Introduction to Systems Acquisition

Jim Ripley

Marine Corps Systems Command

Mission of the Acquisition System

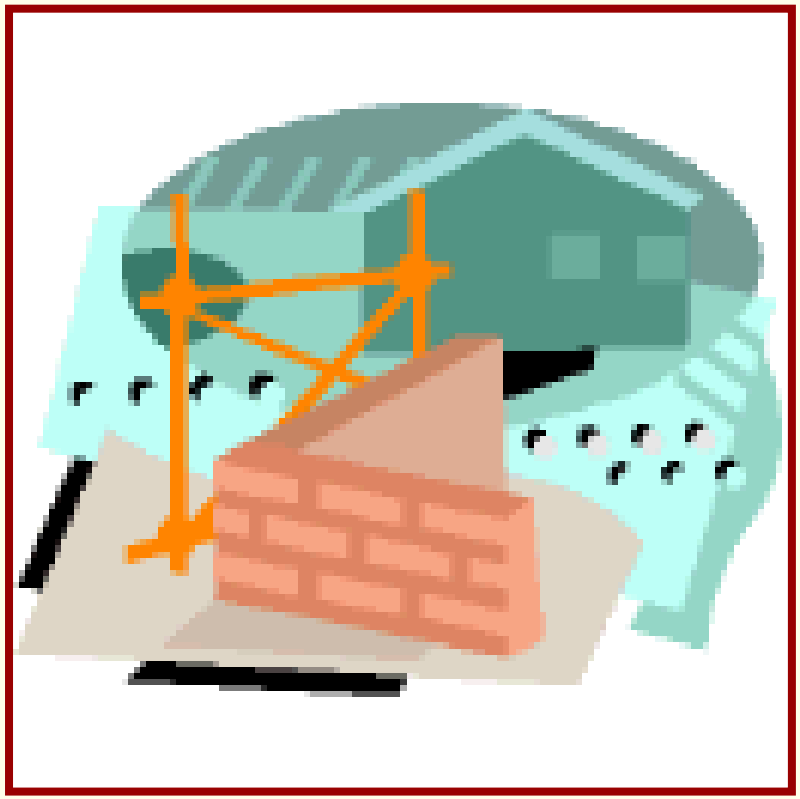
The mission of the acquisition system is to develop, acquire, modernize and maintain the most advanced combatant capabilities and associated systems, ensuring continuous, cost-effective innovation that advances warfighting capability.

Outline

1. Acquisition Fundamentals
2. The Defense Acquisition System
3. Acquisition Planning
4. Financial Management
5. Contract Management
6. System Engineering
7. Acquisition Logistics
8. Production, Quality and Manufacturing Management

Module One

Acquisition Fundamentals



Key Terms

Authorities

Critical Concepts

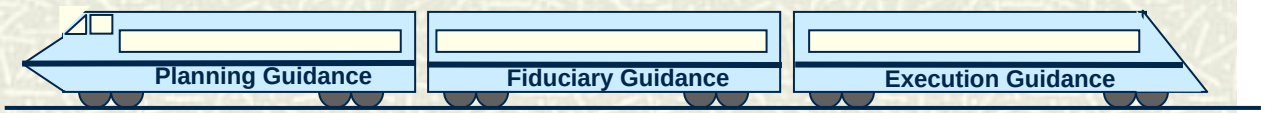
Decision Support Systems

Authorities: Statutory Direction

- Acquisition Laws
  - Armed Services Procurement Act (1947) as amended
  - Small Business Act (1963)
  - Office of Federal Procurement Policy Act (1983)
  - Competition in Contracting Act (1984)
  - DOD Procurement Reform Act (1985)
  - DOD Reorganization Act (1986) (Goldwater-Nichols)
  - Federal Acquisition Streamlining Act (FASA (1994)
  - Clinger-Cohen Act (1996)
- Fiduciary Laws
  - Budgeting and Accounting Procedures Act
  - Federal Managers Financial Integrity act
  - Anti Deficiency Act
  - Chief Financial Officer Act of 1990
  - Government Performance and Results Act
  - Government Management Reform Act

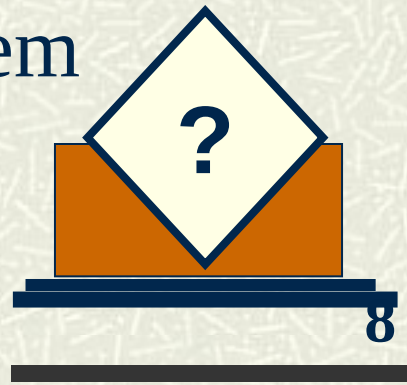
Authorities: Policy Guidance

- Acquisition Policy
  - DODD 5000.1, The Defense Acquisition System
  - DODI 5000.2, Operation of the Defense Acquisition System
- Financial Management Policy
  - DOD 7000.14-R, Financial Management Regulation
  - DODD 7045.14, The Planning, Programming, and Budgeting System
  - DODI 7045.7, Implementation of the Planning, Programming, and Budgeting System
- Federal Acquisition Regulation (FAR)



Decision Support Systems

- Joint Capabilities and Integration Development System (JCIDS)
- Acquisition Management System
- Planning, Programming, Budgeting and Executing System
- Financial Systems



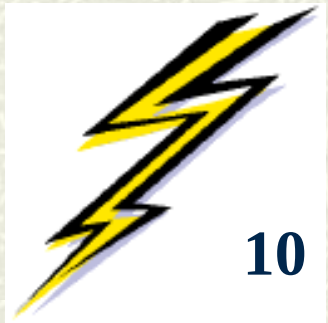
Critical Concepts

- Up Front and Early
- Risk
- Requirements
- Funding Planning
- Acquisition Strategy
- Teamwork
- Communications

Critical Concept: Program Manager's Mantra

Critical Concept: Risk and Risk Factors

- Risk – the measure of the potential inability to achieve objectives
  - (1) the ***probability/likelihood*** of failure
  - (2) the ***consequence/impact*** of the failure
- Risk Factors
  - Technical performance
  - Cost
  - Schedule
- Risk Assessment



Critical Concept: Risk Handling

- Four techniques for handling risk:
  - Control – reducing the probability of occurrence
  - Avoid – changing the source of the potential risk
  - Assume – planning for the potential consequences
  - Transfer – making someone else accountable

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Critical Concept: Requirements

- What capability is needed?
- When is the capability needed?
- Can we afford the new capability?
- Does the need flow from Combat Command, Coalition, and Service operational concepts and architectures?

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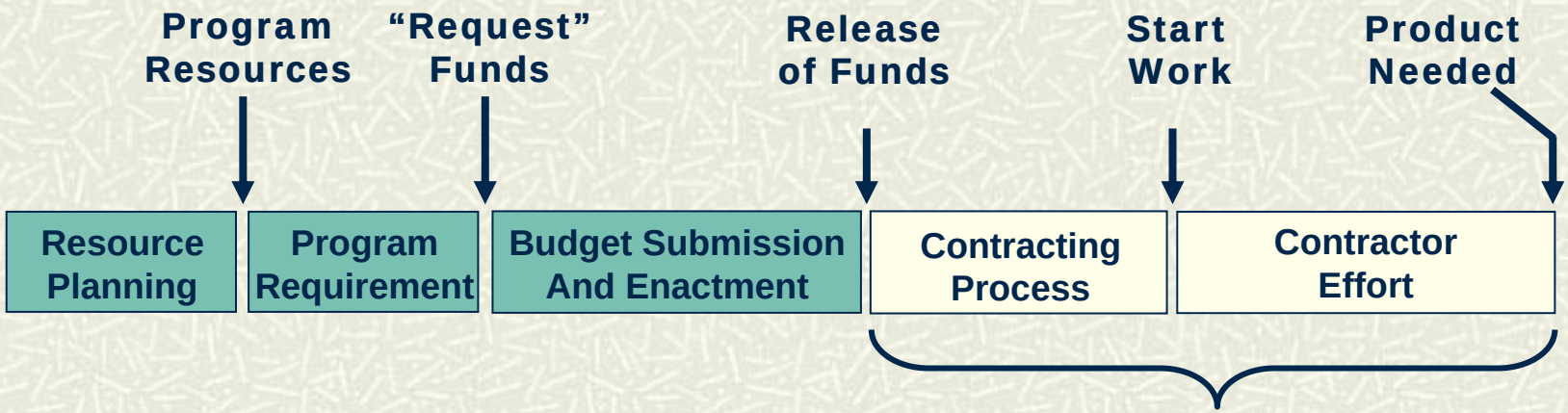
Critical Concept: Funding Planning

- **Rule #1**: Establish funding requirements at least nine years prior to the need.
- **Rule #1a**: Consider process schedules in defining when funding will be needed.
- **Rule #2**: Do not reduce front-end funding to save money. It does not work!
- **Rule #3**: Delays during the program – schedule slips – increase total ownership costs.

Critical Concept: Funding Planning

Funding: Start early and know the Rules.



	Example	
IOC	IOC FY 0	FY 06
Production Period		1 yr
Contract Start	FY -1	FY 05
Contracting	FY -2	FY 04
Budgeting	FY -3	FY 02-03 (Budget FY04)
Programming	FY -7	FY 98-01 (POM 04)
Planning	FY -9-10	FY 95-97

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Critical Concept: Acquisition Strategy

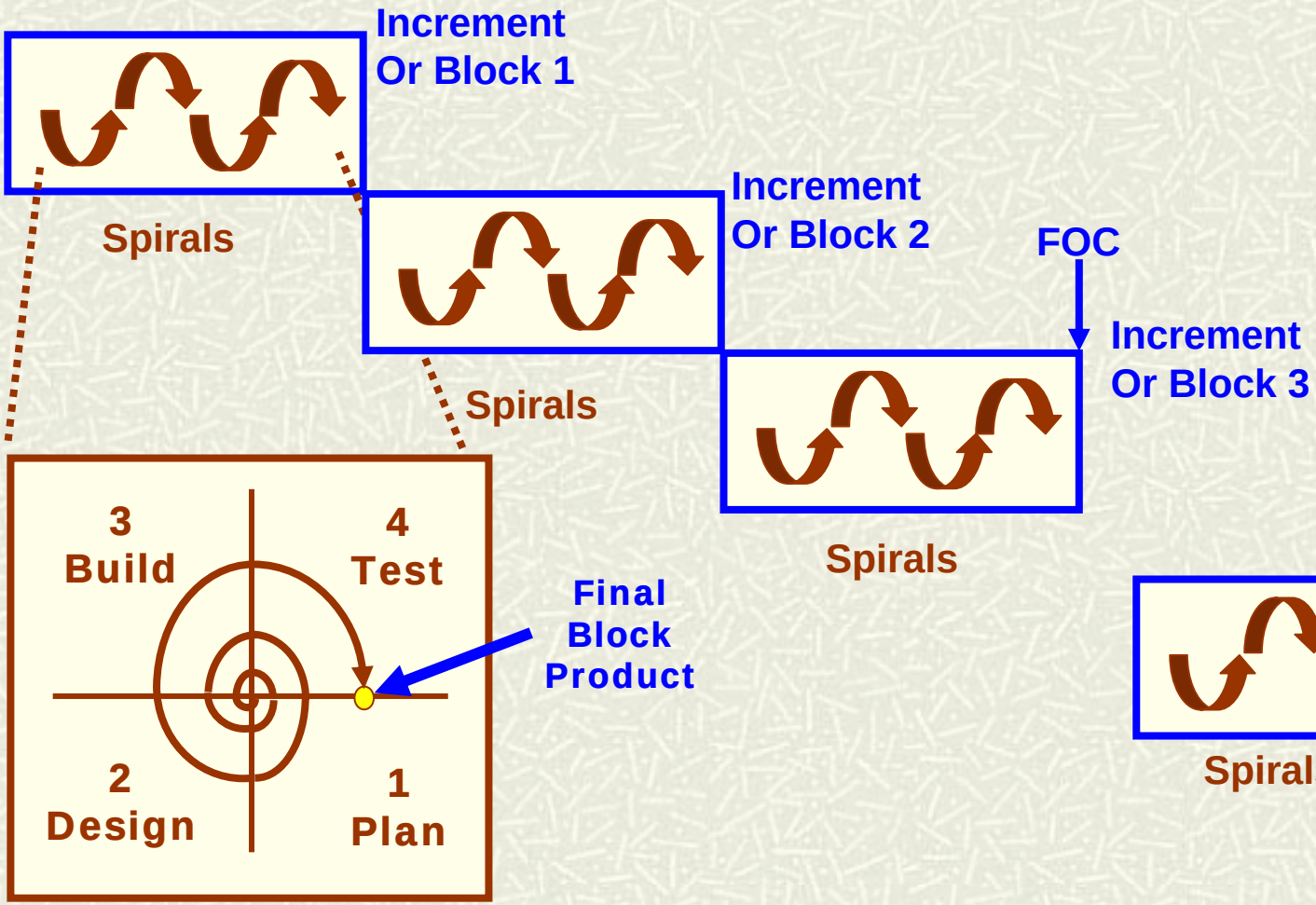
- **Concurrency**: Parallel planning and development from concept through disposal
  - System development
  - Test and Evaluation
  - Acquisition Logistics
  - Production

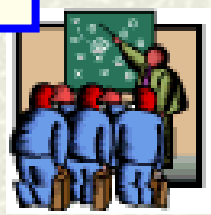
- **Evolutionary Acquisition** – the ultimate capability is delivered to the user in two or more blocks with increasing increments of capability

- **Spiral Development –** continuously expanding versions based on learning from earlier prototypes or development.

- **Pre-Planned Product Improvement (P^3I) –** process for adding improved capabilities to a mature system.

Evolutionary Acquisition, Spiral Development, and Pre-Planned Product Improvement (P^3I)





Critical Concept: Teamwork

- **Teamwork –** the involvement of all stakeholders throughout the entire acquisition process

Stakeholders:

- Science and Technology
- Engineering
- Acquisition Logistics
- Production
- Operations
- T&E/OPTEVFOR
- Program Management

Teamwork: A Cooperative Effort

Critical Concept: Communications

Program Office

- **Requirements Officer**
- **Resource Sponsor**
- **Comptroller**
- **Contracting Officer**
- **Design Agent**
- **In-Service Agent**
- **Fleet**

Communications: A Daily Routine

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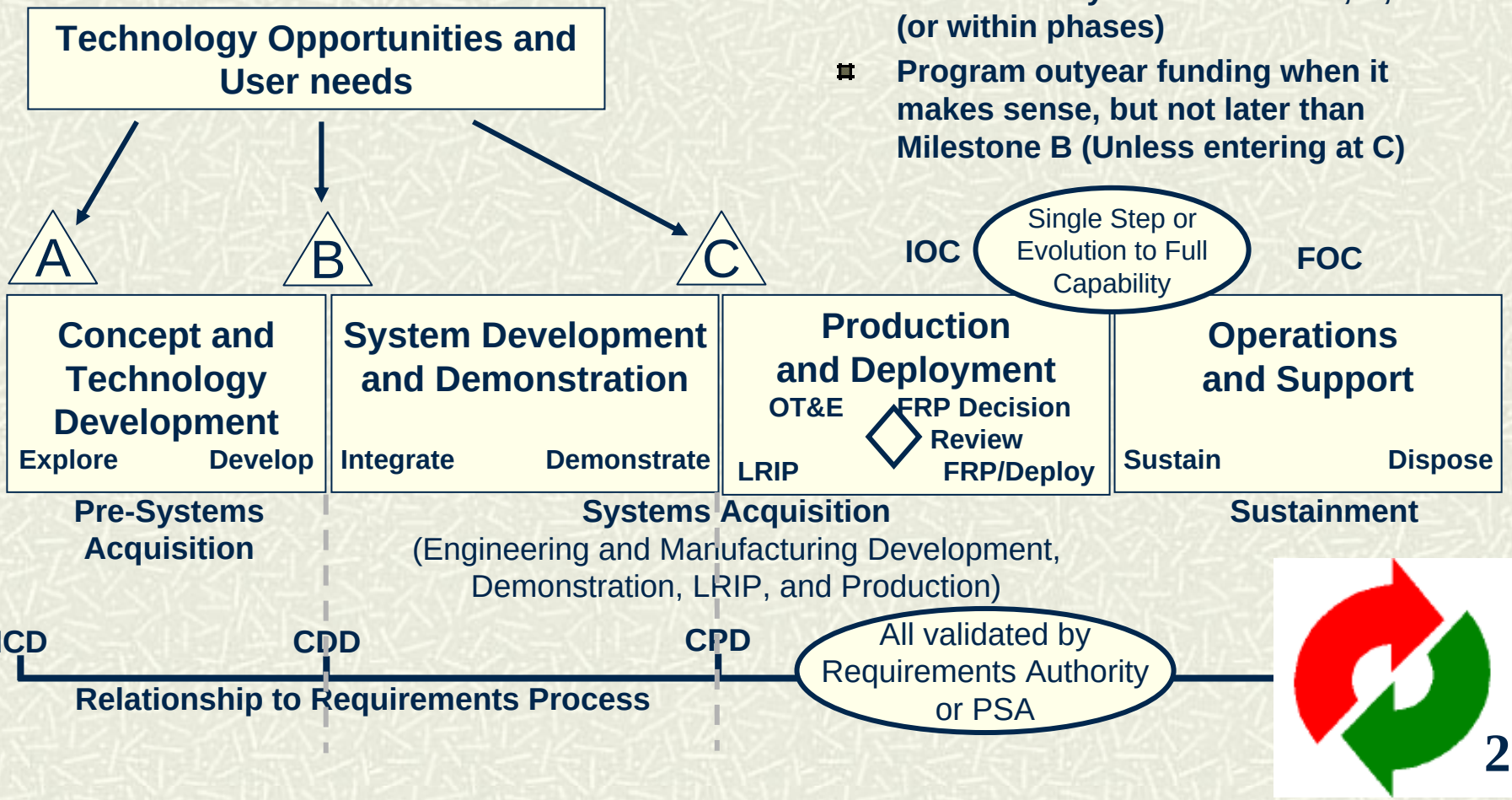
Module Two

Defense Acquisition System

- Framework
- Needs
- Milestones
- Phases
- Work Efforts
- Entrance Criteria
- Exit Criteria

The Acquisition Life Cycle

- Process entry at Milestones A, B, or C (or within phases)
- Program outyear funding when it makes sense, but not later than Milestone B (Unless entering at C)



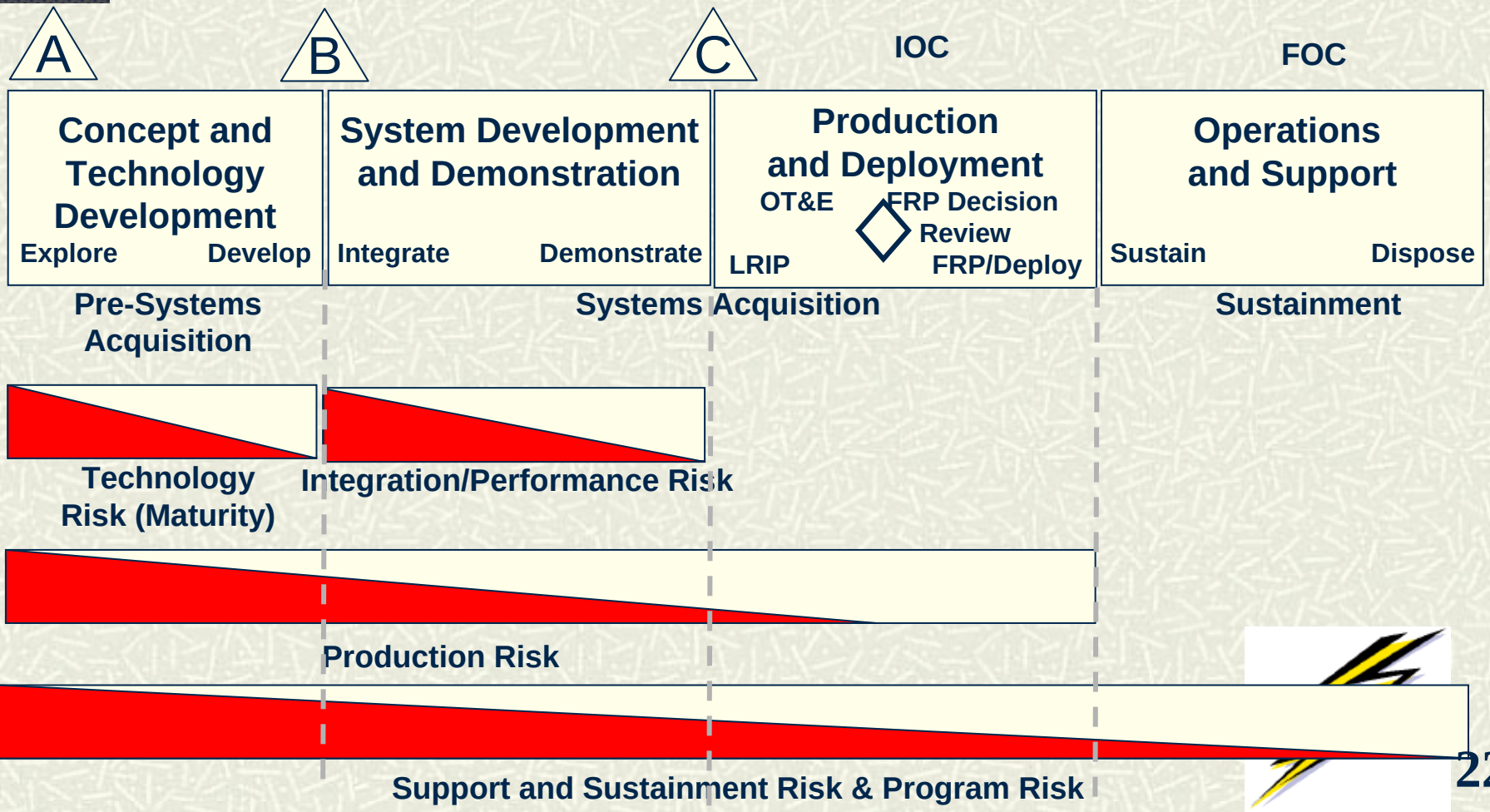
Transitioning through the Acquisition Process

If technical maturity is:	then enter at
Unproven	Milestone A or between A and B
Proven	Milestone B or between B and C
Ready or nearly ready for deployment (commercially available)	Milestone C

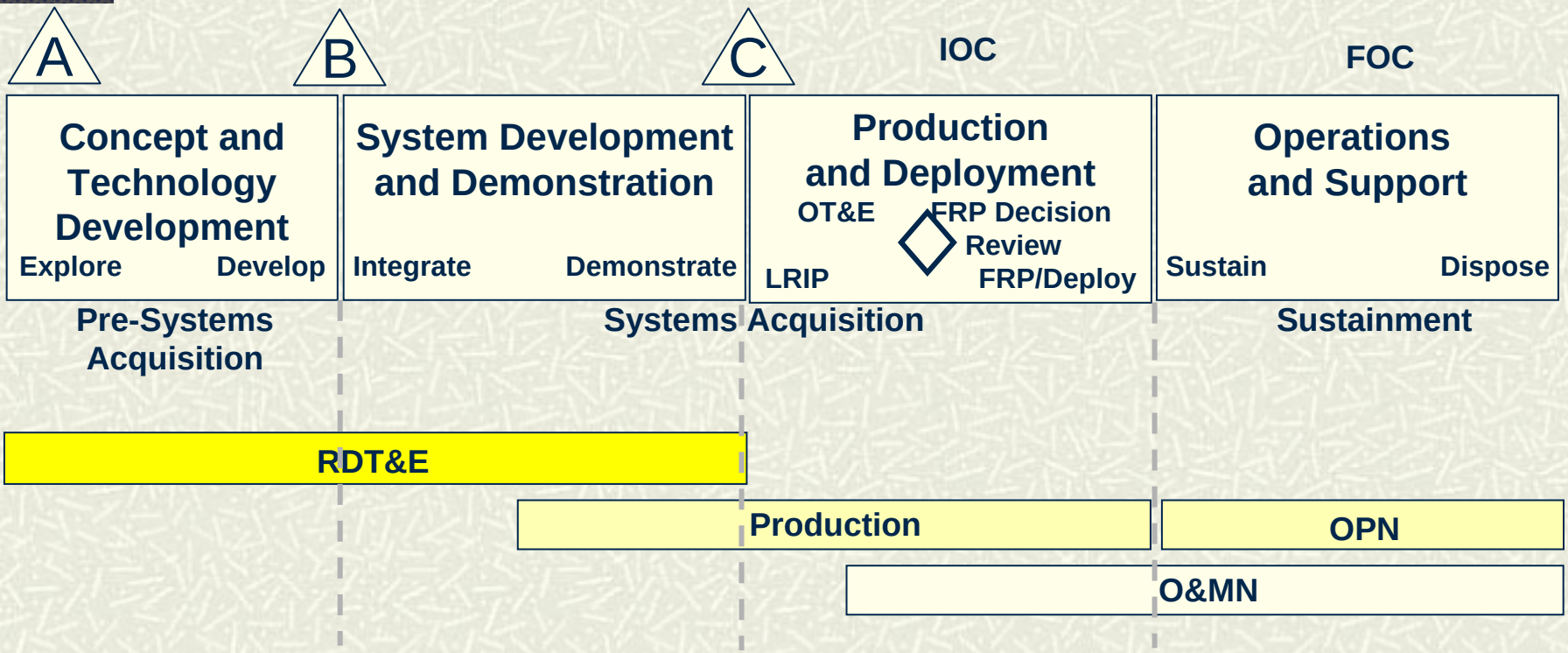
- Phase **Entrance** Criteria
  - *Phase*-specific
    - Documentation
    - Technology maturity
    - Technology risk
    - Technology maturation and demonstration needs

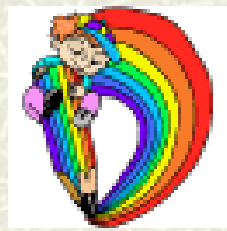
- Phase **Exit** Criteria
  - *Program*-specific
    - Measurable or observable performance conditions
    - Defined in the Acquisition Decision Memorandum

The Acquisition Life Cycle and Risk



The Acquisition Life Cycle and the Color of Money





Module Three

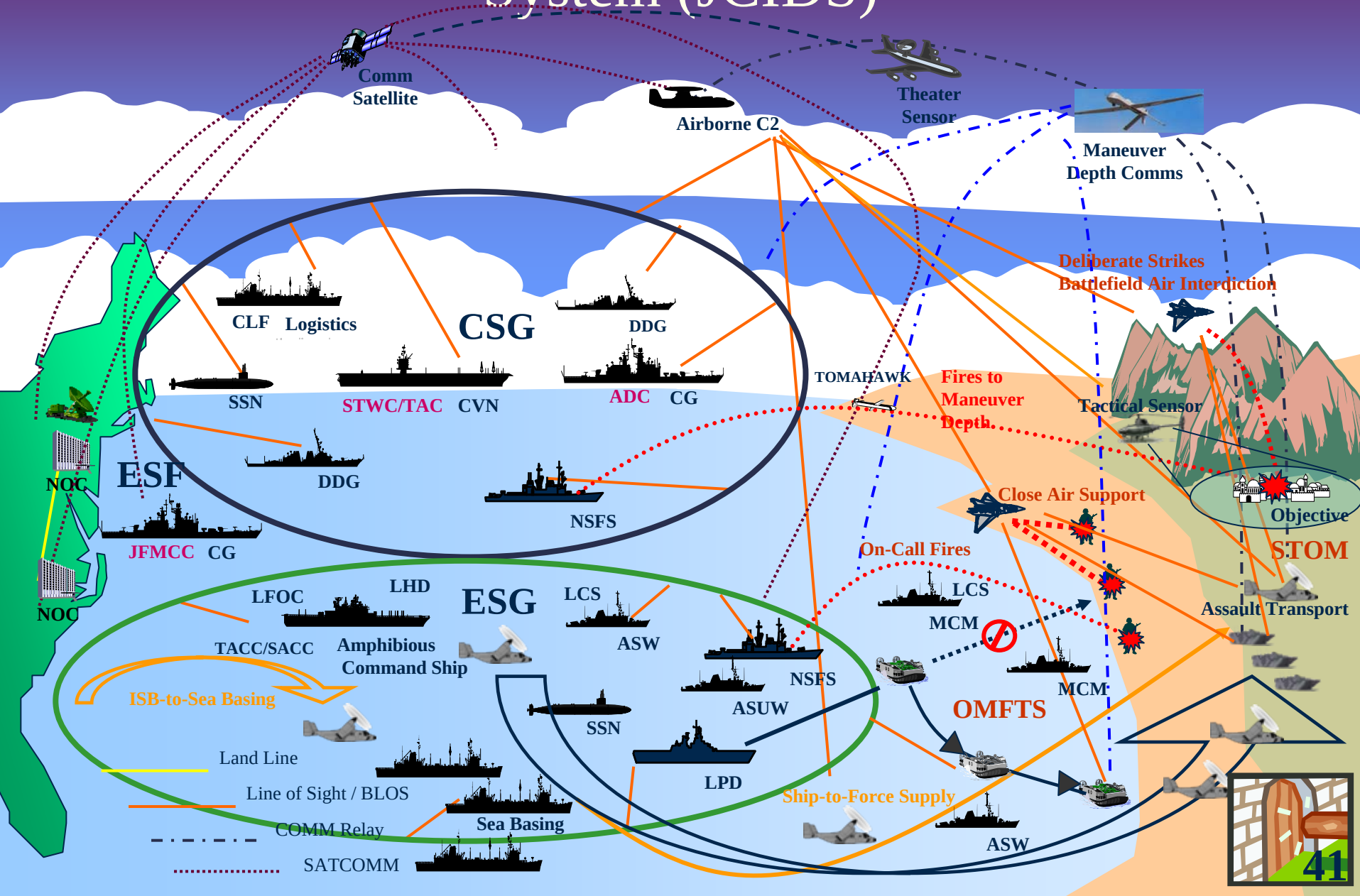
Acquisition Planning

- Requirements
- Acquisition Organizations
- Acquisition Categories
- Acquisition Team
- Work Breakdown Structure
- Acquisition Initiatives
- Acquisition Program Baseline
- Acquisition Strategy

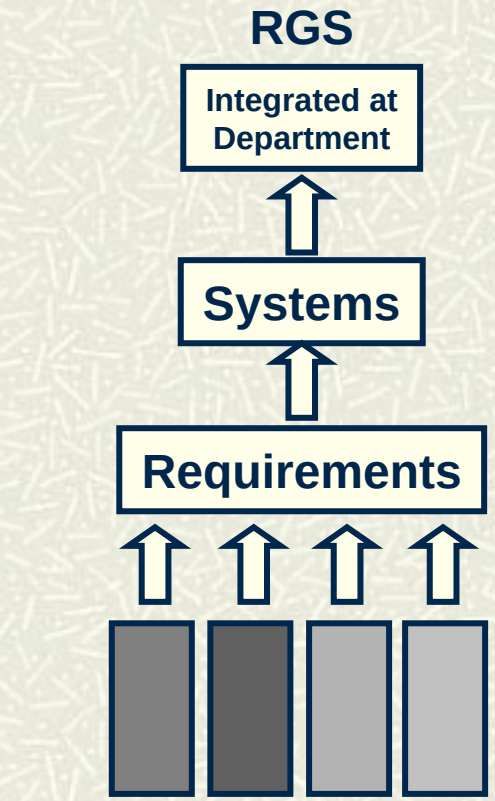
Requirements

- The JCIDS Process
- A Top-Down Process
- Functional Analysis
- An Integrate Proceess
- A Collaborative Effort
- The DoN Requirements Process
- OPNAV Requirements and Programs (N7)
- Influencing Pressures

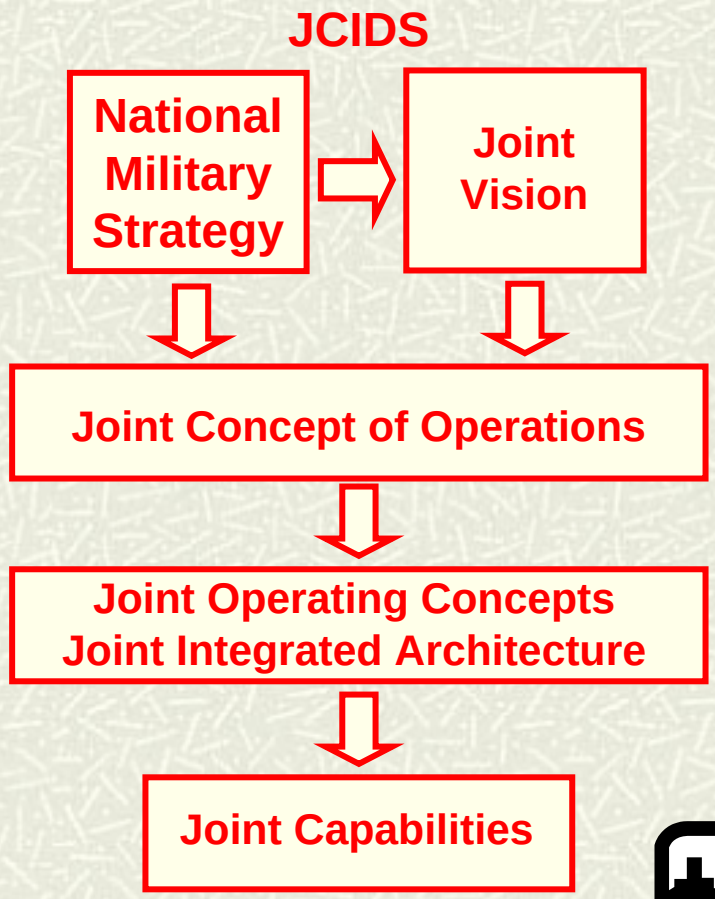
Joint Capabilities and Integration Development System (JCIDS)



A Top-Down Process



Bottom Up, Often Stovepiped



Top Down, Born Joint

Functional Analysis

- **Functional Area Analysis (FAA)**
  - Threat versus Capability
  - Future Threats
  - Current and Projected Capabilities
  - Opportunities for Change
  - Advances in Technology
  - Impact of Policy Changes
  - Cost Reduction
- **Functional Needs Analysis**
  - Shortfalls and Duplications
  - Opportunities
  - Reliability and Maintainability
- **Functional Solution Analysis (DOTMLPF)**
  - Non-materiel (DOTLPF)
  - Materiel (M)

An Integrated Process

The Requirements/Acquisition Handshake

Functional Solution Analysis

- Capability Gap
- Range of Military Operations
- Joint Concepts and Integrated Architectures
- Threat/Operational Environment
- DOTMLPF Analysis
- Capability Sets
- Analysis of Materiel Approaches
- Recommended Alternative

ICD

A — Concept and Technology Development

- Key Performance Parameters (KPPs)
- Performance Thresholds
- Performance Objectives
- CAIV
- Interoperability
- Information Exchange
- Information Assurance
- Program Strategy (for achieving full capability)

CDD

B — System Development and Demonstration

- Measures of Effectiveness
- Refined KPPs
- Threat Summary
- Program Summary
- Shortcomings of systems in place
- C4ISR architectures
- Program Support
- Joint DOTLPF Impact
- Logistics and Facilities Consideration
- Interoperability Certification
- Program Schedule
- Program Affordability

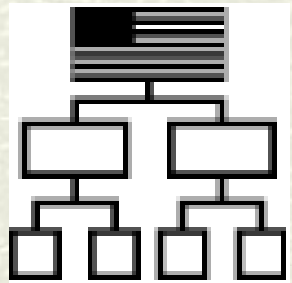
CPD

C — Production And Deployment

- LRIP
- OT&E
- FRP
- Log Support
- Deployment

Key Acquisition Organizations

- DoD Acquisition Organizations
- OSD Acquisition Functions
- DoN Acquisition Organizations
- Program Executive Offices
- System Commands
- Program Offices



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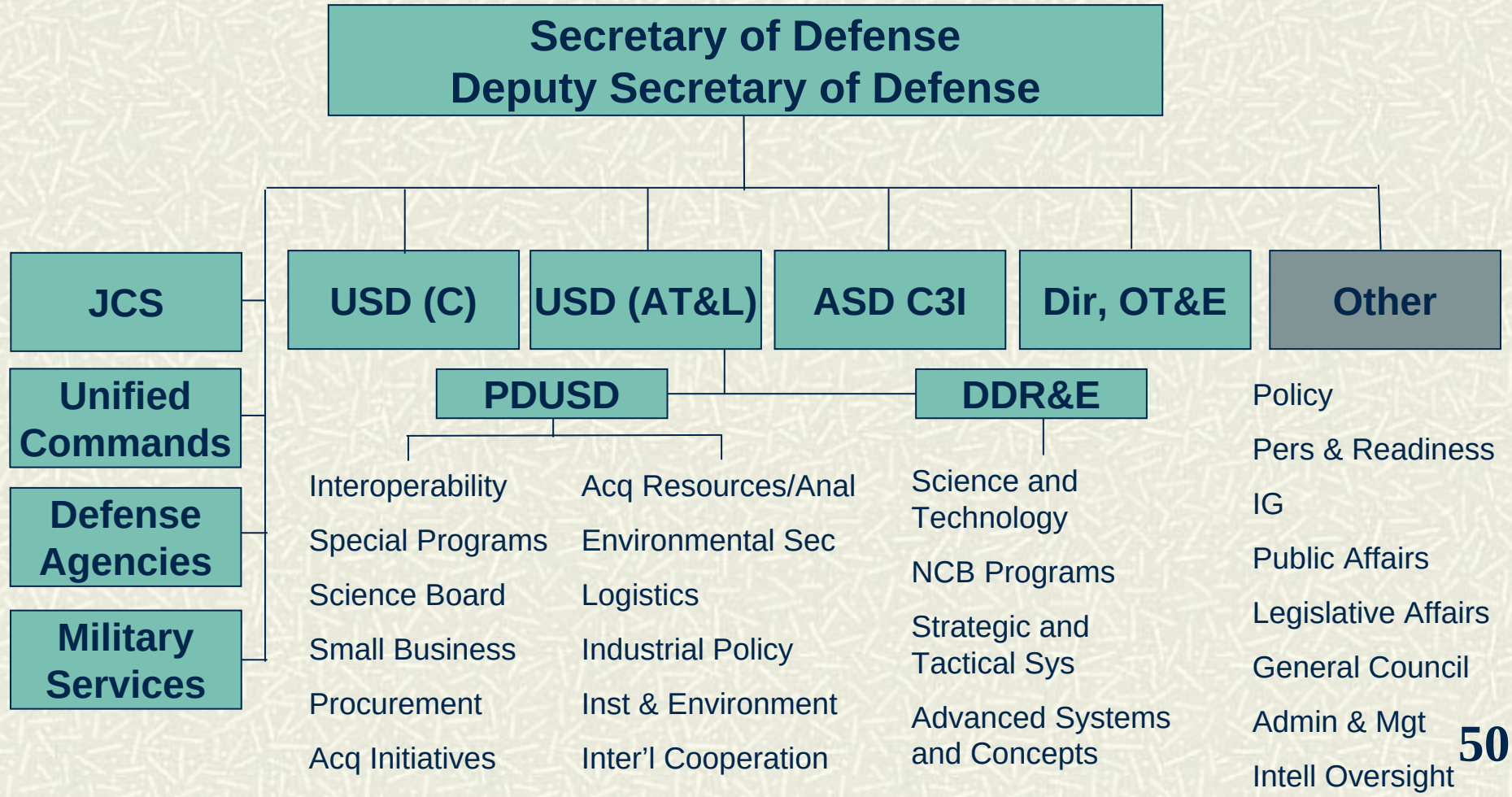
The DOD Acquisition Organization



Acquisition Categories

ACAT	Parameters	MDA
ACAT I	>$365M RDT&E/$2.19B Proc or special interest to USD(AT&L)	
ACAT ID		USD(AT&L with DAB advice
ACAT IC		Delegated to component head
ACAT IA	MAIS >$32M in a single year or total cost >$126M	ASD(C^3I)
ACAT II	>$140 RDT&E/$660M Proc	Component head
ACAT III	Below ACAT I and II	Component acquisition Executive (ASN(RDA)
ACAT IV	Do not affect mil characteristics of ships or aircraft Do not involve combat capability	Designated by component head
ACAT IVT	Requires OT&E	
ACAT IVM	Does not require OT&E	

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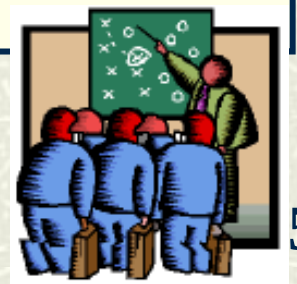
Acquisition Strategy

- Comprehensive guidelines for program execution throughout the system's life cycle
- Event driven linking decisions to demonstrated accomplishments
- Developed using an iterative process
- Documents the major issues in program execution
- Developed prior to program initiation and updated prior to each milestone decision point

The Acquisition Strategy Guidelines:

- Requirements
- Program Structure
- Acquisition Approach
- Risk
- Program Management
- Design Considerations Affecting the Acquisition Strategy
- Support Strategy
- Business Strategy



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Acquisition Strategy: Some Examples

- Development Strategies
  - Evolutionary Acquisition
  - Concurrent Development
  - Spiral Development
- Business and Contracting Strategies
  - Full and Open Competition
  - Sole Source
  - Firm-Fixed Price
  - Indefinite Delivery Indefinite Quantity
  - Cost Plus Fixed Fee
- Support Strategies
  - Organic
  - Contract
    - Contractor Logistic Support
    - Virtual Prime Vendor
    - Contractor Support and Sustainment

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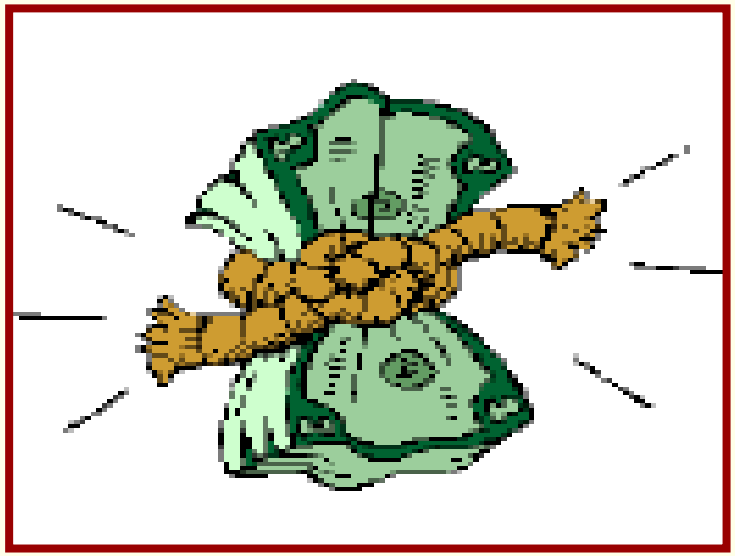
Module Four

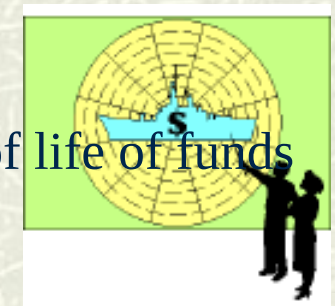
Financial Management



Cost Estimation → Resource Allocation → Budget Enactment → Budget Execution

Purpose and Definitions

- Purpose
  - To aid executives in planning and controlling their organizational operations
    - Ensure that obligations and costs are within the law
    - Funds, property, and other assets are safe-guarded against waste, loss, unauthorized use or misappropriation
- Definitions
  - Budget Authority – legal authorization
  - Commitment – administrative reservation of funds
  - Obligation – legal reservation of funds
  - Expenditure – actual payment of funds
  - Outlay – disbursement to suppliers from concept to end of life of funds



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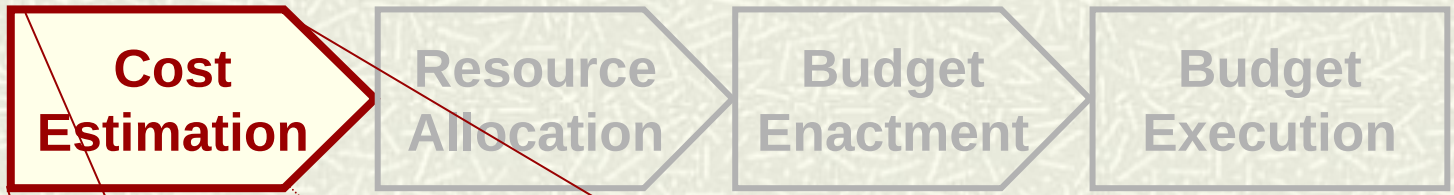
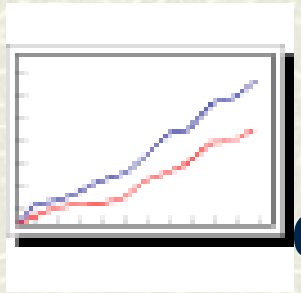
Cost Estimation



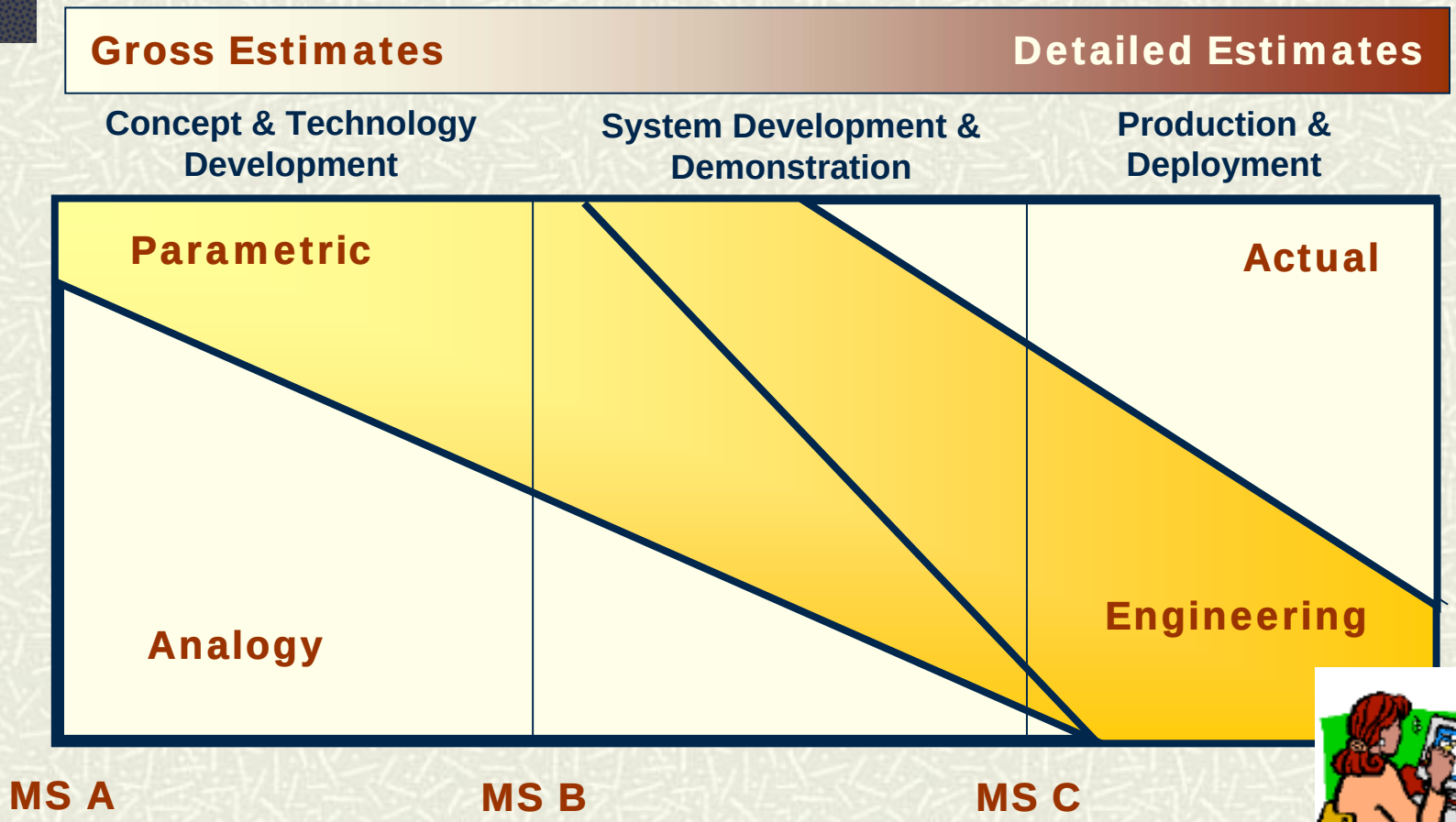
- Life-Cycle Cost Estimates
- Cost Estimation Techniques
- Cost Estimation Types
- Cost Estimate Review

Life-Cycle Cost Estimates

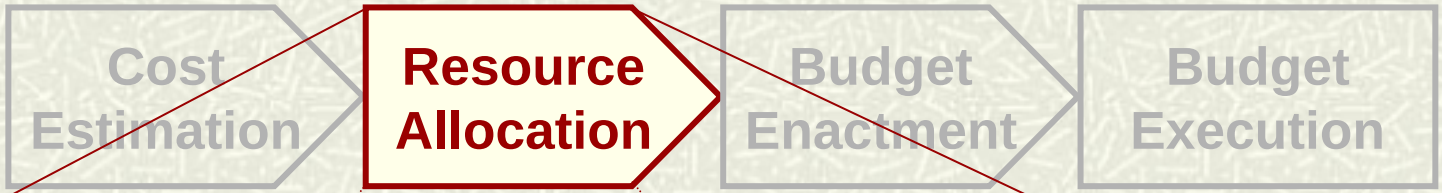
- Life-Cycle Costs (LCC)
- Life-Cycle Cost Estimates (LCCEs)
- Life-Cycle Cost Breakdown
  - Appropriations
  - WBS
  - Cost Categories



Estimation Techniques and the Acquisition Life Cycle



Resource Allocation

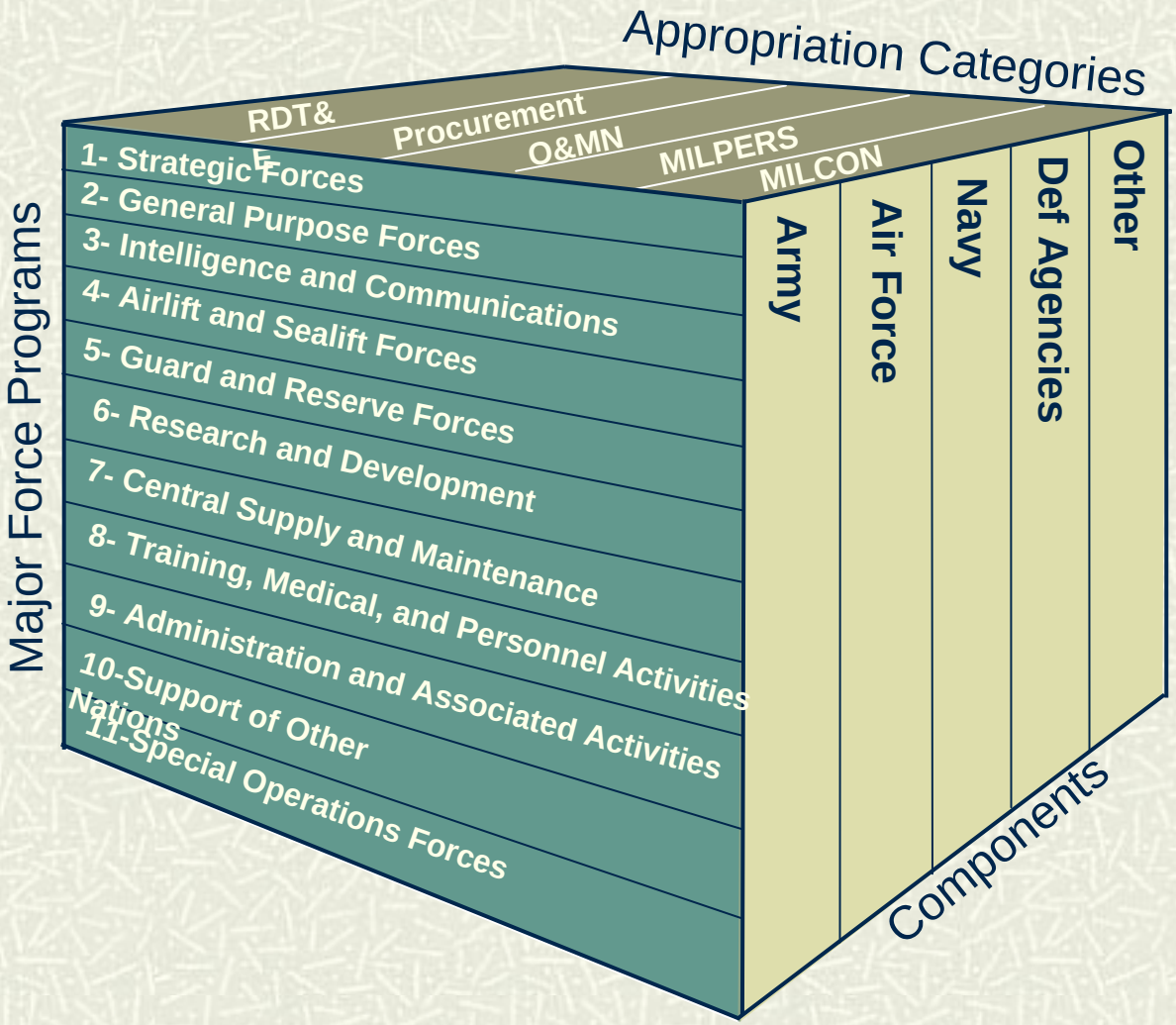


- **Defense Appropriations, Obligation, and Funding Policies**
- **Planning, Programming, and Budgeting System (PPBS) and the Future Year Defense Program (FYDP)**
- **PPBS Phases**
- **Congressional Action**
- **Budget Reviews and Annual Budget Overlap**
- **OPNAV Resources, Requirements and Assessments (N8)**

Defense Appropriation Categories, Obligations and Funding Authority

Appropriation Categories		Type	Obligation Period	Funding Authority
RDT&E		Expense & Investment	2 year	Incremental
Procurement	APN OPN WPN PANMC PMC SCN	Investment	3 year 5 year	Full
O&M	O&MN FHN&MC (Ops) O&MMC RPN O&MNR RPMC O&MMCR	Expense	1 year	Annual
MILPERS (O&M)	MPN MPMC			
MILCON (Proc)	MCON MCONR FHN&MC	Investment		Full

The Planning, Programming and Budget System (PPBS) and the Future Years Defense Program (FYDP)



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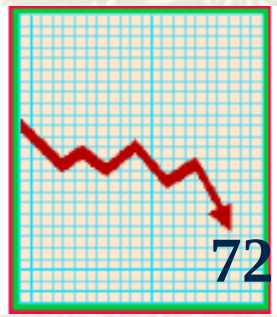
PPBS Phases

- Planning Phase (How much defense is enough?)
  - Defense Planning Guidance (DPG), SECDEF guidance for POM development
  - Service Planning Guidance
- Programming Phase (How much defense can we afford?)
  - Program Objectives Memorandum (POM) or (PR) and Program Decision Memorandum (PDM), OSD decisions concerning Service programs
- Budgeting Phase (Are we executing efficiently?)
  - OSD/OMB Budget submission
    - Budget Estimate Submission (BES)
    - Budgetary implementation of PDM
    - Program Budget Decisions (PBD)
  - President's Budget (PB) Submission



Navy PPBS Overview

PPBS Flow




FY/FY/FY/FY/FY/FY
FY (FY)


PLANNING

STRATEGIC VISION

NAT'L POLICY

NSPG / LRPO

COMBAT COMMANDS, AGENCIES, SERVICES

JSR/JPD

MCP/FNC

NMSD

WORLD SITUATION

CPAM ISSUES

OSD PLANNING

CPAM ANALYSIS

SUMMARY CPAM

DPG/FG

PROGRAMMING

NAVY ISSUES

PROGRAMMING GUIDANCE

SPP
T-POM
POM

OSD REVIEW

DECISION (PDM)

BUDGETING

NAVY BUDGET PREPARATION & REVIEW

OSD/OMB BUDGET SUBMIT

OSD/OMB REVIEW

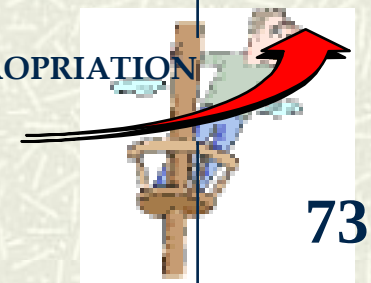
DECISION (PBD)

PRES. BUDGET

CONGRESS

APPROPRIATION

EXECUTE



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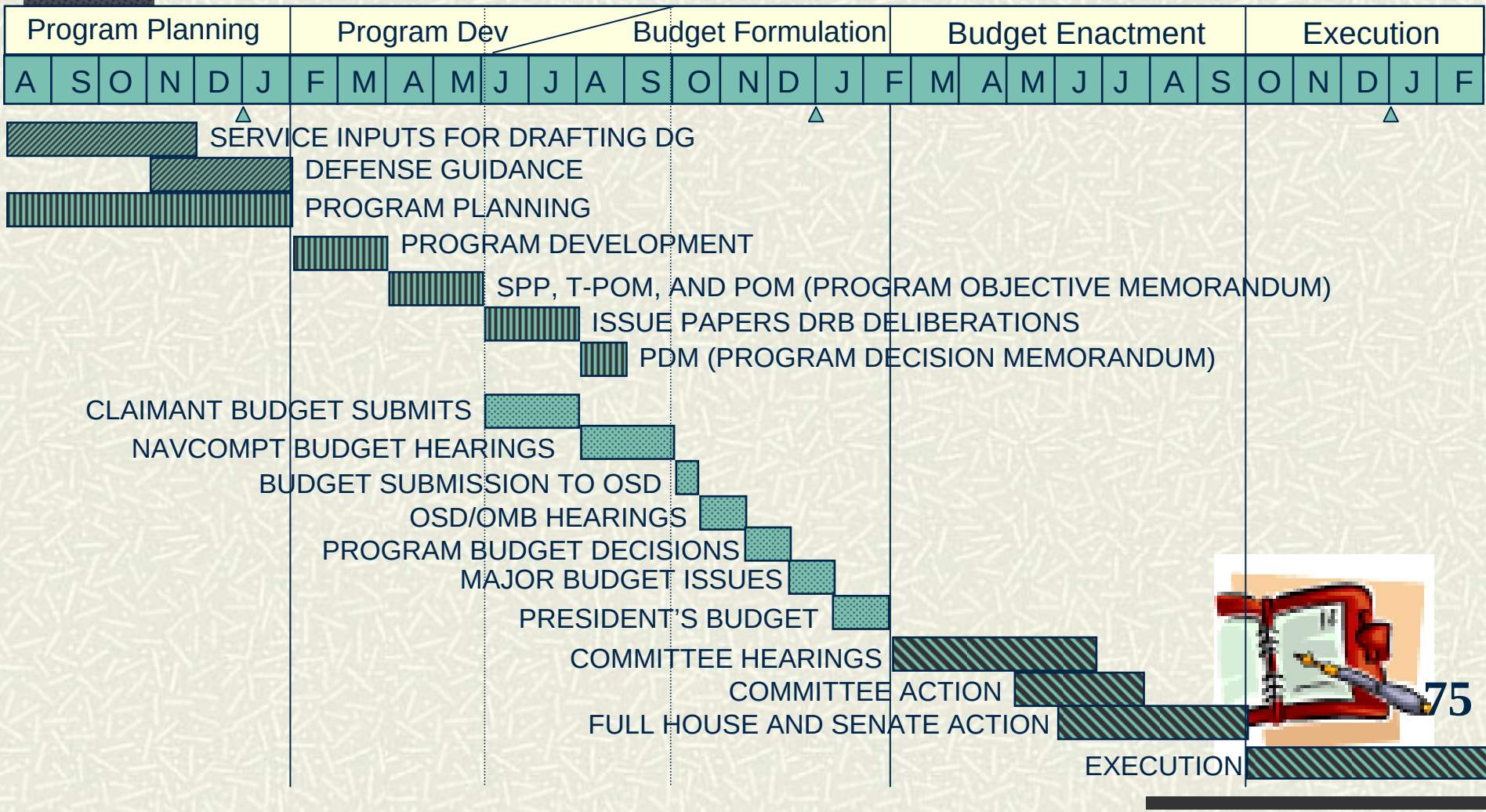
PPBS Timeline



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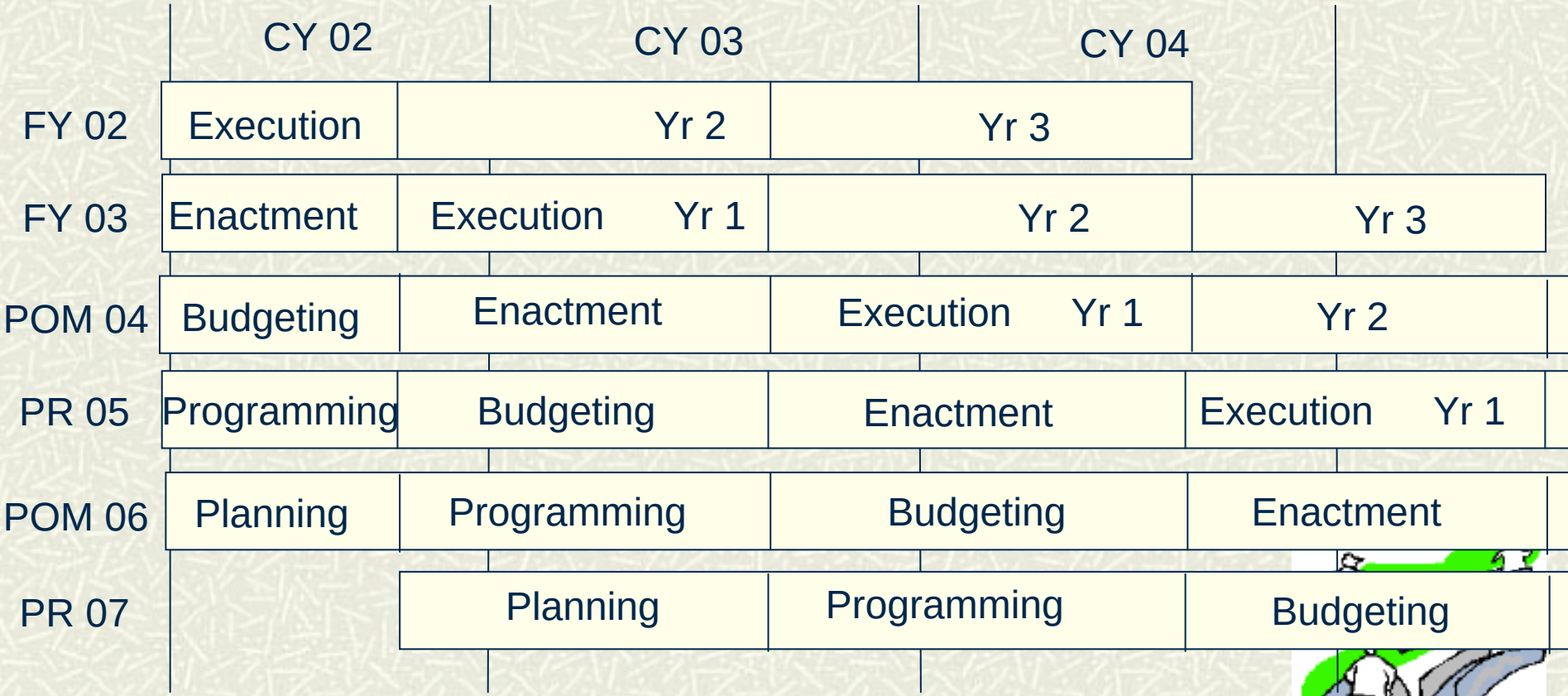
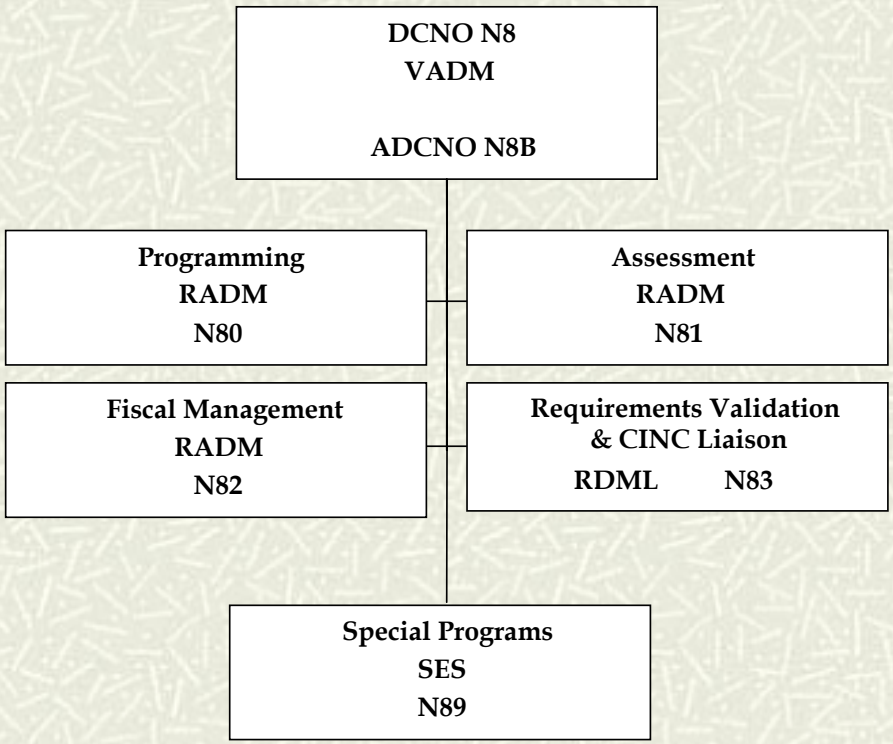
Annual Budget Overlap



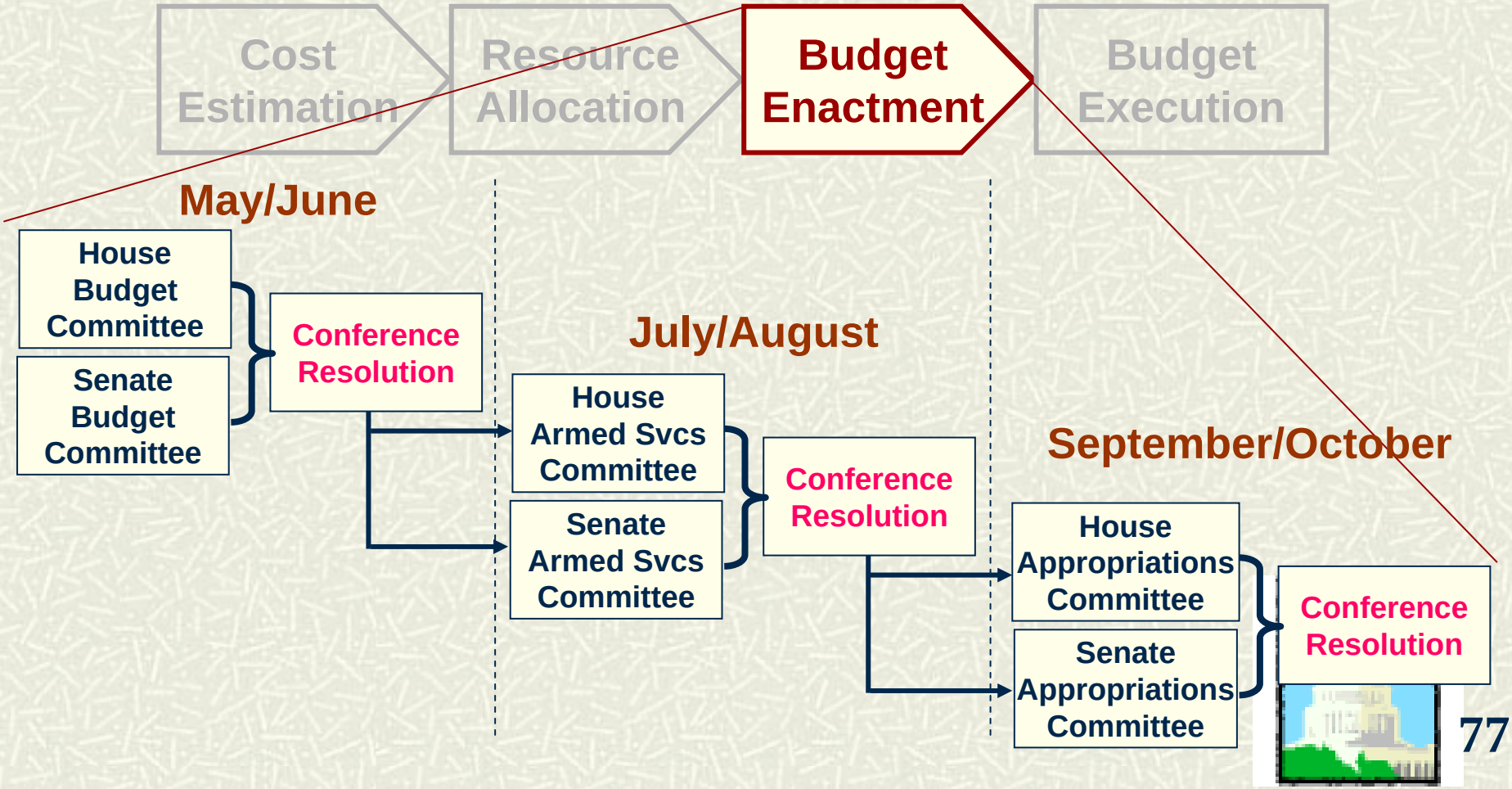
OPNAV Resources, Requirements and Assessments (N8)

Resources, Requirements & Assessments (N8)



- **Acts as CNO's principal advisor for the allocation of resources**
- **Assesses strategy, requirements, and resources to achieve military capabilities through the IWAR and CPAM process**
- **Directs the development of the Navy POM**
- **Supports the CNO/Secretary in the budget process**
- **Oversees the CEB and NROC**
- **Directs the CNO studies program and the Quadrennial Defense Review**
- **Provides the Fleet CINCs, unified CINCs, and Navy Component Commanders representation on the OPNAV staff**

Budget Enactment (Congressional Action)



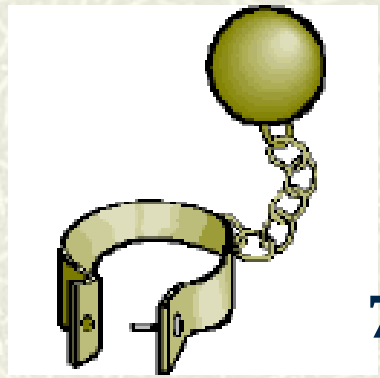
Budget Execution

Cost Estimation → Resource Allocation → Budget Enactment → **Budget Execution**

- **Statutory Requirements**
- **Congressional Prior Approval Reprogramming**
- **Internal Reprogramming**
- **Below Threshold Reprogramming**

Budget Execution: Statutory Requirements

- Expiration of Funds
- Cancellation of Funds
- Misappropriation of Funds
  - (Title 31, U.S. Code, Section 1301)
- Anti-Deficiency Act
  - (Title 31, U.S. Code, Section 1517)



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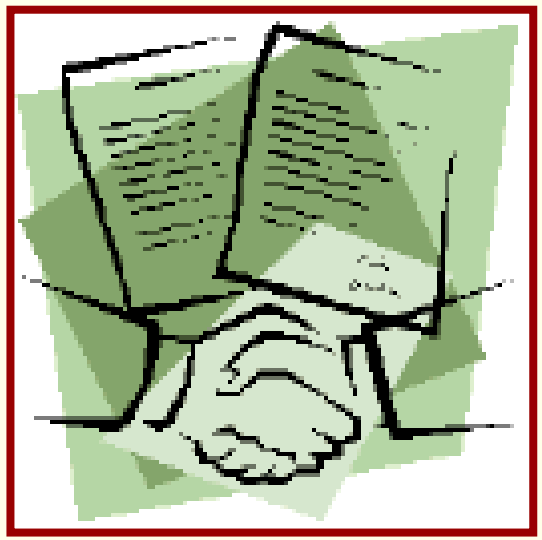
Module Five

Contract Management



Solicitation Planning → **Solicitation Evaluation & Contract Award** → **Post Award & Contract Mgt / Earned Value Mgt**

Solicitation Planning

Solicitation Planning

Solicitation Evaluation and Contract Award

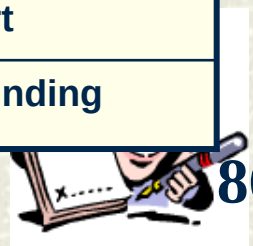
Post Award and Contract Management

Earned Value Management

- Definition and Elements of a Contract
- The FAR and the Contracting Officer
- Requirements for Competition
- Determination of Requirements
- Contracting Methods
- Contract Types

Definition and Elements of a Contract

Essential Elements	Features
Offer	**Must:** 1. Express Intent 2. Be communicated 3. Have completer terms 4. Be clear and unambiguous
Acceptance	**Must be:** 1. Timely 2. Clear and unequivocal 3. A mirror image of the offer
Consideration	**Types include:** 1. Promise to perform 2. Promise in return for performance 3. Sufficiency and adequacy of consideration
Legal and Binding	**Objective or purpose needs to be legal to be enforced in court**
Competent Parties	**Both parties must be legally competent for a contract to be binding**



The FAR and the Contracting Officer

- The Federal Acquisition Regulation (FAR)
- Types of Contracting Officer
  - Procuring Contracting Officer (PCO)
  - Administrative Contracting Officer (ACO)
  - Termination Contracting Officer (TCO)

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The Program Manager and the Contracting Officer

	Program Manager	Contracting Officer
Authority	Charter	Warrant
Responsibility	Entire Program	Contract
Background/Training	Technical/Programatic	Business
Guiding Directives	DoD 5000 Series Regs	FAR
Organization	IPT	IPT

The only person who can discuss a contract in detail with a contractor is the contracting officer.

Requirements for Competition

Competition Requirements	Description
Requirement for full and open competition	All responsible sources are permitted to compete for the effort. The CO decides how full and open competition will be achieved.
Allowance for full and open competition after exclusion of sources	Excluding sources may be done to facilitate: 1. Establishing or maintaining alternate sources. 2. Setting aside work for small business concerns. 3. Fulfilling Small Business Administration's objectives for Section 8(a)
Allowance for exceptions to full and open competition (Sole Source)	Seven exceptions to full and open competition include: 1. Only one source will satisfy requirements 2. Unusual and compelling urgency 3. Industrial mobilization 4. International agreement 5. Authorized or required by statute 6. National security 7. Public interest
Requirement of approval of other than full and open competition	Requested by Justification and Approval (J&A) or a Determination and Finding (D&F)

Contracting Methods

Sealed Bidding	Negotiated
Well-defined requirements	Less well-defined requirements
Adequate competition required	Competitive or sole source (can be a defined requirement)
Uses an Invitation for Bid (IFB) solicitation	Uses a Request for Proposal (RFP) solicitation
Award based on price and price related factors	Award based on evaluation criteria
No discussions allowed	Discussions/negotiations expected
Usually Firm-Fixed Price (FFP)	Usually Cost Plus Fixed Fee (CPFF)

Contract Types

Fixed-price

- Low risk to Government
- Moderate risk to contractor
- Well-defined requirements, higher degree of certainty
- Guaranteed delivery by contractor
- Payment after delivery/performance
- Profit based on efficient performance and cost control
- Use of either IFB or RFP

Cost-reimbursed

- Higher risk to Government
- Reduces risk to contractor
- Less well-defined requirements, higher degree of uncertainty
- Contractors best efforts
- Payment as cost are incurred
- Fee or formula to compensate the contractor beyond cost
- Use of an RFP

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Comparison of Contract Types

	Fixed-Price	Cost-Reimbursement
What is promised	Acceptable goods and services	Best efforts
When is payment	After delivery (progress payment possible)	As costs are incurred
Cost risk to Contractor	High	Low
Cost risk to Government	Low	High

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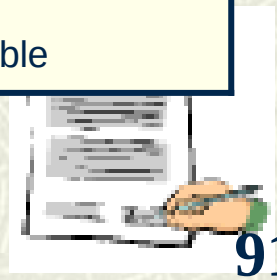
Other Contract Types

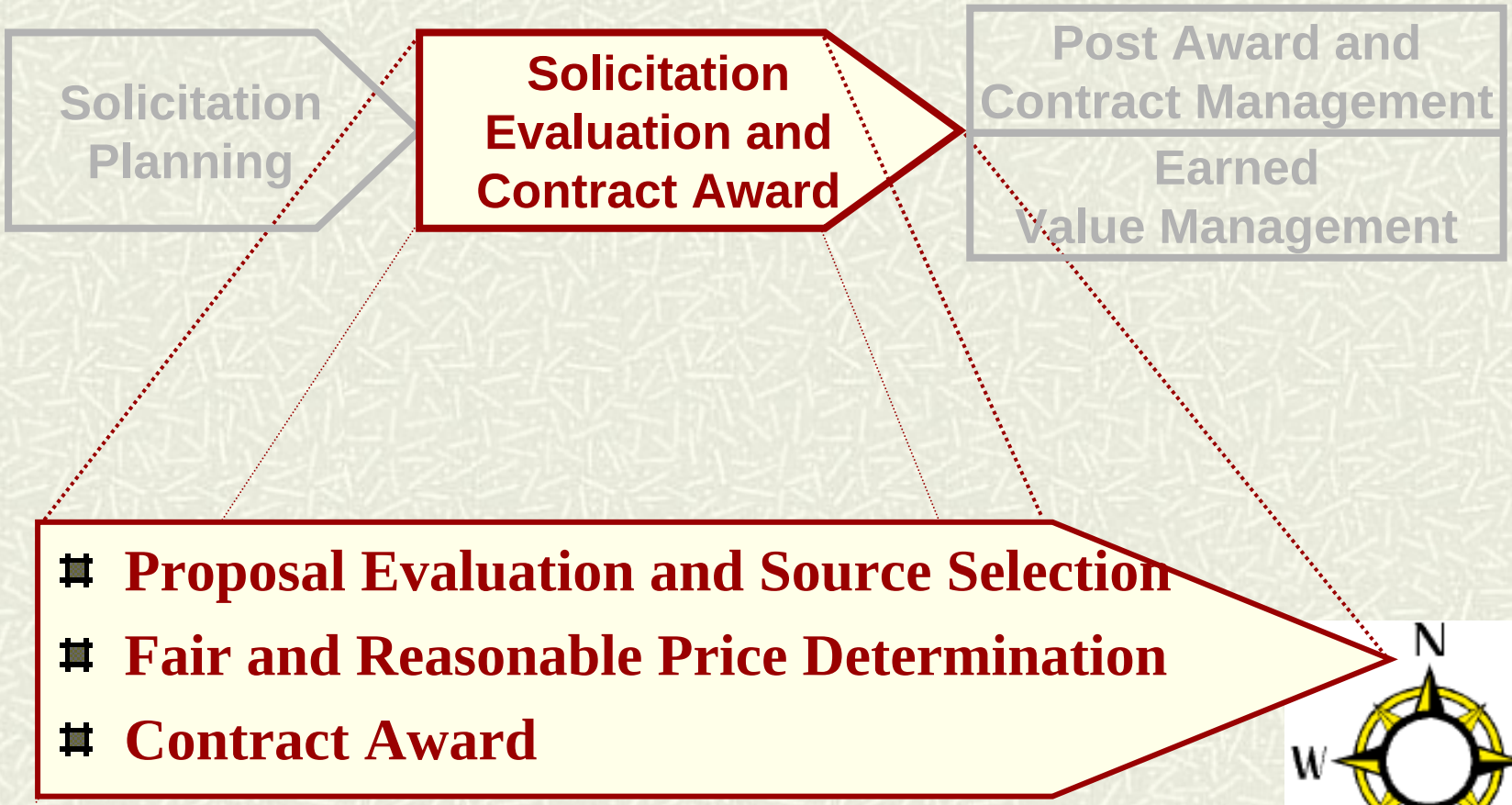
This type of contract…	Provides for …	And may be used when…
Indefinite Delivery: Definite Quantity	Delivery of a definite quantity for a fixed period	1. Definite quantity of supplies or services will be required 2. The supplies or services are regularly available
Indefinite Delivery: Indefinite Quantity	Indefinite quantity within stated limits during a fixed period with performance to be specified in delivery orders	Exact quantity of supplies or services is unknown
Indefinite Delivery: Requirements	Filling all actual purchase requirements of a designated activity during a specified period with deliveries or performance to be specified in delivery orders	Acquiring any supplies or services on a recurring basis when specific quantities are not known at the outset

Other Contract Types (Continued)

This type of contract…	Provides for …	And may be used when…
Time and Materials	Acquisition of supplies and services on the basis direct labor and material costs	It is not possible to estimate extent and duration of work or costs with confidence
Letter	Preliminary contractual instrument containing a price ceiling permitting contractor to begin providing services or supplies	1. Government's best interest for contractor to begin immediately 2. Time does not permit negotiating a definitive contract
Multiyear	Purchase of supplies or services for more than one, but not more than five, program years	1. There will be substantial savings of total anticipated cost 2. Quantity or rate is expected to remain unchanged 3. Funding is expected to be stable



Solicitation Evaluation and Award



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Evaluation and Source Selection

Key Player	Responsibilities
Contracting Officer (CO)	Process compliance with law/regulation Proposal compliance with solicitation Establishing competitive range for discussions
Source Selection Evaluation Board (SSEB)	Evaluating proposals for weaknesses and deficiencies
⌗ Technical Evaluation Panel (TRP)	Evaluating the technical proposal against evaluation factors Supporting the CO in discussions and negotiations
⌗ Cost Review Panel (CRP)	Conducting price and/or cost analysis of offeror's proposals Supporting the CO in discussions and negotiations
Source Selection Advisory Council (SSAC)	On request, perform comparative analysis of SSEB evaluations of each proposal Forward recommendations to SSA
Source Selection Authority (SSA)	Appoint qualified personnel to the SSEB and SSAC Oversee process, ensure integrity Select best value source
Contracting Officer (CO)	Communicate with offerors

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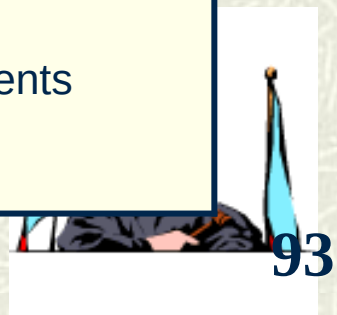
Fair and Reasonable Price Determination

Analysis	Definition	Techniques include:

Price Analysis	the process of examining and evaluating a proposed price without evaluating its separate cost elements and proposed profit.	▪ Comparing offerors' proposed prices
		  ▪ *(#hours x hourly rate + material)*
		▪ Applying rough yardsticks
		▪ Comparing with:
		  ▪ Competitive price lists
		  ▪ Government cost estimates
		  ▪ Market prices

Cost Analysis	the process of reviewing and evaluating the separate elements and proposed profit in the contractors cost proposal.	▪ Applying judgmental factors to proposed costs ▪ Examining all cost elements



Contract Award

SSA

- Decides which offer(s) to accept for contract award
- Briefs a higher authority before the selection is approved, if necessary

CO

- Signs and distributes the contract
- Notifies unsuccessful offerors of the final decision.
- If requested, debriefs unsuccessful offerors,

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Post Award and Contract Administration

Solicitation Planning → Solicitation Evaluation and Contract Award → **Post Award and Contract Management** → Earned Value Management

- **Post Award Roles and Responsibilities**
  - **Agencies**
  - **Key Personnel**
- **Contract Administration**
- **Delivery and Contract Closeout**
  - **Contract Modification**
  - **Contract Closeout**

Post-Award Roles and Responsibilities

- Agencies
  - Defense Contract Audit Agency (DCAA) – *accounting and financial advisory services*
  - Defense Finance and Accounting Service (DFAS) – *timely payment to the contractor*
  - Defense Contract Management Agency (DCMA) – *contract administrative services*
- Key Personnel
  - Program Integrator (PI) – *contract management office's POC for a specific program*
  - Administrative Contracting Officer (ACO) – *performs administrative functions for the contract*
  - Termination Contracting Officer (TCO) – *negotiates equitable settlement with the contractor*
  - Contracting Officer Representative (COR) – *designated qualified person authorized to assist in contract administration*
  - Procuring Contracting Officer (PCO) – *handles procurement from pre-solicitation through award*
  - Technical Point of Contract (TPOC) – *provides technical oversight for a contract or contract task orders*

Contract Administration

- Purpose
- Role
- Functions
- Contract Management Office Functions
  - Informal Performance Assessment Reporting System (IPARS)
  - Contractor Performance Assessment Reporting System (CPARS)

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Delivery, Modification and Closeout

- Delivery – time and place, quantity, method, and person authorized to receive
- Contract Modification
  - Bilateral – adjustment to contract price due to change order; definitize letter contracts; and incorporate other agreements
  - Unilateral – administrative changes; issue a change order; make authorized changes; and issue a termination notice
  - Change order – directs contractor to make a change prior to agreement on terms and conditions
  - Constructive Change – an unauthorized change requiring the contractor to perform beyond contract requirements
- Contract Closeout – when all deliveries and services have been completed and accepted

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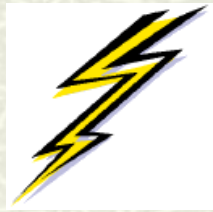
Risk In Contracting

- To the Government
- To the Contractor



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Earned Value Management (EVM)

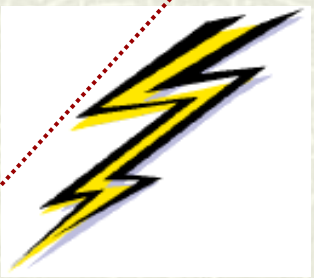
Solicitation Planning

Solicitation Evaluation and Contract Award

Post Award and Contract Management

Earned Value Management

- **Definition**
- **Objectives Measures**
- **EVM Systems**
- **EVM Surveillance and Review**



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EVM: Definition

- EVM is a series of processes that relate scope of the work with schedule and budgets.

	Scope	Schedule	Budget
Work Planned	What work is scheduled?	When is it scheduled?	How much is budgeted?
Work Completed	What work was done?	When was it done?	How much was budgeted for it?
Cost of Work	How much was actually spent?		

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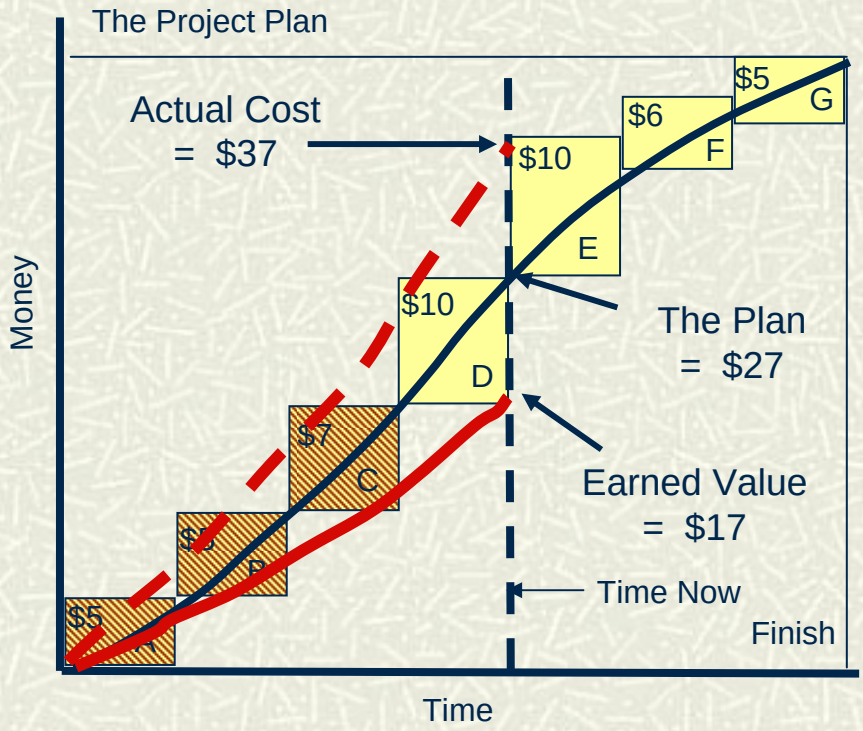
EVM: Example



Case Two

- Schedule Status = $10 behind schedule
- Cost Status = $37, the planned value plus the value of the task to completed

Module Six

System Engineering

Test and Evaluation

Software Acquisition

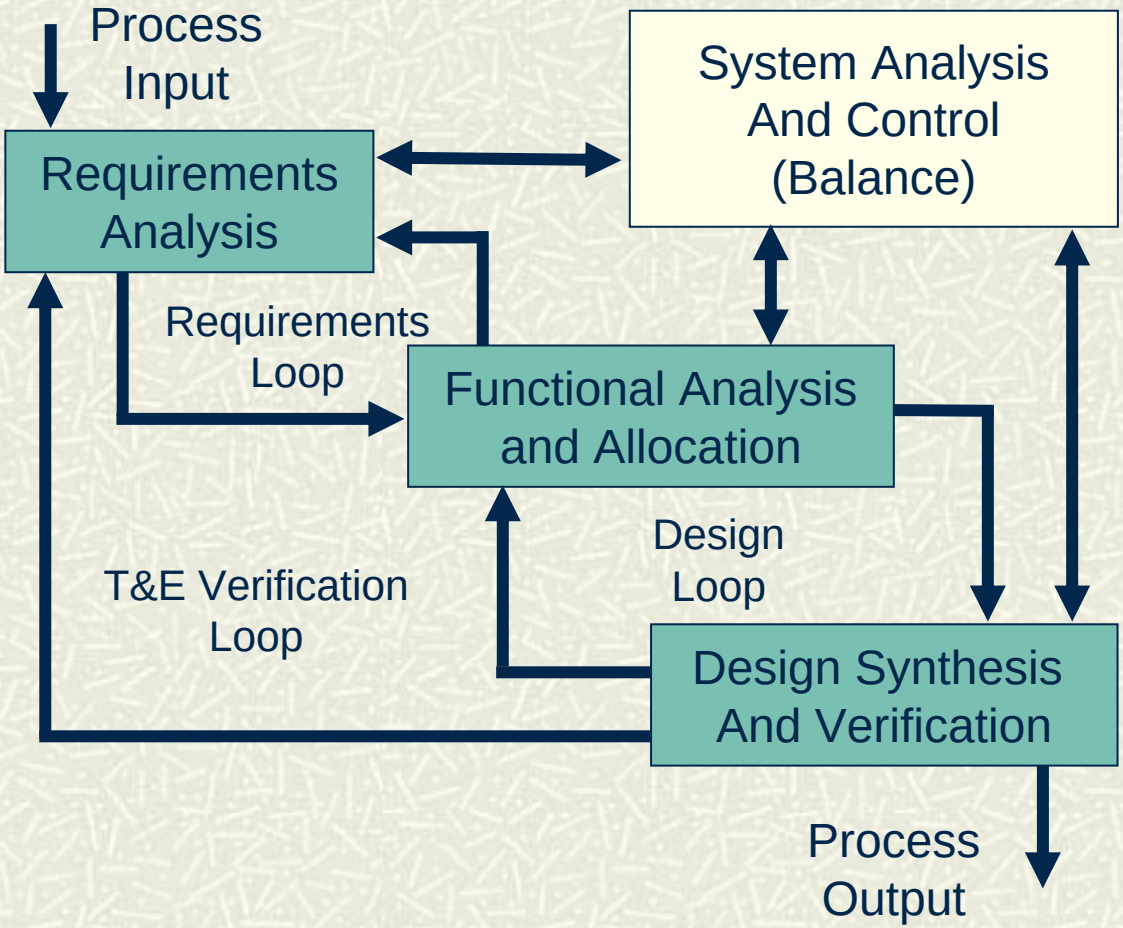
Science and Technology

Software Acquisition

The Systems Engineering Process

- The Feedback Process
- Systems Engineering Disciplines
- Involvement in the Life Cycle
- Influence on the Life Cycle

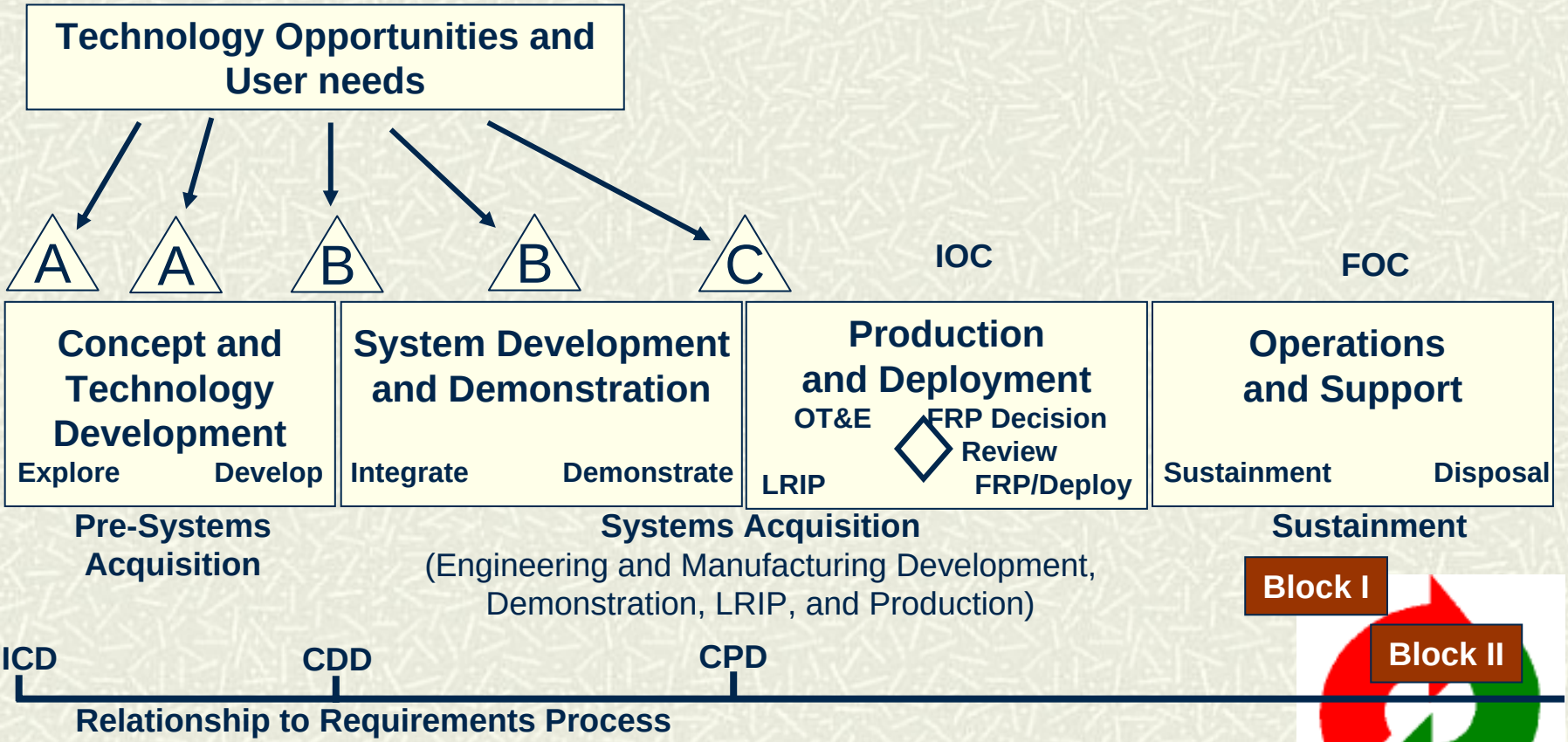
The System Engineering Process



Process Outputs

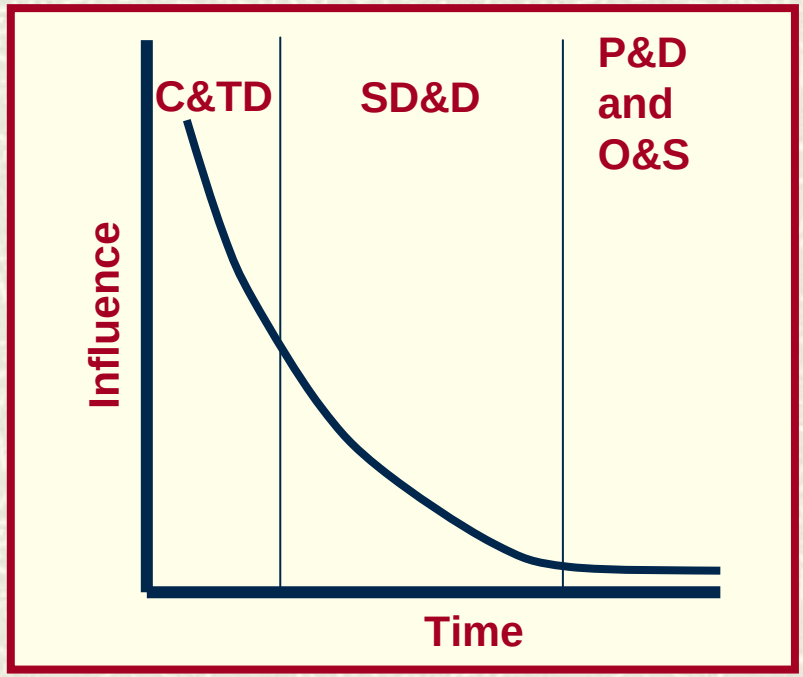
- Specification functions
- Performance-based Specs and Standards
- Program-unique Specifications
- Specification development
- System specifications
- Item specifications
- Process and material specifications
- Specification flowdown

Involvement in the Life Cycle



Influence on the Life-Cycle

- System concept
- Preliminary design
- Detailed design
- Fabrication, test, and integration
- Life-cycle costs
  - Concept and Technology Development
  - System Development and Demonstration
  - Production and Deployment
  - Operations and Support



Potential influence on LCC by acquisition phase

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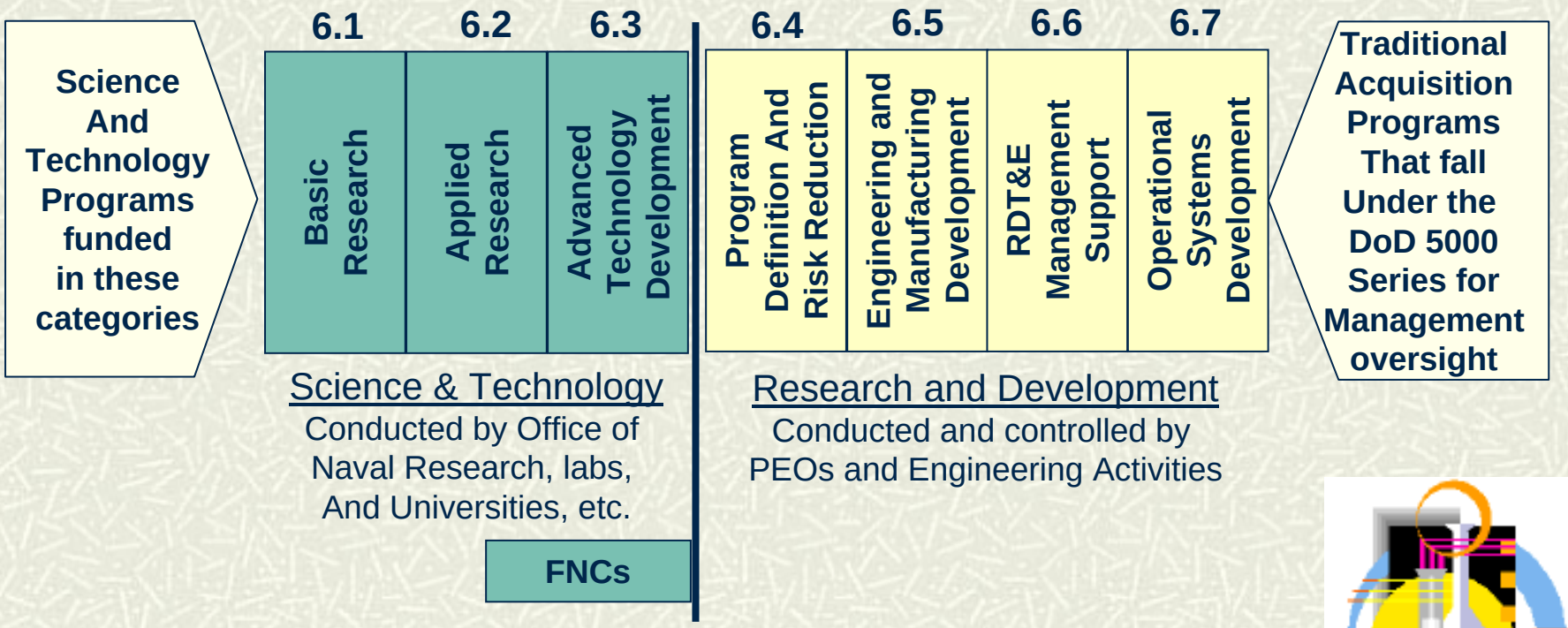
RDT&E Budget Categories

Major Force Program 6 Breakdown



Introducing New Technology Into the System

Assess pay-off, risks, benefits

Assess impact on, baseline.

Pre-planned Product Improvement (P^3I)

P3I, new manufacturing techniques

Block Upgrades

Compliance

Improved Techniques

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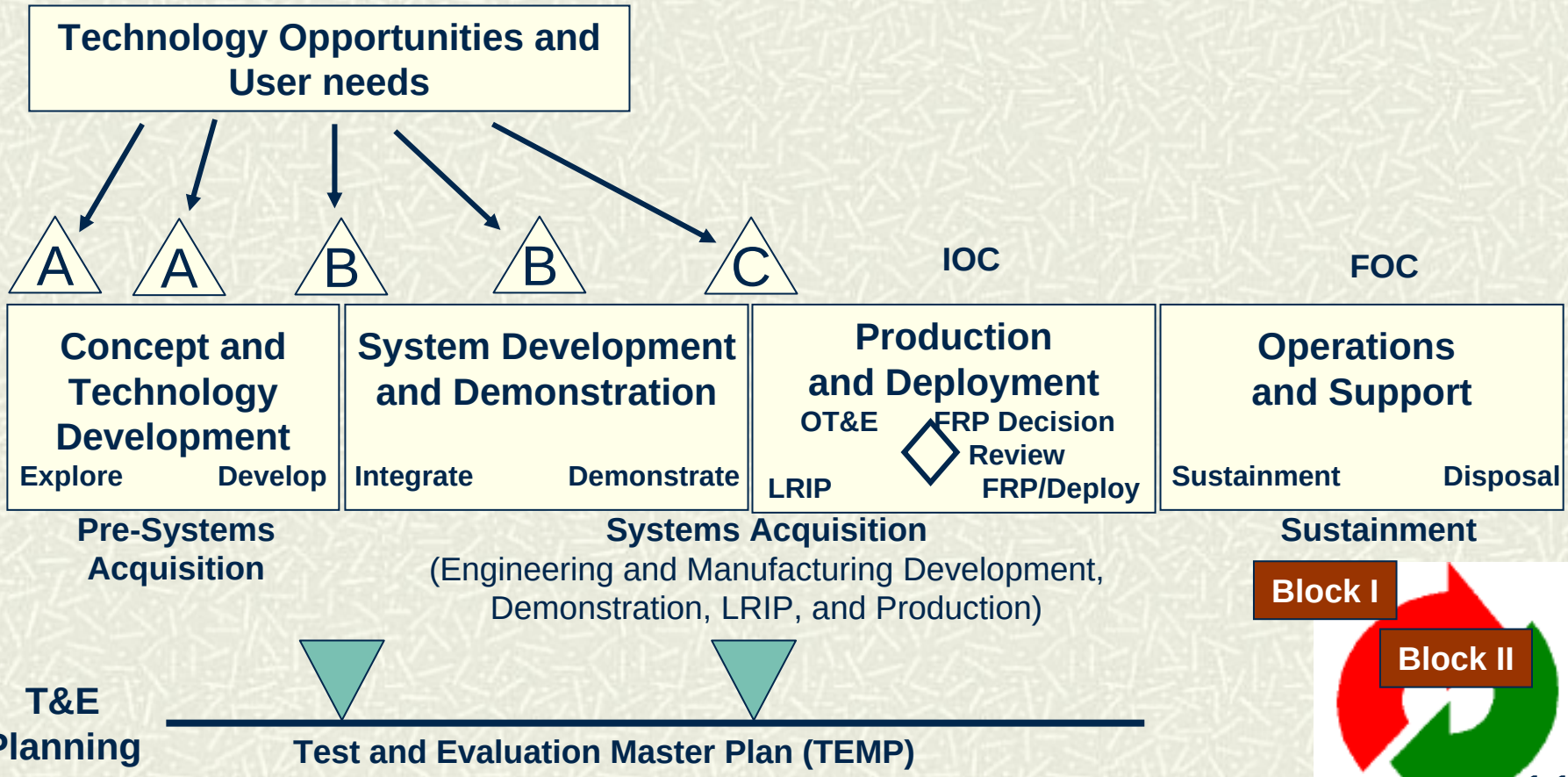
T&E and the Acquisition Life Cycle



Developmental and Operational T&E

	DT&E	OT&E
What is tested	Measures technical performance against the design specifications in a controlled environment	Determines operational effectiveness and suitability as defined in the Operational Requirements Document (ORD)
Who conducts tests	Government and Contractor	Government
Who is responsible	Program manager	OPTEVFOR

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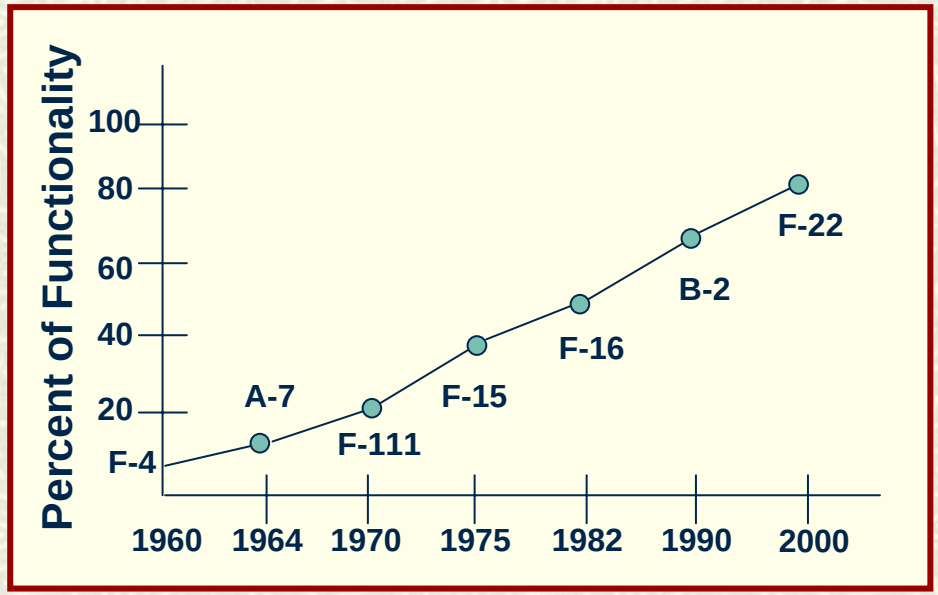
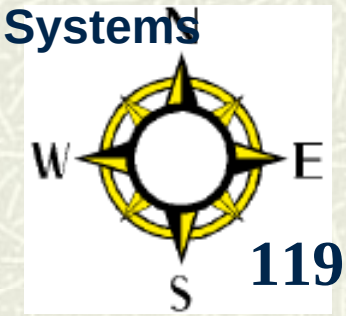
Software Acquisition Fundamentals

- Architecture, Open Systems, and Interoperability
- DoD Software Acquisition Guidelines
- System Engineering and Software Development
- Final Thoughts on Software Development

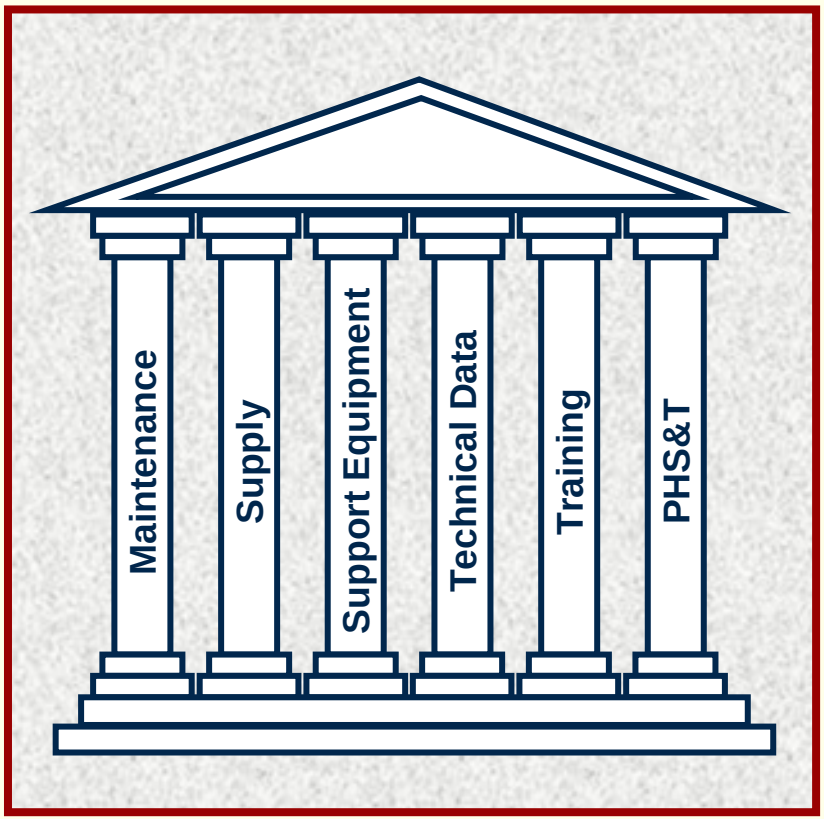


The Growth of Software Dependencies in DoD Systems



Module Seven

Acquisition Logistics



Logistic Elements

Reliability, Availability and Maintainability

Supportability and System Costs

Support Considerations and Analysis

"I don't know what the hell this 'Logistics' is that Marshall is always talking about, but I want some of it."
Fleet Admiral E. J. King, 1942

Supportability Planning

- Support Elements
  - Maintenance Planning
  - Manpower and Personnel
  - Supply Support
  - Support Equipment
  - Technical Data and the Technical Data Package
  - Training and Training Devices
  - Computer Resources Support
  - Facilities
  - Packaging, Handling, Storage, and Transportation
  - Design Interface

Fundamental Concepts

- Acquisition Logistics is
  - A multifunction discipline
  - Integral to design and development
  - Concerned with peacetime and wartime sustainment

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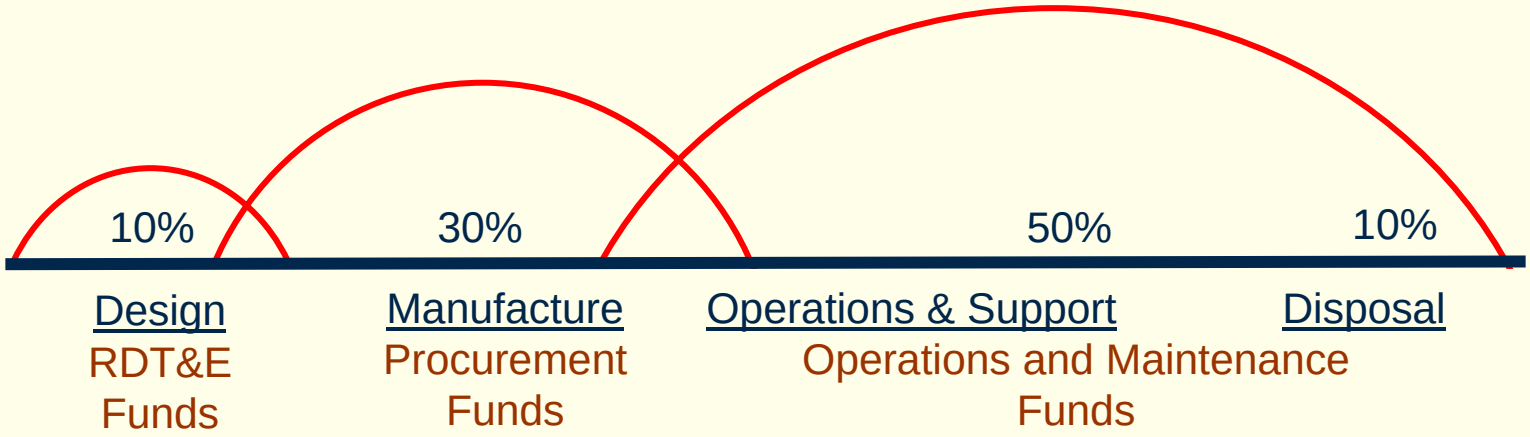
Commercial-Off-the-Shelf Items (COTS)

- COTS/Non-developmental items are more affordable
- COTS/Non-developmental items become obsolete quickly
- COTS Support Planning
  - Life-time buy of parts
  - Design for replacement of obsolete parts
  - Buy parts for support until planned upgrade is in place

Supportability and System Cost Over Time



- Reduce supportability costs by:
  - Considering supportability during design phase
  - Apply system engineering practices to improve reliability, availability and maintainability
  - Use Integrated Product and Process Development (IPPD)

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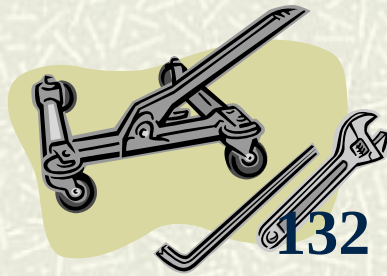
Reliability, Availability, and Maintainability

- Reliability: MTBF = $\frac{\text{Total \# of unit operating hours}}{\text{\# of failures}}$
- Maintainability: MTTR = $\frac{\text{Total Time for Corrective Actions}}{\text{Total \# of Corrective Actions In a Given Time Period}}$
- Availability: $A_O = \frac{\text{Up Time}}{\text{Up Time + Down Time}}$

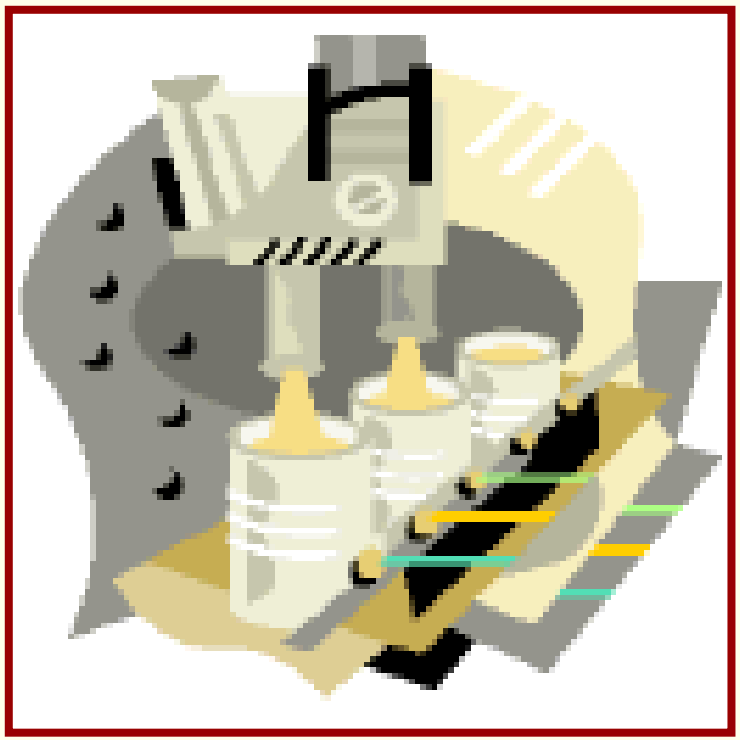


Support Considerations

- Developing support concepts
- Providing support data
- Acquiring support resources
- Conducting supportability analyses as a part of the systems engineering process

Module Eight

Production, Quality, and Manufacturing Management



Manufacturing Processes

Design Goals

Quality Standards

Production Problems

Design Engineering and Production

- Three Step Process
  - Influence the design process
  - Prepare for production
  - Execute the manufacturing plan
- Manufacturing Process
  - Manpower
  - Measurement
  - Method
  - Machinery
  - Material
- Design Goals
  - Ease of fabrication
  - Ease of assembly
  - Multiuse
  - Minimize the number of parts
  - Maximize the number of common parts
  - Maximize the use of COTS Parts

Quality

- Key Quality Activities
  - Establish Capable Processes
  - Monitor and Control Critical Product and Process Variations
  - Establish mechanism for feedback of field product performance
  - Implement an effective root-cause analysis and corrective action system
  - Continuous process improvement
- Quality Standards and Systems
  - ISO 9000
  - DI 9000 (Boeing)
  - Six Sigma (Motorola)
  - AS 9000 (Aerospace Industry)
  - QS 9000 (Automotive Industry)
  - Quality Function Deployment (QFD)
- Statistical Process Control (SPC)

Quality is fitness for use

Production Problems

- Unstable Rates and Quantities
- Design Instability
- Undue Emphasis on Schedule
- Inadequate Configuration Management System
- Inattention to Environmental Impact