11th Annual Systems Engineering Conference

Reduction of Total Ownership Costs (R-TOC) and Value Engineering (VE) in the Defense System's Life Cycle

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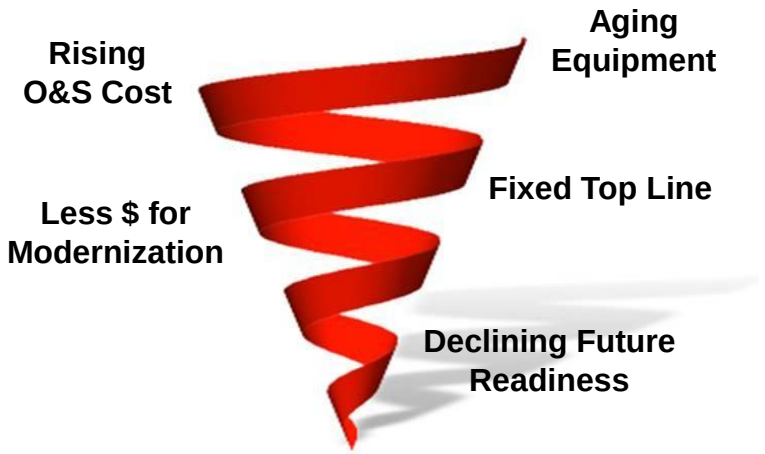
R-TOC Genesis

- 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
  - Focus on institutionalization
  - Direct funding for long-term savings 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

R-TOC
Special Interest Programs (SIPs)

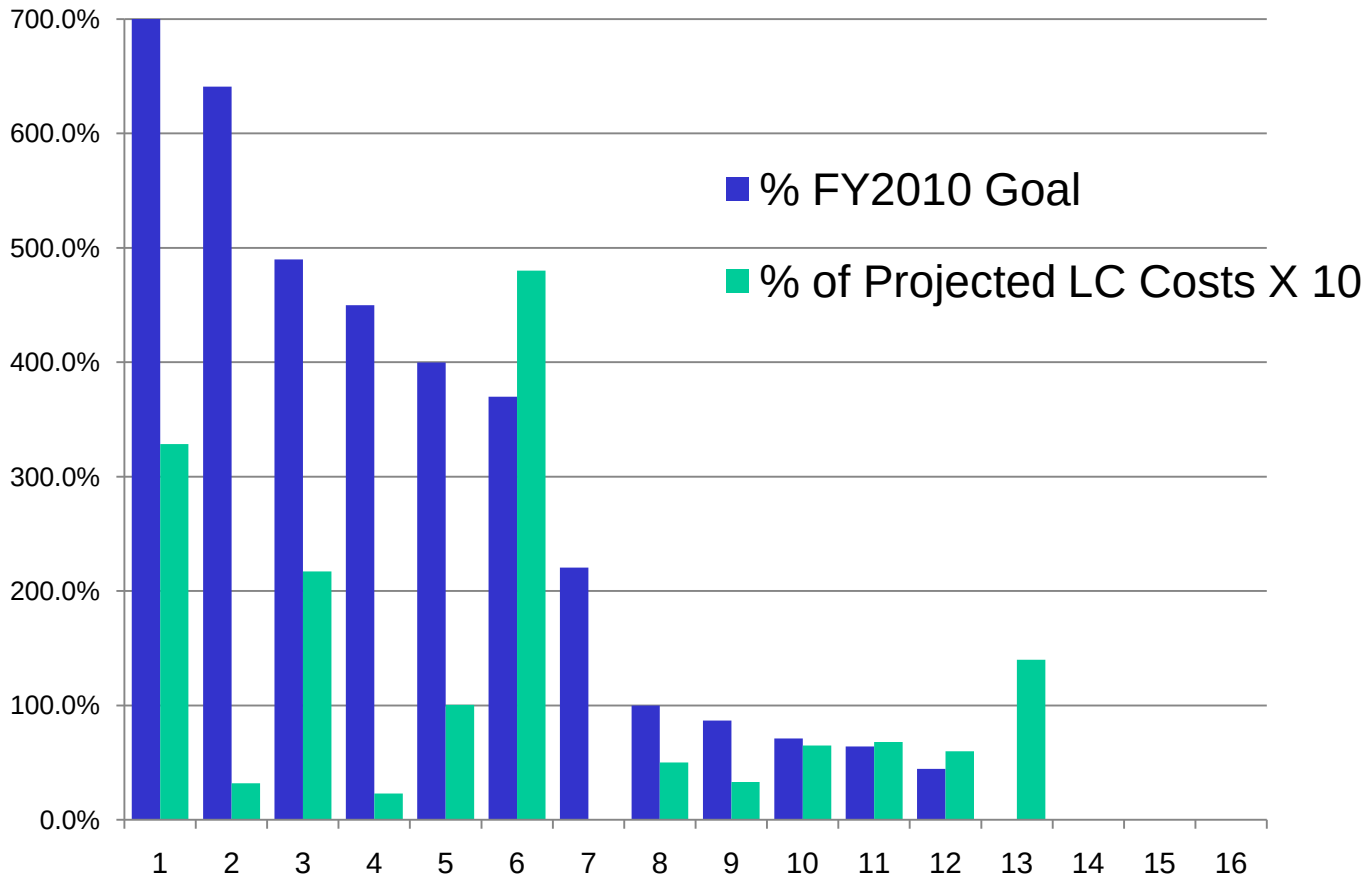
Army
- Bradley A3 Upgrades
- UH-60M – Upgrade
- Stryker
- UAVS
- Guardrail

Air Force
- Global Hawk
- Engines (2)
- F-16

Navy
- H-1 Upgrades
- V-22
- F/A-18E/F
- H-60
- ASE
- Common Ship

Joint
- F-35 (JSF)

Status of R-TOC SIP Program Savings

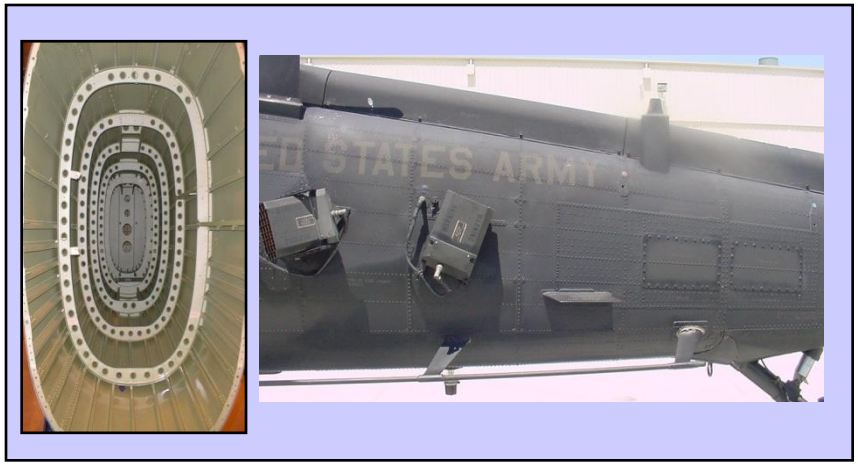


UH-60M Composite Tailcone

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

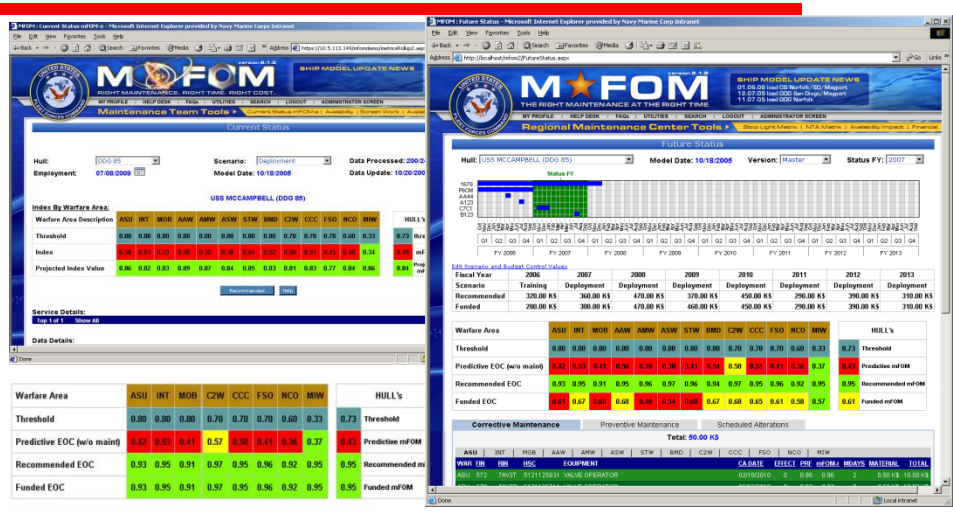
Investment: $2.35M

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

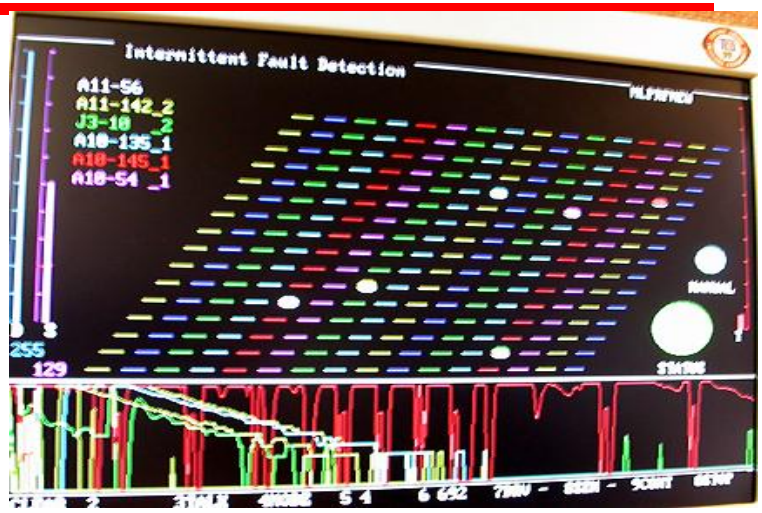
Investment: $0.5M

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 Projects Cost Reductions

	FY2006	FY2007	FY2008	FY2009	FY2010
Army					
LC ROI	34:1	48:1	27:1	64:1	32:1
LC Savings	$1,730M	$179M	$295M	$714M	$345M

DoN					
LC ROI	60:1	35:1	21:1	50:1	61:1
LC Savings	$155M	$95M	$359M	$735M	$463M

Air Force					
LC ROI	100:1	108:1	33:1	100:1	68:1
LC Savings	$2,205M	$261M	$522M	$557M	$718M

DoD Total ROI	71:1	75:1	28:1	69:1	58:1
DoD Total Savings	$4,090M	$535M	$1,176M	$2,006M	$1,527M

DoD TOTAL FY06-10	
Life Cycle Savings	$9,334M
Average LC ROI	80:1

Initiatives Contributing to R-TOC

- Lean Enterprise Value
- Six Sigma
- Supply Chain Management
- DoD Manufacturing Technology (ManTech)
- Value Engineering
  - Law Requires
  - FAR provisions offer contractual incentives
  - OMB Directs Implementation
  - Strategic Plan guides DoD
  - Methodology offers an approach to partner with industry

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

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**

VE Goal: Lower the government's costs, improve value & provide cost effective solutions to problems in design, development, fielding, support, & disposal

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 results
  - Provide training
- OMB Circular A-131 implemented by the DoD through VE Strategic Plan

DoD VE Strategic Plan

- Signed by USD (AT&L)

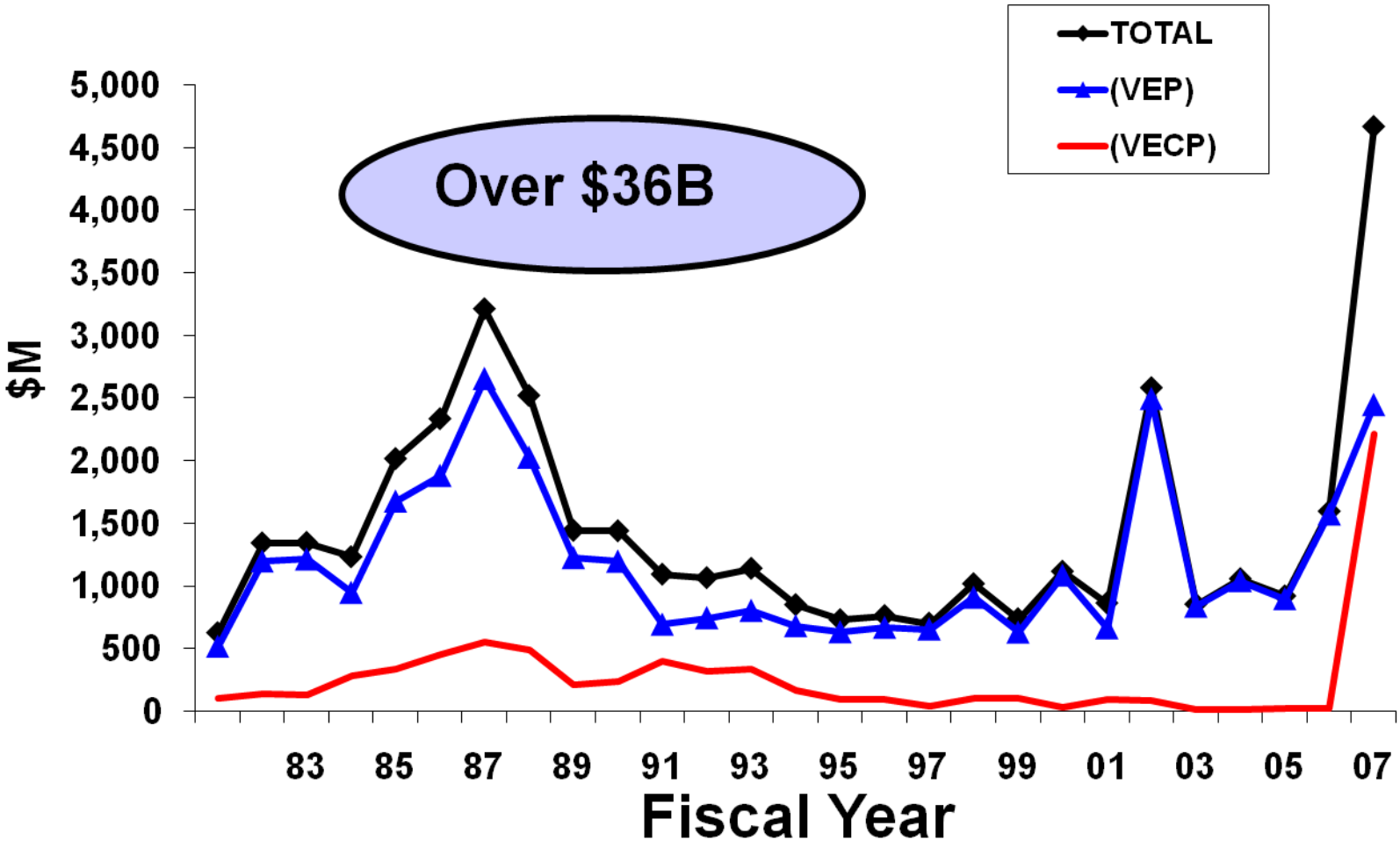
- Objectives
  1. Improve the Value Proposition for Defense Systems

  2. Align Industry and Government Value Propositions in Defense Systems

  3. Increase Value Engineering Expertise

SAVINGS GOAL = 1.5% OF TOA ANNUALLY

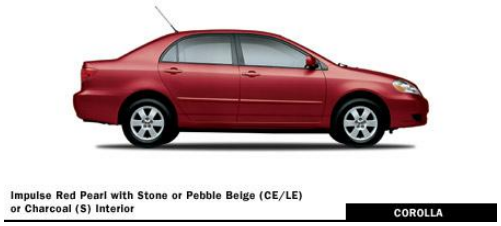
DoD VE Savings and Cost Avoidance



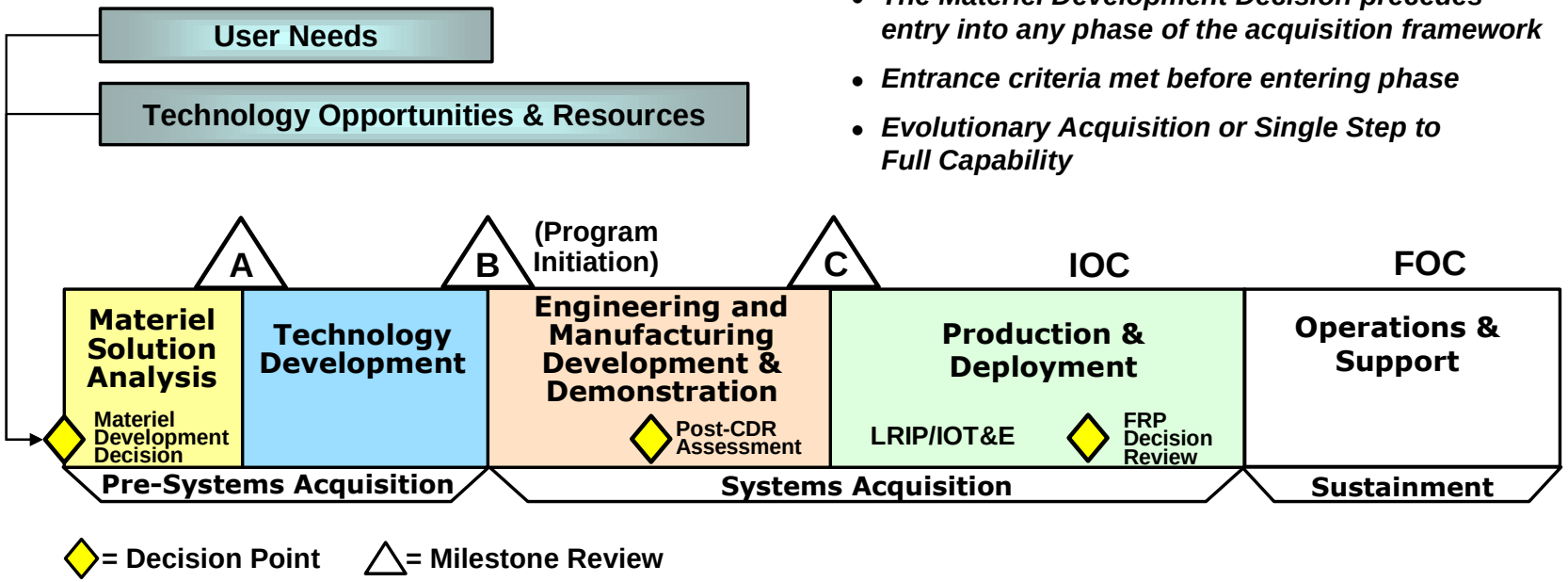
VE – An Industry Example

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**



The Defense Acquisition System



- *The Materiel Development Decision precedes entry into any phase of the acquisition framework*
- *Entrance criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*

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 – Material Solution Analysis**
  - 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 Engineering and Manufacturing 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 – R-TOC
  - 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 – All Life Cycle Phases
- R-TOC provides a focus on O&S considerations - All Life Cycle Phases
- DoD VE documents: 1) VE Contractor's Guide, 2) VECP Contracting Guide, and 3) VE Handbook
- VE revitalization effort in-work –
  - USD(A&T) memo on compliance with OMB Circular A-131 guidance
  - Joint Analysis Team (JAT)
- OMB A-131 update needed

- R-TOC/VE websites: http://rtoc.ida.org or http://ve.ida.org
- R-TOC / VE Points of Contact: Chet Bracuto: Chet.Bracuto@osd.mil and Danny Reed: dreed@ida.org