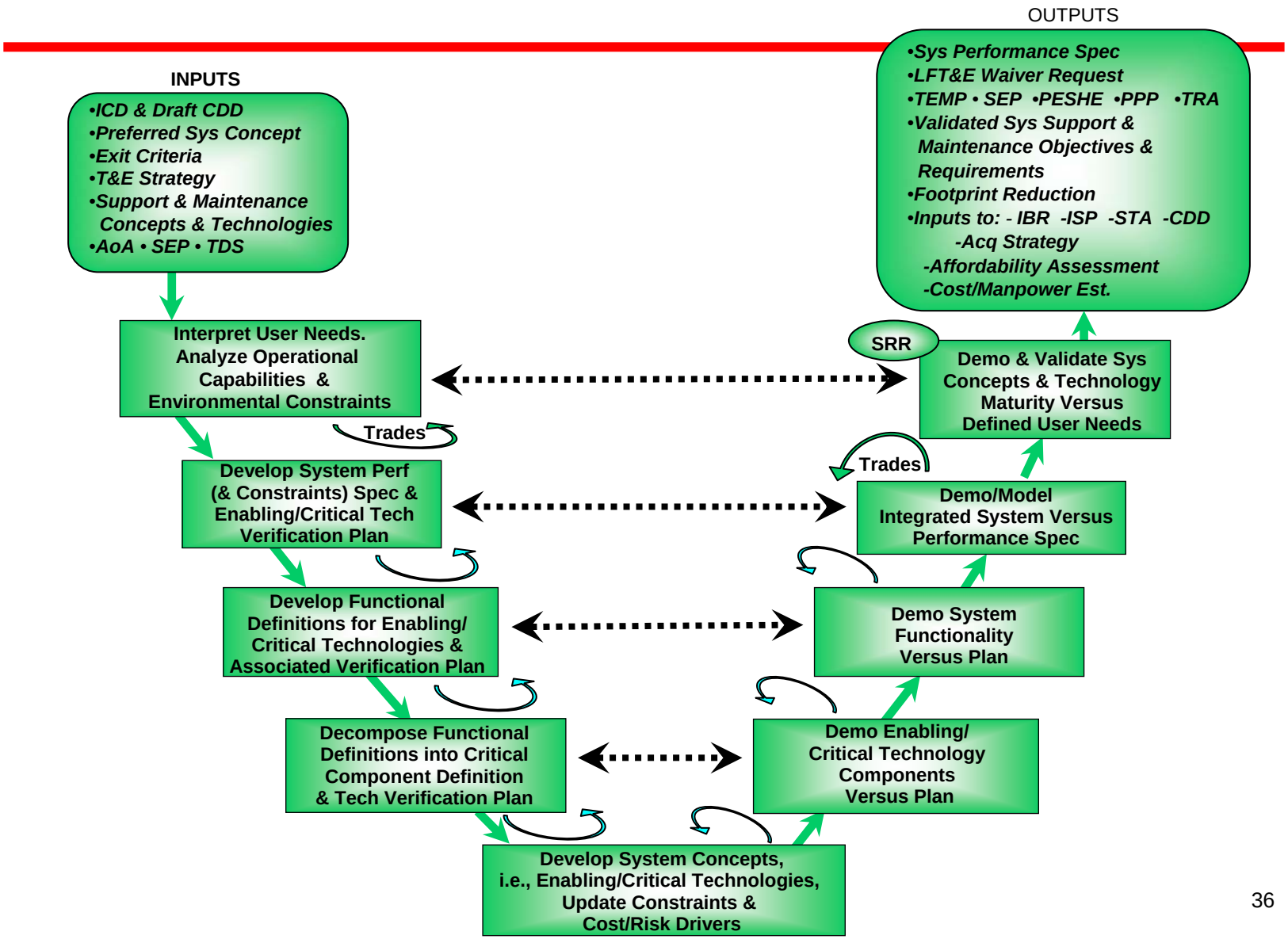


Understanding Systems Engineering by Phase

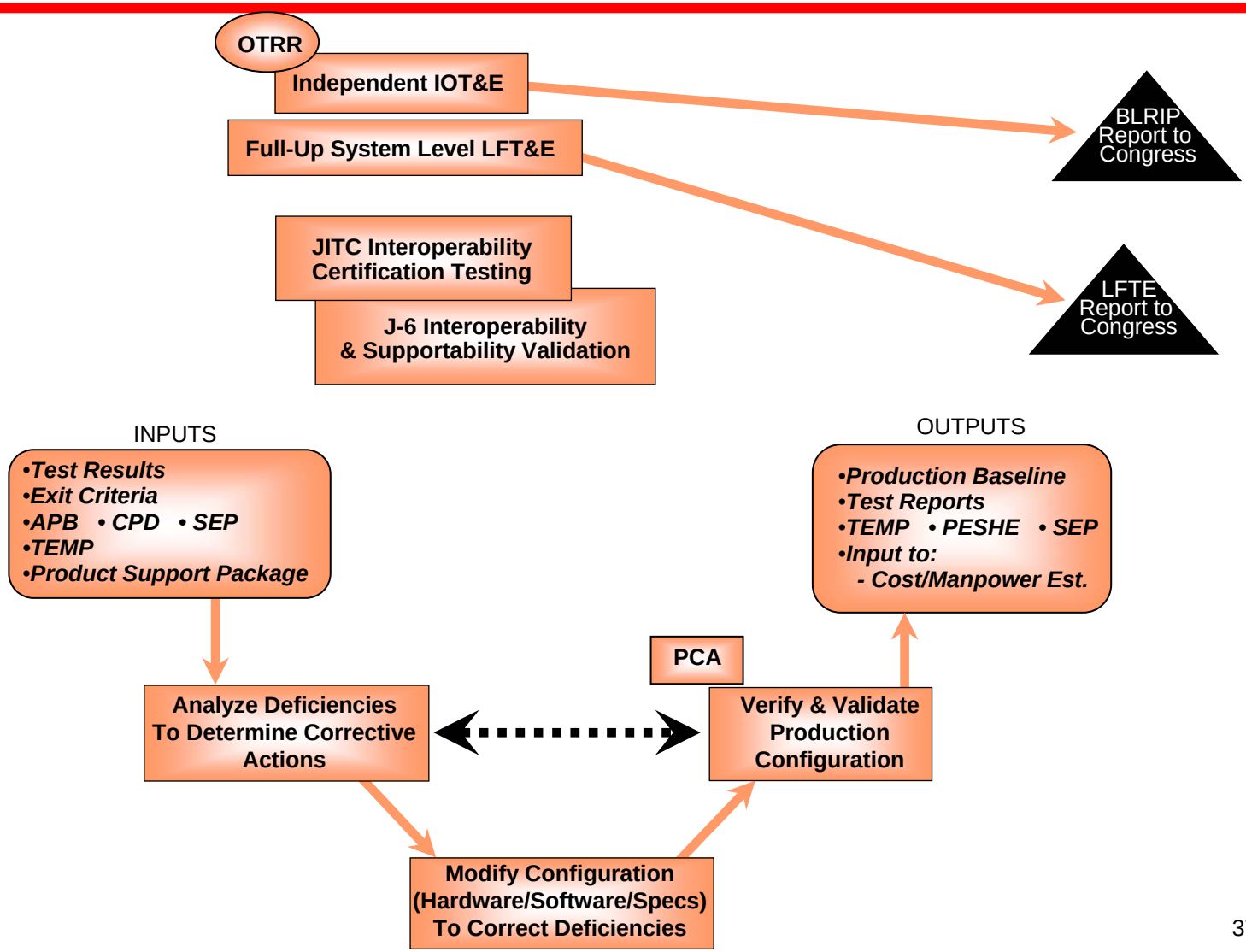
SE Processes (Engineering, Supportability, TA&E) directly tied to technical Inputs/Outputs by phase



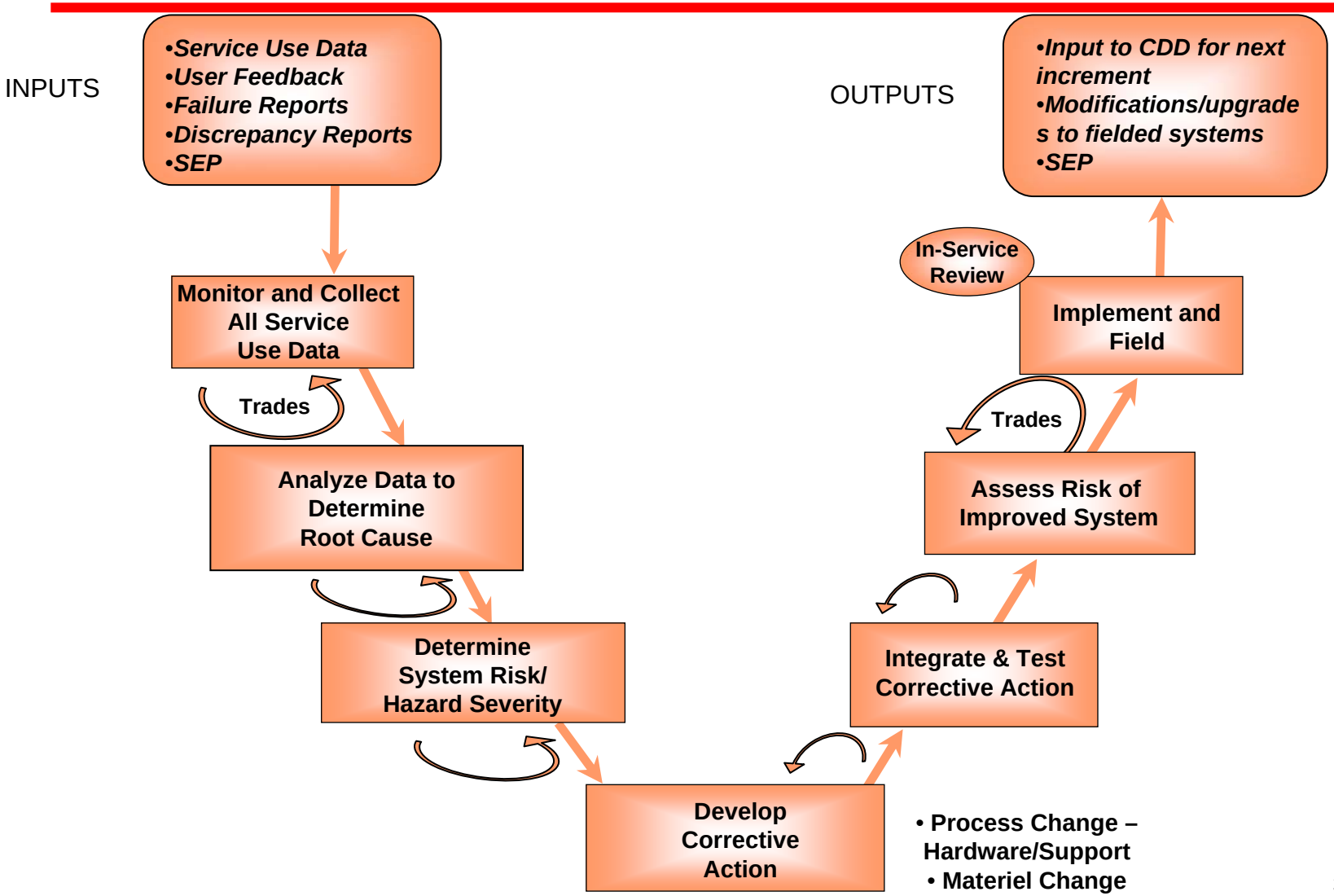
Technology Development Phase



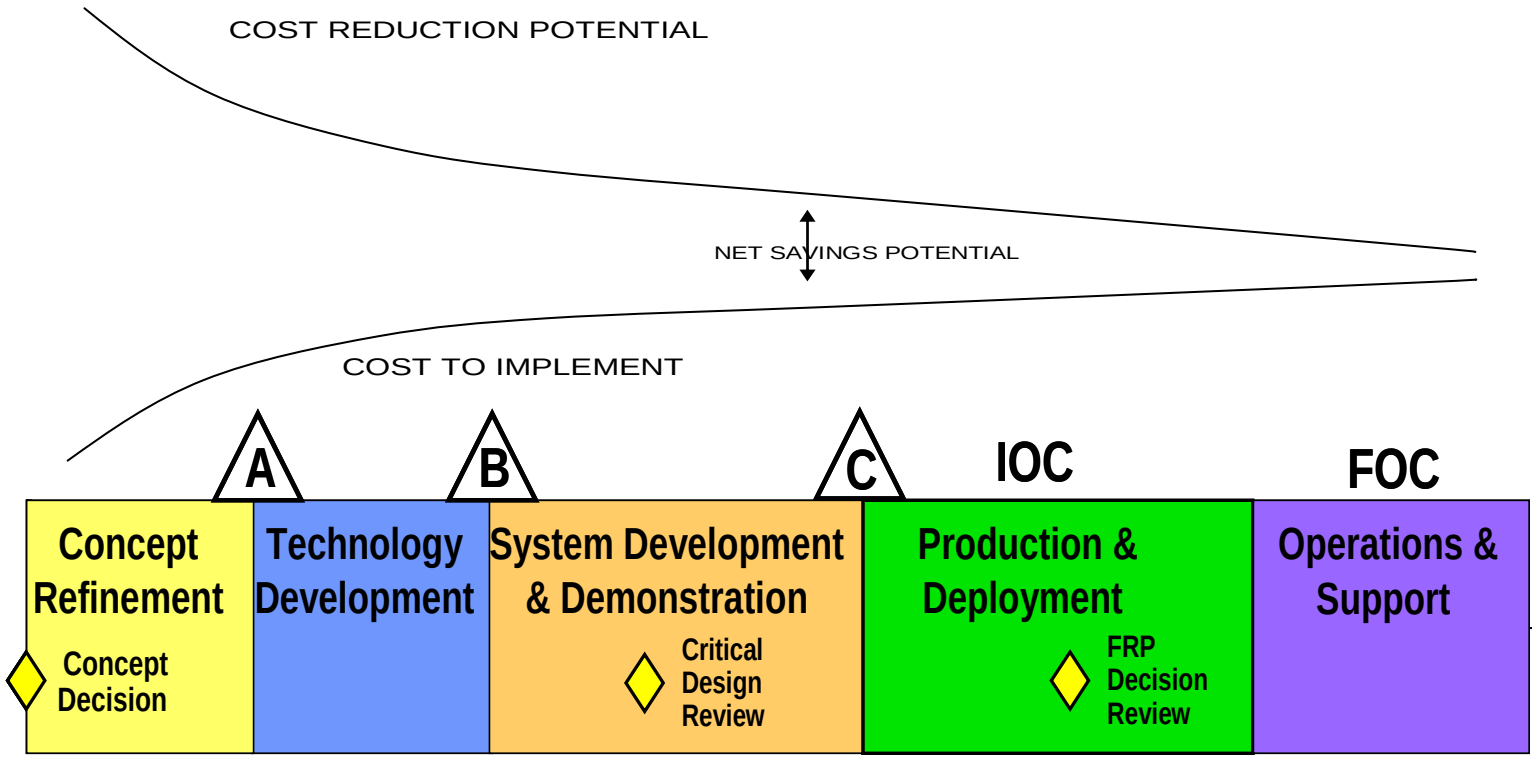
Production and Deployment Phase



Operations and Support Phase



LifeCycle Cost Reduction Potential



USD(A&T) FY 2005 R-TOC Goal

- USD(AT&L) Goal: "…reduce the O&S cost of fielded systems (excluding manpower and fuel) by 20% (compared to current FY 1998 levels) by the year 2005."
- "Each Military Department recently proposed ten major 'pilot program' activities to test Program Manager performance…I intend to use the pilot programs to demonstrate the type of cost savings depicted in the Defense Planning Guidance."

  (Under Secretary of Defense Jacques Gansler)

OSD Funding for Selected R-TOC Projects

- R-TOC Program Element (PE) was created using funds ($25M per year) provided by the Services in PBD 707
- PBD 707: USD(AT&L) and the Services agreed to move 1/3 each from the Services O&M accounts to an OSD account to fund the R-TOC PE
- Competitive funding of projects submitted by Services to reduce long-term O&S costs