O&S Cost Analysis

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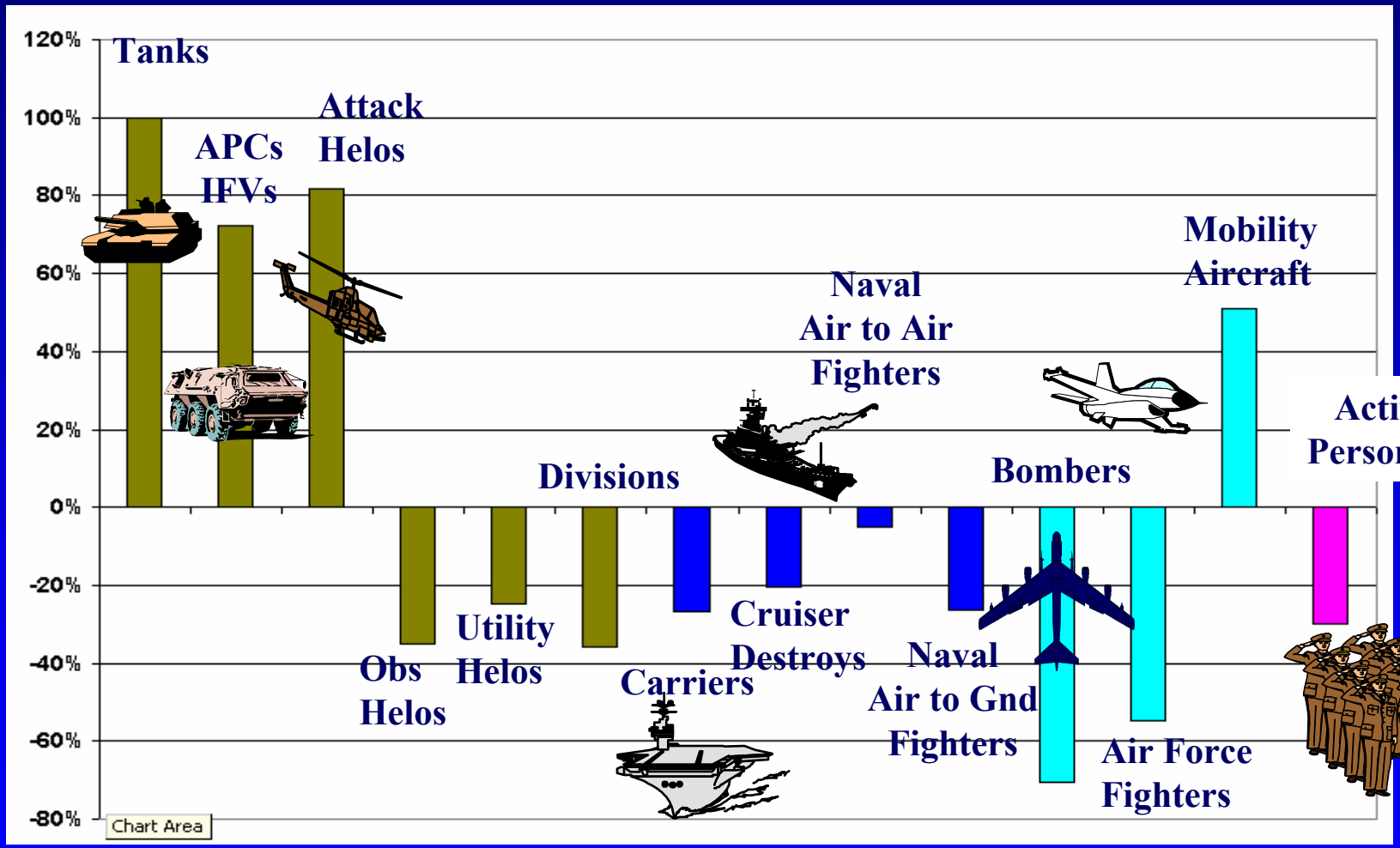
O & S Cost Estimating

- Funding Trends
- O&S Cost Analysis Course
- Selected O&S Cost Estimating Topics
- Preparing For The Future

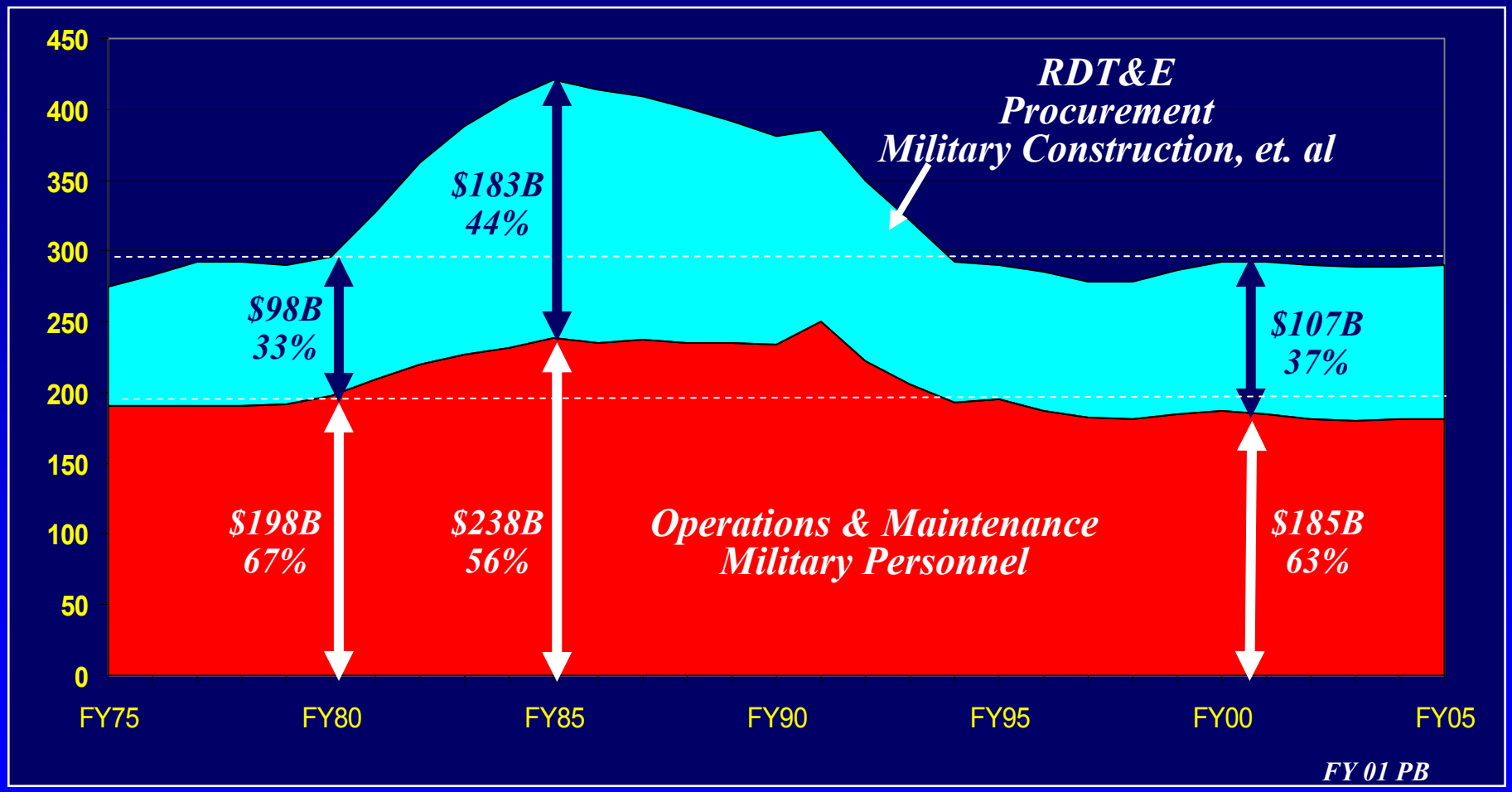
Force Size Changes 1975 to 1995



DoD Funding Trends

FY01$
Billions

DoD TOA adjusted[1] for funding policy changes



1. “Normalizing the Future Years Defense program for Funding Policy Changes, 2000”, IDA Paper P-3543

Explanations

- Why IS O&S Spending Roughly The Same in 1995 as 1975 While Force Structure Has Decreased 30%?
- Possible Reasons
  - Higher training levels
  - More expensive systems

Trends In System O&S Costs

Percent Change
FY75 to FY95

	Number of Systems	Optempo Per System	O&S Per Unit Optempo	Total O&S
Army				
Tanks	100%	0%	103%	305%
APCs/IFVs	72%	22%	337%	819%
Attack Helos	82%	-2%	44%	156%
Obs Helos	-35%	0%	6%	-31%
Utility Helos	-25%	0%	107%	56%
Navy				
Carriers	-27%	15%	18%	0%
Crusiers/Destroyers	-20%	34%	-9%	-3%
Air Superiority Aircraft	-5%	-35%	29%	-20%
Gnd Attack Aircraft	-26%	-22%	71%	-2%
Air Force				
Bombers	-71%	-8%	95%	-48%
Gnd Attack Aircraft	-55%	14%	35%	-30%
Mobility Aircraft	51%	-47%	20%	-4%

The last generation of systems cost more to operate than their predecessors.

For the same level of O&S spending, DoD must have fewer systems or less training.

Reducing O&S costs is as important as reducing acquisition costs.

The Challenge

If we cannot accurately forecast O&S costs, we have little chance of containing or reducing them

O&S Cost Analysis Course

- An Assignment Specific Course (BCF 215)
  - Positions responsible for:
    - Developing and/or evaluating O&S cost estimates,
    - Conducting logistics support analyses,
    - Engineering development in programs implementing CAIV or R-TOC,
    - Cost and performance tradeoff analyses such as force structure studies
  - Participant communities:
    - Business, Cost Estimating, and Financial Management,
    - Acquisition Logistics,
    - System Planning, Research, Development, and Engineering,
    - Program/Project managers.

O&S Cost Analysis - BCF 215

- One week course with advance reading materials
- Objectives:
  - Plan and perform an O&S cost estimate
    - Recognize the full spectrum of costs in O&S cost estimates
    - Obtain and normalize O&S data
    - Apply appropriate cost estimating methods and models
    - Document and present O&S cost estimates
    - Perform basic sensitivity and risk analysis of an O&S estimate
  - Apply economic analysis tools
  - Apply O&S cost analysis to CAIV and R-TOC efforts

BCF 215 Topics (1 of 2)

Introduction To O&S Cost

- Current Issues and Macro Trends
- System Level Trends and Cost Drivers

O&S Foundations

- O&S Policies
- O&S Terminology
- Components of O&S Costs

Planning O&S Estimates

- OSD O&S Cost Estimating Structure
- Systems View (System Tech Char, Op Concept, Support Concept)
- Choosing Analogies

Sources of O&S Data

- OSMIS, VAMOSC, AFTOC
- Other O&S Sources

Adjusting O&S Costs

- Inflation Adjustments
- DWCF

Sensitivity and Risk Analysis

- Sensitivity Analysis
- Risk Analysis

Economic Analysis

- Discounting (NPV, Breakeven)
- Measures of Return (ROI, IRR)

BCF 215 Topics (1 of 2)

Cost Estimating Methods

- Personnel Costs
- Operating Consumable Costs
- Maintenance Costs (RAM)
- Sustaining Support

O&S Cost Models

- Unit Level Models
- System Level Models
- Major Subsystem Models

Special O&S Topics

- R-TOC, CAIV, A-76

Case Analysis

Work Shop

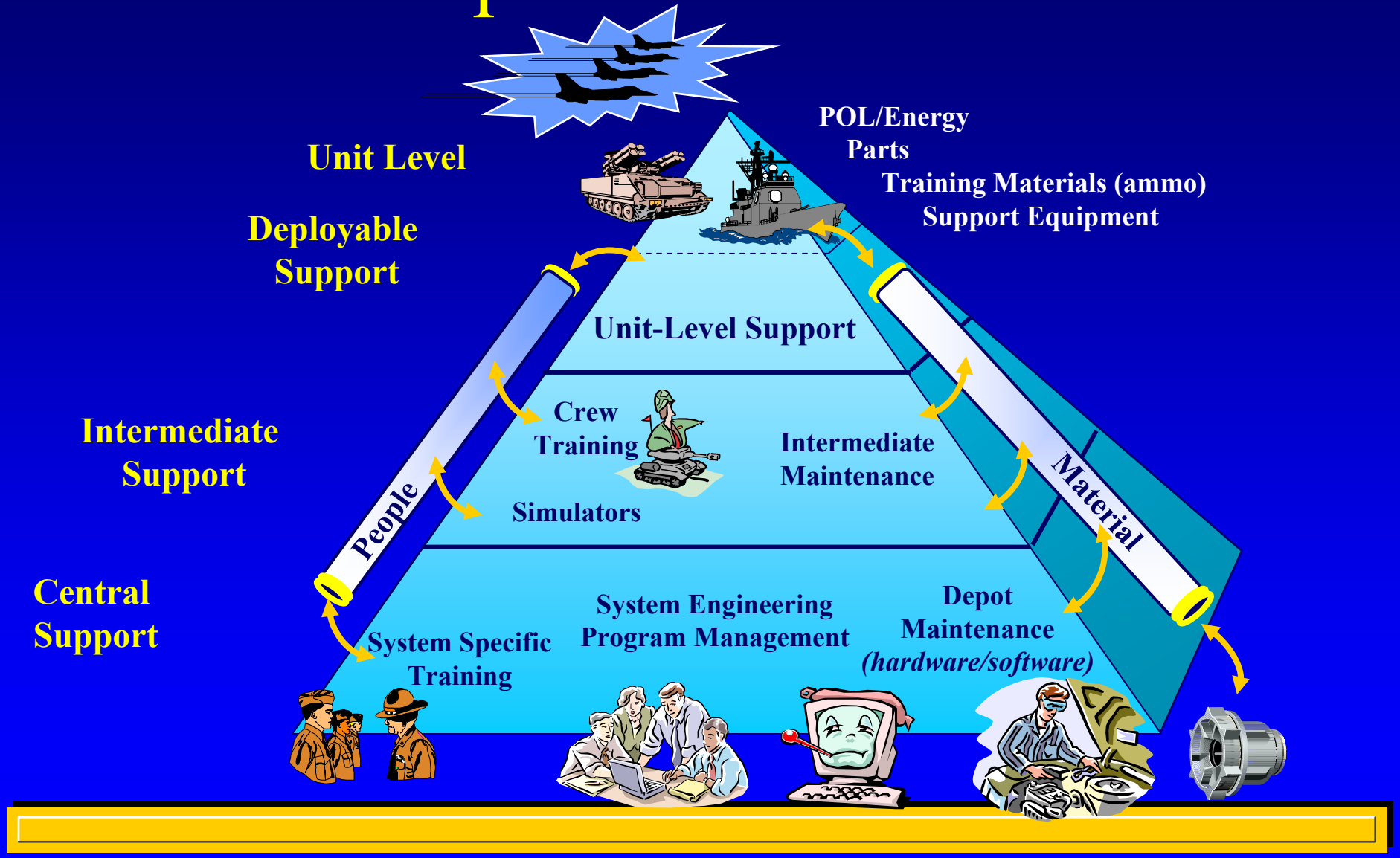
- Team O&S estimating problem
- Student presentations of results
- Student critiques

Components of O&S Costs

- Costs of operating, modifying, maintaining, supplying, training, and supporting a system throughout its deployed life
  - Peacetime operations and support
    - Although staffing and support equipment may be based on wartime
  - Costs attributable to a specific system (attributable costs are those that would not occur if the system did not exist)

- Not Defined By Appropriation or Funding Agency
- Excludes End of Life Disposal Cost

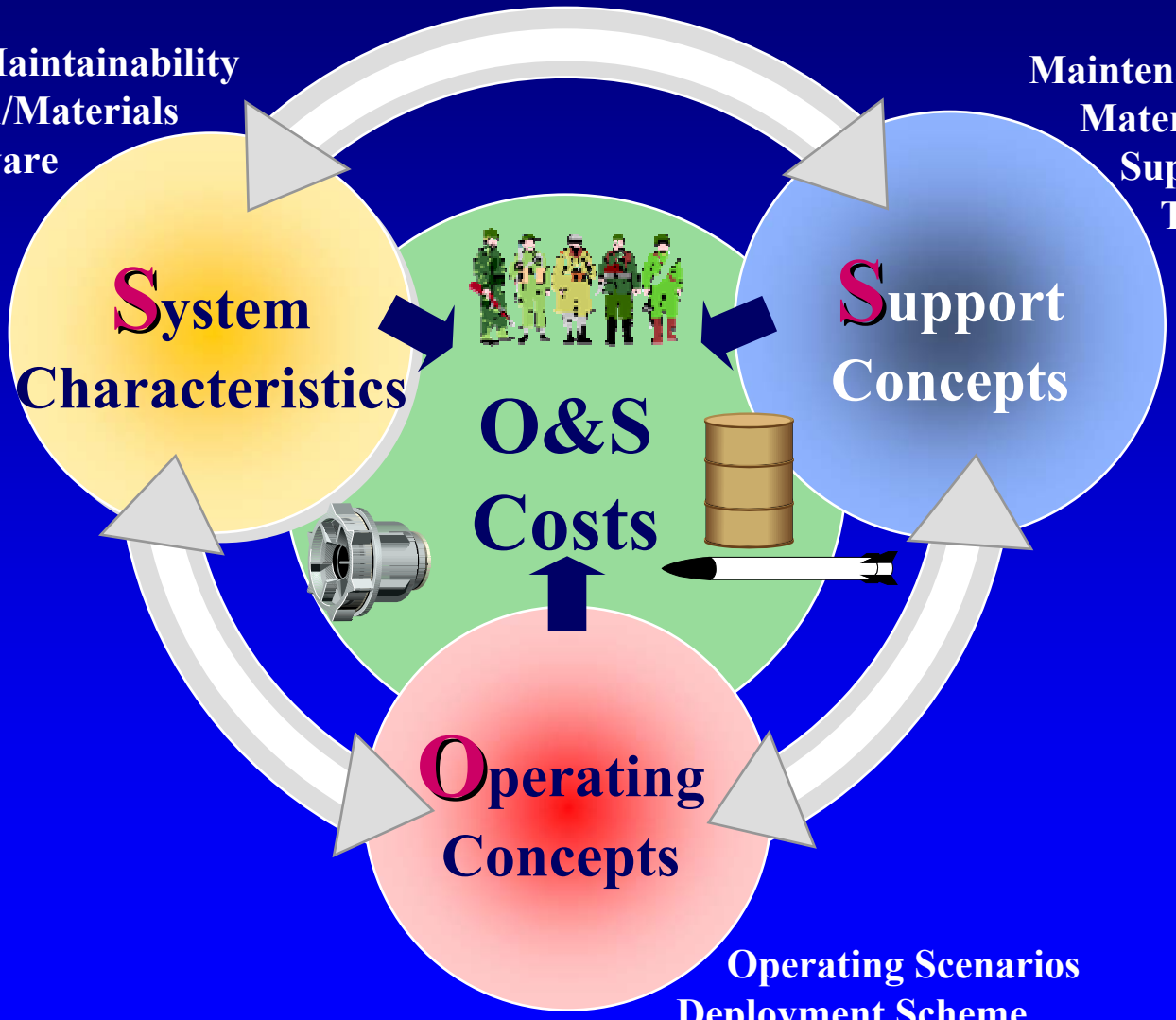
The Scope Of O&S Activities



O&S In LCC

	Design, Test & Evaluation, Manufacturing, Deployment	Operations Support	Disposal
PME	Design, T&E, manufacturing, and deployment	Hardware modifications and software support	
Operating Material	DT&E and OT&E	Deployed and support units	
Non-PME Spares Support Training	Initial outfitting of operating and support units including initial spare parts Training devices/simulators	Material and labor used to maintain and support PME Replacement support equipment Temporary Duty Travel Environmental and Safety costs Simulator operations and support System-specific training	
Facilities	Facility construction and outfitting to operate and support PME	Facility operations & maintenance	
	Development / Production	O&S	Disposal

O&S Costs - A Systems View



Selecting Analogies

- Most O&S Estimates Are Based On Historical Data For Analogous Systems
- Biggest Challenge Is Selecting Appropriate Analogies
  - Match System, Operating, and Support characteristics
  - Appropriate analogies at subsystem level
    - Airframe, hull, avionics, engines, propulsion
  - Confirm analogies by cost area
    - Personnel, maintenance, support

Effects Of Stealth On O&S

- Adding Stealth Affects O&S
  - Personnel, special consumables and reparables, scheduled maintenance, facilities, test equipment, sustaining engineering, software support
  - LO verification testing - new cost element
- Effect Varies
  - Aircraft:
    - +5% modified existing platforms
    - +25% new platforms

O & S Cost Estimating Structure

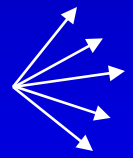
- Key Cost Elements
  - Unit Mission Personnel
  - Unit Level Consumption
  - Intermediate Maintenance
  - Depot Maintenance
  - Contractor Support
  - Sustaining Support
  - Indirect Support

OSD O&S Cost-Estimating Guide (1992)
http://www.dtic.mil/pae/

Estimating Structure Changes

Old Structure

- Unit Mission Personnel
- Unit Level Consumption
- Intermediate Maintenance
- Depot Maintenance
- Contractor Support
- Sustaining Support
- Indirect Support



Revised Structure

- Unit Mission Personnel
- Unit Operations
- Maintenance
- Sustaining Support
- Continuing System Improvements

- Indirect Support

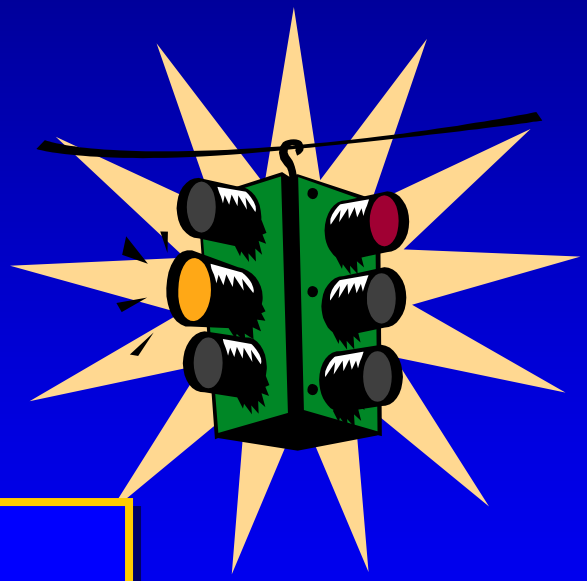
O&S Cost Data

- 1974 OSD asked Services to develop an information system to report actual O&S costs
  - Visibility And Management Of Operating and Support Costs (VAMOSC)
    - Army: OSMIS
      (Operating and Support Management Information System)
    - Navy: VAMOSC
    - Air Force: AFTOC
      (Air Force Total Ownership Cost)
- Other sources:
  - COMET AMCOS Service Pubs

Caution!!!!

Σ(VAMOSC Data) $\neq$ O&S Estimate

Missing Data
Some Personnel
Contract Logistics Support
Software Maintenance



Data Needs Adjustment
OPEMPO
Depot Surcharge Fluctuations

Preparing For The Future

O&S Estimating Capabilities

	Ships	Fixed Wing Aircraft	Rotary Wing Aircraft	Land Vehicles	Tactical Missiles	Electronics	Space Systems
Mission Personnel	44%	22%	48%	58%	8%	29%	14%
Unit Consumption	16%	15%	38%	24%	21%	13%	12%
Inter Maint	<1%	8%	0%	0%	12%	<1%	0%
Depot Main	30%	13%	1%	1%	11%	7%	3%
Contractor Spt		8%	1%	0%	4%		2%
Sustaining Spt	7%	26%	11%	10%	29%	41%	66%
Indirect Spt	3%	8%	1%	6%	15%	10%	3%

Legend

Current State — *Good* — *Poor*

Trend — *Better* — *Worse*

Source: Service Cost Agencies at IDA 2001 Cost Research Symposium

On-Going O&S Research

Aerospace	Space Systems Costing Suite
Aerospace	Costs of Space, Launch and Ground Systems
Aerospace	Ground Station Cost Model (GSCM)
AFCAA	NASA/Air Force Cost Model (NAFCOM)
AFIT/ENG	Estimating C-17 Operating and Support Costs: Development of a Systems Dynamic Model
CEAC	Personnel Costing System
CEAC	Force & Contingency Cost Models Update
CEAC	Study on Rotary Wing Aircraft DLR CER
IDA	Cost of Stealth
NAVSEA	The Effect of New Technologies on Ship Systems A Dynamics Cost Modeling Approach
NCCA	Ship and Shipboard System Operating and Support Cost Model (OSCAM)
NCCA	Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology
NCCA	AIS Software Cost/Technical Database and Estimating Methodology
NCCA	Aircraft Operating and Support Cost Analysis Model
NCCA	Aviation Maintenance Subsystem Database (AMSD)
NSWCCD	Force Level Ship Environmental Cost Model
ONR	Uncertainty Calculus to Minimize Total Ownership Costs for Ships
PA&E	Force and Support Cost System
PA&E	Analysis of the Repair and Overhaul of Reparable Items
RAND	The Cost of Future Military Aircraft Avionics
RAND	Advanced Airframe Structural Materials Operating and Support Costs
RAND	Aircraft Support Cost Estimating Relationships
SMC/AFMC	Unmanned Spacecraft Cost Model (USCM)

Near Term Challenges

- Increasing Importance Of Post Deployment Support
  - System Engineering/Program Management
  - Continuing hardware modifications (P^3I)
  - Continuing software maintenance
- Changing System Technologies and Support Concepts
  - Increasing reliance on contract support
  - COTS
  - Stealth and emerging technologies
  - Embedded software