Defense Acquisition University

Cost Analysis/Should Cost Management

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Outline

- Program X – Back to the Basics
- Cost Estimating Process
- Cost Drivers
- Questions to Ask
- Should Cost

Program X – Back to the Basics

	PYrs	FY15	FY16	FY17	FY18	FY19	FY20	FY 21
Approved $								
Required $								
Delta								

- What is the latest “Approved $” position? PB 17? PB 16?
- Which is the starting point to assess Program Funding?
- Which is the starting point to assess Program Cost?
- Which is the “Will Cost” number?

Cost Estimating Process

- Definition and planning
  - Understand the requirement and purpose of the estimate
  - Define the ground rules and assumptions
  - Select the estimating approach
  - Put together the Cost Estimating Team and CPIPT
- Data collection and analysis
  - Historical data collection
  - Normalize the data
  - Determine cost drivers
- Estimate formulation
  - Use available methodologies and tools (learning curves, inflation, FY spreads)
- Review and presentation
  - Reasonable – Realistic - Complete
- Final documentation
  - Will someone else be able to figure out what you've done?

What are cost drivers? What questions could you ask?

Cost Drivers

- Items having major impact on program cost
  - Ex: High dollar value items
- Any item with a high programmatic risk
  - Ex: Software development
- Any item with a high variation in value
  - Ex: Precious metals
- Any item for which a small change in value may have major impact
  - Ex: Labor rates

Questions to ask about Cost Estimates

- Question assumptions (Valid?)
  - Software reuse assumption?
  - Use of APB KPP objective or threshold values?
- Collect/analyze actual data on previous programs (Actuals available?)
  - How old is the data?
  - How similar are the programs to your program?
- Use different estimating methods (Crosschecks?)
  - Crosschecks should at least be done on the cost drivers
- Identify cost drivers (What is most important?)
- Perform sensitivity analyses (Distribution of estimate?)
  - What's the best case, worst case, most likely cost?
  - What confidence level is the most likely cost estimate at?
  - What confidence level do you want it to be?
    - What are you going to do to get it there?
- Update results with latest data (Is info current?)
  - How current is your cost estimate?

What’s the difference between “Will Cost” and “Should Cost”?

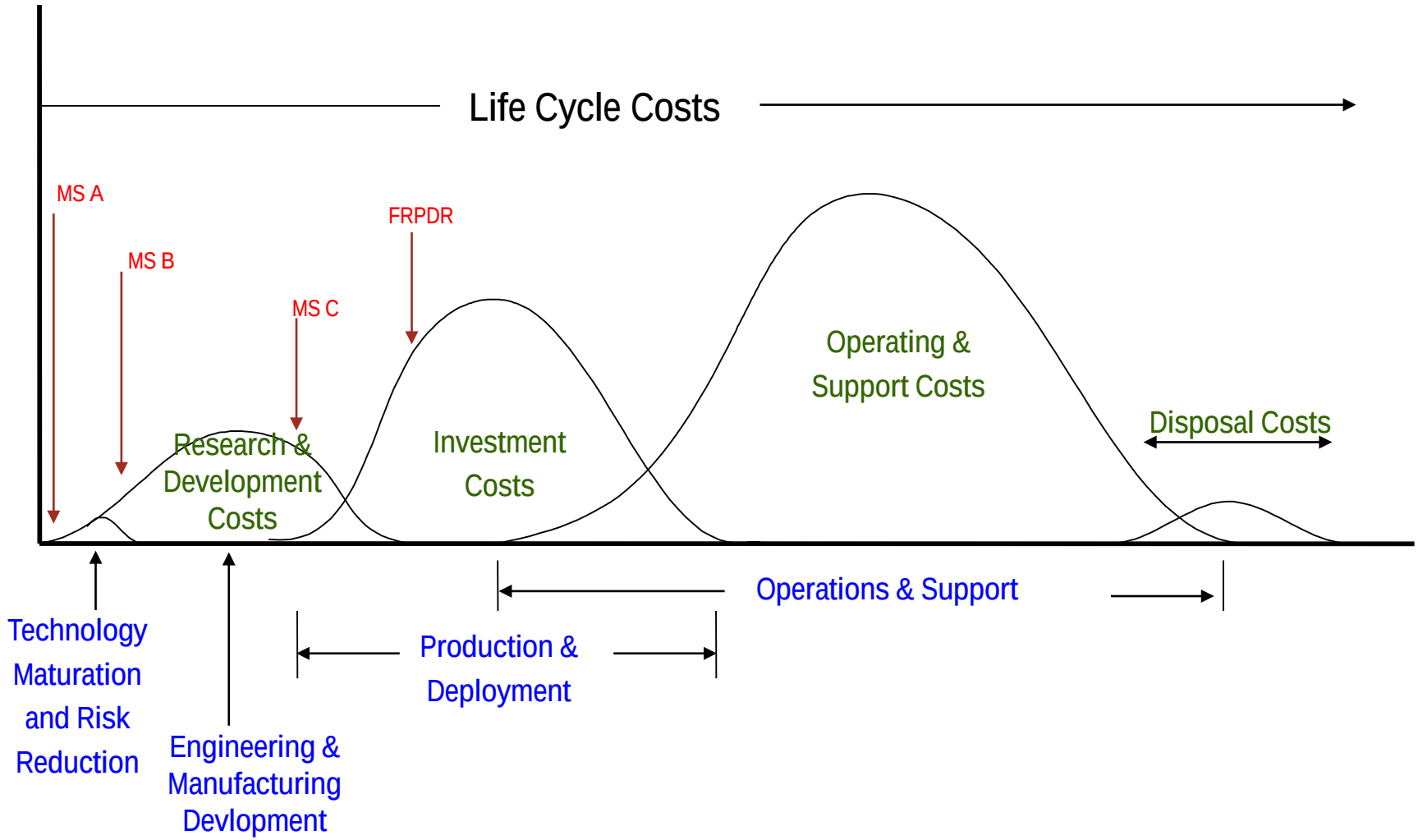
"Will Cost" vs "Should Cost"

USD (AT&L) and USD(C) 22 Apr 11 Memo

- Will Cost
  - Used for programming and budgeting
  - Used for acquisition program baselines (APBs)
  - Used for all reporting requirements external to DoD

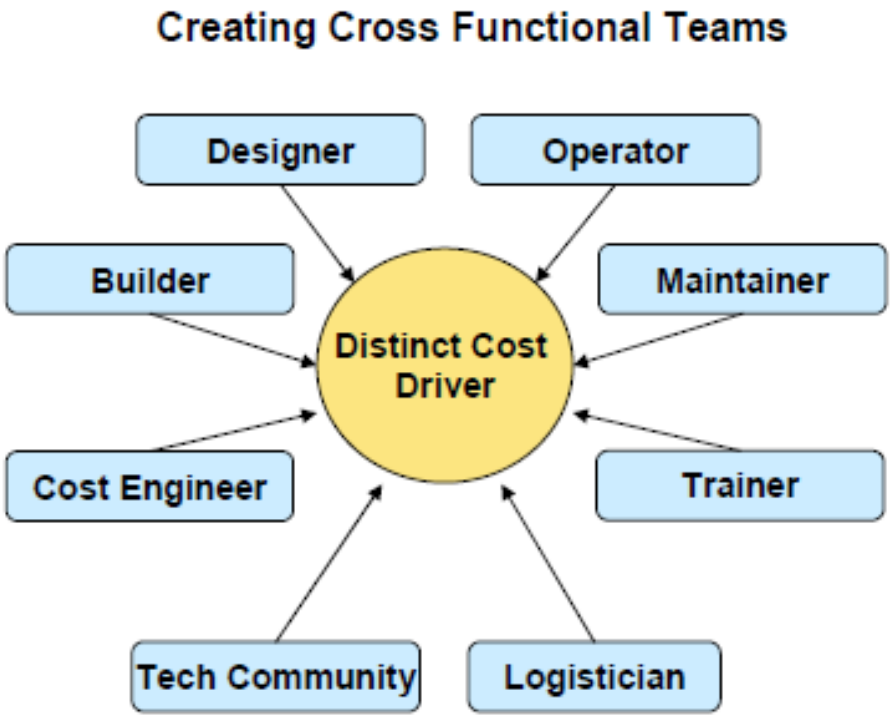
- Should Cost
  - Scrutinize every element of govt and contractor costs
  - 3 ways to develop should cost estimates:
    - Bottoms –Up estimate
    - Determine specific discrete and measurable items
    - Use competitive contracting and contract negotiations to identify should cost savings (old FAR definition)

Life Cycle Cost Categories by Phase



PM's Should Cost Team

- Seek outside assistance
  - The Service's Cost Analysis Agency
  - DCMA
  - PEO/SAE staff
- Collaborate with appropriate center level functional organizations
- Engage with personnel who developed the Cost Estimate and/or other previously defined should-cost estimates



Typical Cost Elements of a Program
(Typical Largest Cost Drivers in Program Acquisition)

- Contract Costs (recurring versus non-recurring)
  - Direct
    - Labor
    - Materials
    - Other Direct Charges (ODC)
  - Indirect
    - Overhead
    - G&A
    - Cost of Money
- Other Govt Costs
  - Govt testing
  - GFE
  - Program Office Support
  - Support Contractors
  - SE/TA Support
  - Other

Example of SCM: 5 Step Process

- Step 1: Identify Cost Drivers
- Step 2: Identify & Prioritize Opportunities
  - Consider each of the following:
    - Investment Cost
    - Ease of Implementation
    - Time to Implement/Realize
    - Unit Cost Benefit
- Step 3: Develop Discrete "Should Cost" POA&M
- Step 4: Establish Measurable Targets
- Step 5: Disposition of Realized Cost Savings with Higher Hqs

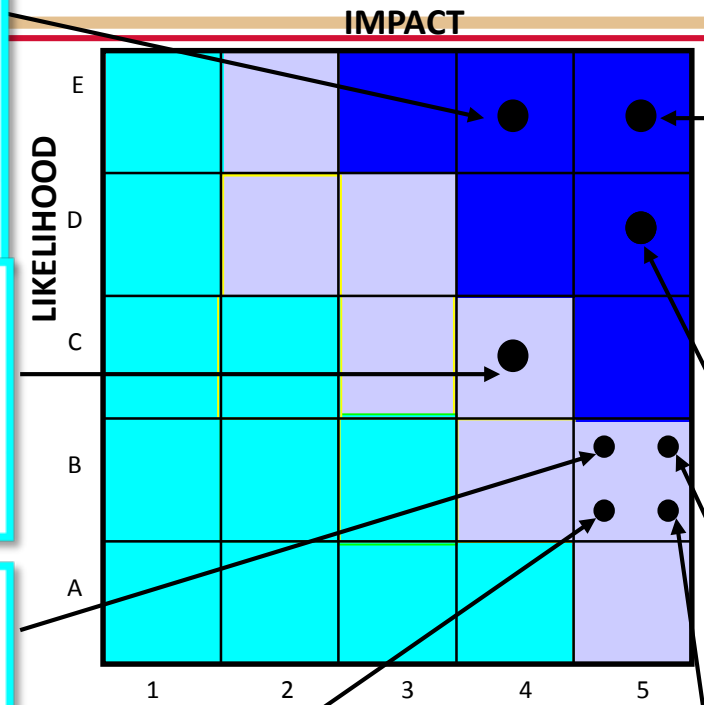
CVN 79 PARM Review: High Impact Opportunities

RAM
- Opportunity: IF there is a Reduction of Spares Costs, THEN a Cost savings can be realized
- **Driver**: PMS 378 CVN 79 PARM Progress Reviews
- **Action:** IWS 3.0 will continue to review to realize cost savings
- **Proposed:** FY16

CV-TSC
- Opportunity: IF increased processing w/ CPS TI16 can reduce the racks from 2 to 1, THEN Cost savings can be realized
- **Driver**: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 5.0 will continue to review to realize cost savings
- Proposed: FY13/14

RLGN
- Opportunity: IF EOQ Pricing based on multiple system procurement is realized, THEN Cost savings can be realized
- **Driver**: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 6.0 will continue to review to realize cost savings
- Proposed: FY15

DBR
- Opportunity: IF a 2-lot System buy concurrent with DDG 1002 occurs , THEN Cost savings can be realized
- Driver: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 2.0 will continue to review to realize cost savings
- Proposed: FY13



Likelihood Scale:
B: 25% C: 50%
D: 75% E: 90%

Impact Scale:
4: Savings from $100k-$1m
5: Savings >$1m

GMLS
- Opportunity: IF EOQ Pricing could reduce shipset equipment cost; based upon FY12 production shipset costs negotiated for CVN 78, THEN Cost savings can be realized
- **Driver**: PMS 378 CVN 79 PARM Progress Reviews
- **Action:** IWS 3.0 will continue to review to realize cost savings
- **Proposed:** FY15

MK 38 MGS
- Opportunity: IF Requirements for MK 38 are fully defined allowing the ROM unit cost to be refined, THEN Cost savings can be realized
- **Driver**: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 3.0 will continue to review to realize cost savings
- Proposed: FY15

DBR
- Opportunity: IF a H/W reduction to ECP and Equipment Refresh is realized, THEN Cost savings can be realized
- Driver: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 2.0 will continue to review to realize cost savings
- Proposed: FY13

DBR
- Opportunity: IF there is a reduction to the cost of Interim Spares, THEN Cost savings can be realized
- Driver: PMS 378 CVN 79 PARM Progress Reviews
- Action: IWS 2.0 will continue to review to realize cost savings
- Proposed: FY16

BACK-UP CHARTS

Should Cost and Affordability Caps

- What are you doing to control/reduce costs?
- What are your Should Cost initiatives?
- How are you implementing your Should Cost Management (people, processes, products)?
- How much SC Savings has your program realized? Projected?
- In BBP 3.0, how does “Should Cost” compare to “Achieve Affordable Programs”(AKA…set and enforce affordability caps”)?

What can you do about Cost Growth?

Source: Interim DoDI 5000.02, Nov 25, 2013 Encl 8*

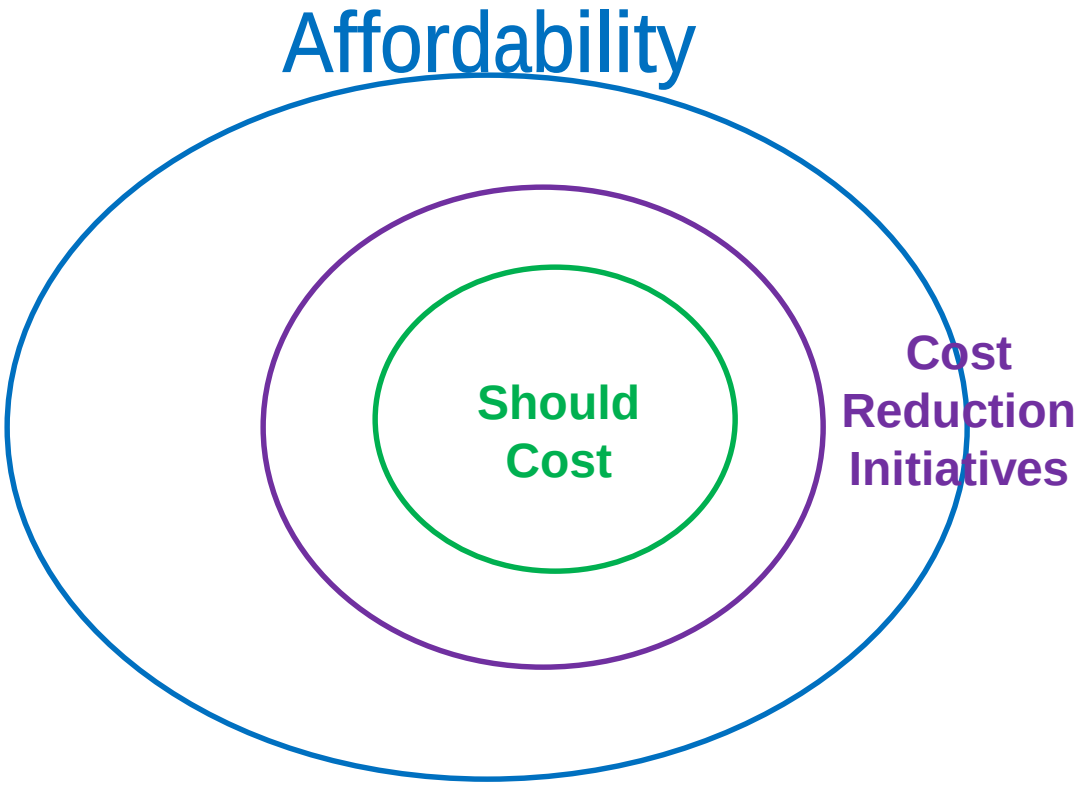
- Understand the basis of the expected cost growth
  - How was the cost growth identified?
  - What part of the program?
  - Why is it projected to occur?
  - When is it expected to occur?
  - Do you have funds to cover it?
  - Can you be your own bill payer through the FYDP?
- Possible actions to take to stay within your budget
  - Should Cost initiatives (Little “a”)
  - Work aggressive cost reduction initiatives with your contractor and MDA (Little “a”)*
  - If the specific area of cost cannot be reduced, then try to find an offset
  - If these efforts aren’t sufficient, then revisit technical requirements, schedule, and required quantities*
    - With support from the Component’s Configuration Steering Board*
    - Any requirements reduction must be proposed to the validation authority*
- If costs cannot be reduced to meet the budget, then look at the option of the Component to raise the budget for the program (AKA raise the affordability cap(s) for the program)*
- If this cannot be done, then obtain MDA approval and the program will be cancelled*

C/KC-130 Program SC Mgt Plan (9/10)

15 Nov 2012

- Elements of Opportunity and Should Cost Management
  - Opportunity Management (OM)
    - Understand cost estimate and identify cost drivers
    - Identify and assess opportunities
    - Prioritize opportunities
    - Develop discrete opportunity capture plans
  - Should Cost Management (SCM)
    - Develop discrete opportunity capture plans (shared with OM process)
    - Establish measurable should cost targets
    - Disposition of realized cost savings with HQMC/OPNAV
    - Understand the cost estimate and identify the cost drivers
      - Repeat the process
- Opportunity Cube (5 X 5 grid)
  - Likelihood: 10%, 30%, 50%, 70%, 90%
  - Benefit: Defined in terms of technical, schedule, and cost

Affordability vs CRIs vs Should Cost (4/10)



- Should Cost applies to your Program of Record
- It should become the focus after MS B

"Should Cost and Affordability" (3/10)

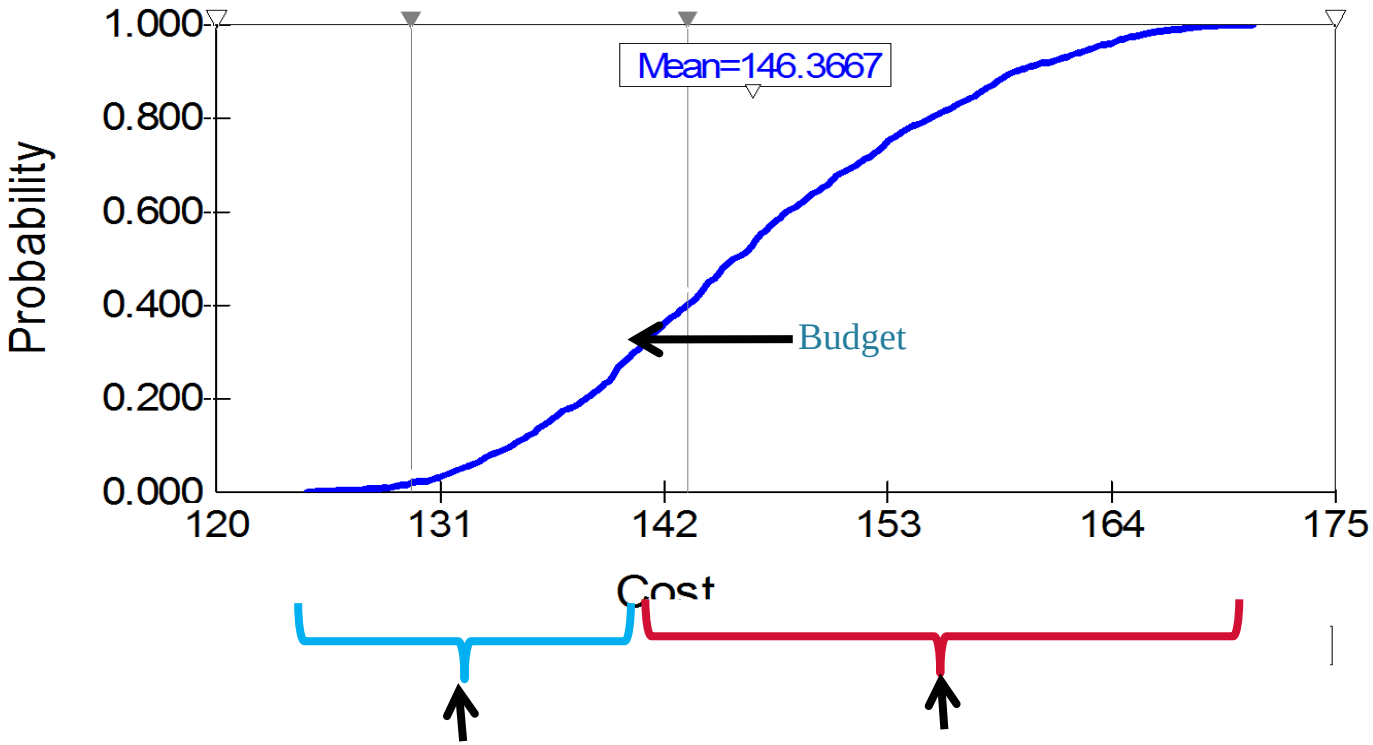
USD (AT&L) 24 Aug 11 Memo

- "Should Cost" vs "Affordability as a Requirement"
  - Not the same
- Affordability as a Requirement
  - Emphasis prior to MS B
  - Define and achieve affordability targets
  - Affordability targets are recorded in the MS A ADM
    - Nominally the average unit acquisition cost* and average annual O&S cost per unit (* could be PAUC or APUC)
  - MDA expects them to be achieved
- Should Cost (SC)
  - Emphasis is post MS B (need to define the design)
  - Focused on controlling the cost of actual work we are doing and expect to do
  - We must continuously fight to lower all our costs, wherever that makes sense
  - Intended to control the final product and sustainment costs
  - Find ways to beat the ICE or program estimate (i.e., the "Will Cost")
  - Expected to be
    - Based on real opportunities
    - Challenging to execute
    - Unrealistic to always achieve every SC initiative and/or at the full value

Should Cost is NOT (2/10)

- Army Affordability Initiatives memo, 10 Jun 2011
  - Broad challenge by management to reduce cost by a specified percentage or dollar value
  - Most items outside the control of the program office and inconsistent with the current program of record
  - Anything requiring significant investment for completion and an increase to the budget
- Air Force Should Cost memo, 15 Jun 2011
  - Arbitrary reductions against the will cost estimate
  - Choosing a lower confidence level from your will cost range
  - Most items outside the control of the program office and inconsistent with the current program of record
  - Anything requiring significant investment for completion and an increase to the budget
  - FFP contracts should only be reopened if there is a clear benefit to do so
- Navy Should Cost memo, 19 Jul 2011
  - Arbitrary reductions against the will cost estimate
  - Choosing a lower confidence level from your will cost range
  - FFP contracts should only be reopened if there is a clear benefit to do so

Risk and Opportunities



Opportunity: Uncertainty covered by budget

Risk: Uncertainty not covered by budget

Confidence Levels (1/6)
Sample Program – Are we O.K.?

APB Objective/Threshold = $130M/$143M Budget = $141.20M

Cost Estimate Example

Integration	
Design	$6.00
Fabricate subsystem prototypes	$1.00
Subsystem Prototype testing	$0.70
Demonstration	
System Prototype Build	$7.00
Reliability Growth Test/Redesign	$0.80
System Developmental Testing	$2.00
Operational Test	$1.20
Producton/Fielding	
Produce Systems	$111.00
Initial Spares	$10.00
Fielding/NETT	$1.50
Total Program Acquisition Cost	$141.20

OK?

We can't tell

Confidence Levels (2/6)
What About Uncertainty?

- **To get a better handle on range of program outcomes…**
  - **The *team* sits down and looks at the uncertain elements to build in risk.**
    - What's the least this could cost (Best Case)?
    - What's the most probable cost (Most Likely)?
    - What's the most it could end up costing (Worst Case)?

Cost Estimate Example

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Design	$6.00
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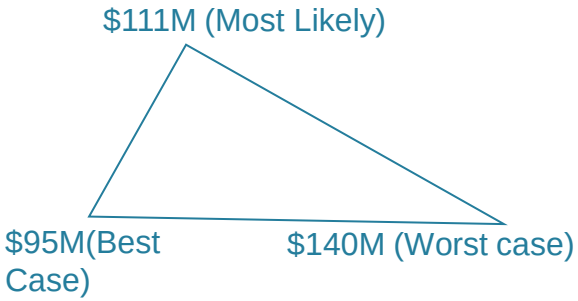
Operational Test	$1.20
Producton/Fielding	
Produce Systems	$111.00
Initial Spares	$10.00
Fielding/NETT	$1.50
Total Program Acquisition Cost	$141.20

Produce Systems



Confidence Levels (3/6)
Create a Program Model
Risk-Adjusted

- **Then plug your distributions into a risk program**

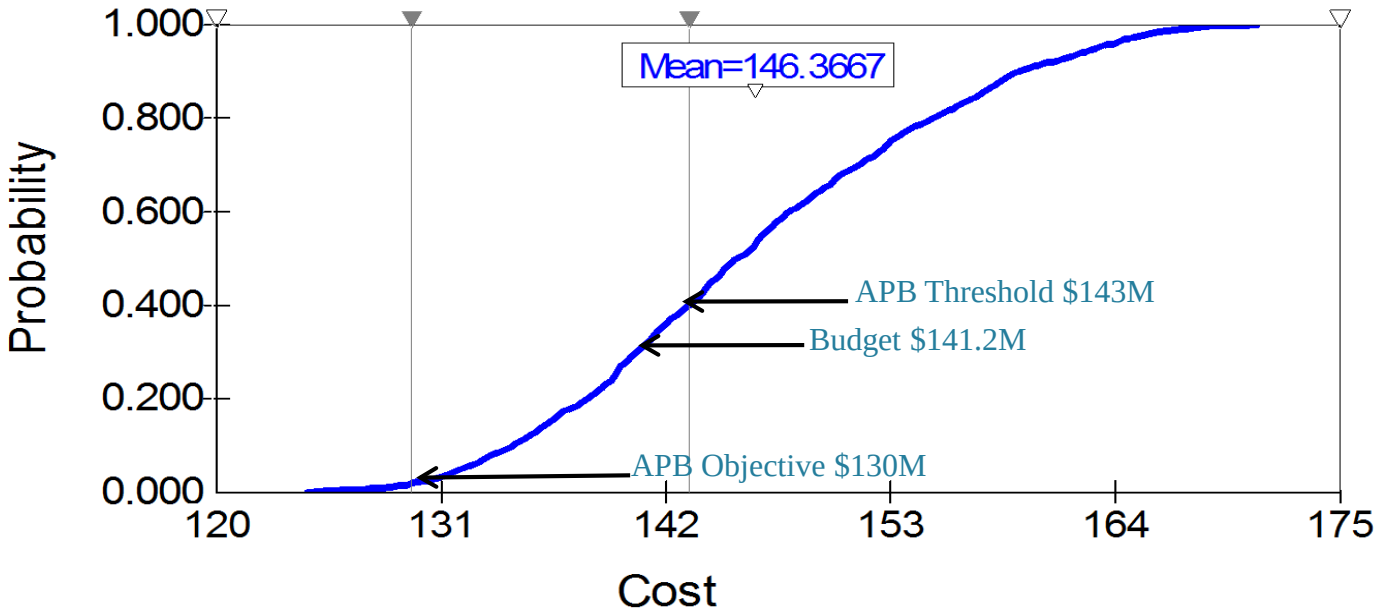
@RISK EXAMPLE

	Point Estimate*	Best Case	Most Likely Case	Worst Case	Mean Value
Integration					
Design	$6.00	$6.00	$6.00	$6.00	$6.00
Fabricate subsystem prototypes	$1.00	$0.80	$1.00	$1.20	$1.00
Subsystem Prototype testing	$0.70	$0.50	$0.70	$0.90	$0.70
Demonstration					
System Prototype Build	$7.00	$5.60	$7.00	$10.50	$7.70
Reliability Growth Test/Redesign	$0.80	$0.60	$0.80	$1.20	$0.87
System Developmental Testing	$2.00	$1.60	$2.00	$2.50	$2.03
Operational Test	$1.20	$0.90	$1.20	$1.60	$1.23
Producton/Fielding					
Produce Systems	$111.00	$95.00	$111.00	$140.00	$115.33
Initial Spares	$10.00	$8.00	$10.00	$12.00	$10.00
Fielding/NETT	$1.50	$1.50	$1.50	$1.50	$1.50
Total Program Acquisition Cost	$141.20	$120.50	$141.20	$177.40	$146.37

*Point Estimate should be the Program Office Estimate, which should be the Most Likely Case

Confidence Levels (4/6)
Simulate the Range of Outcomes

- **Then run a Monte Carlo simulation**

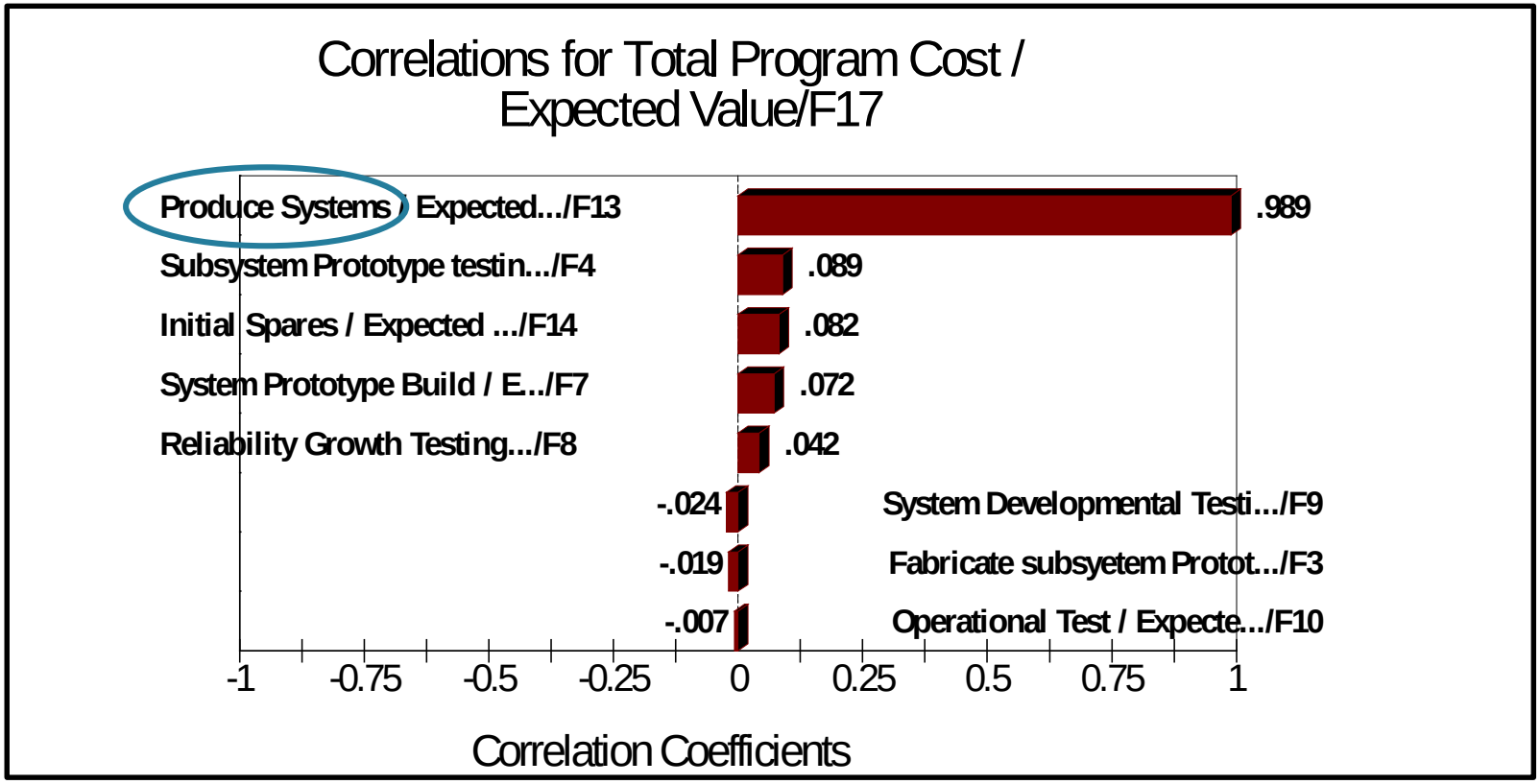


- **<u>Now</u> we have a picture of our cost uncertainty**

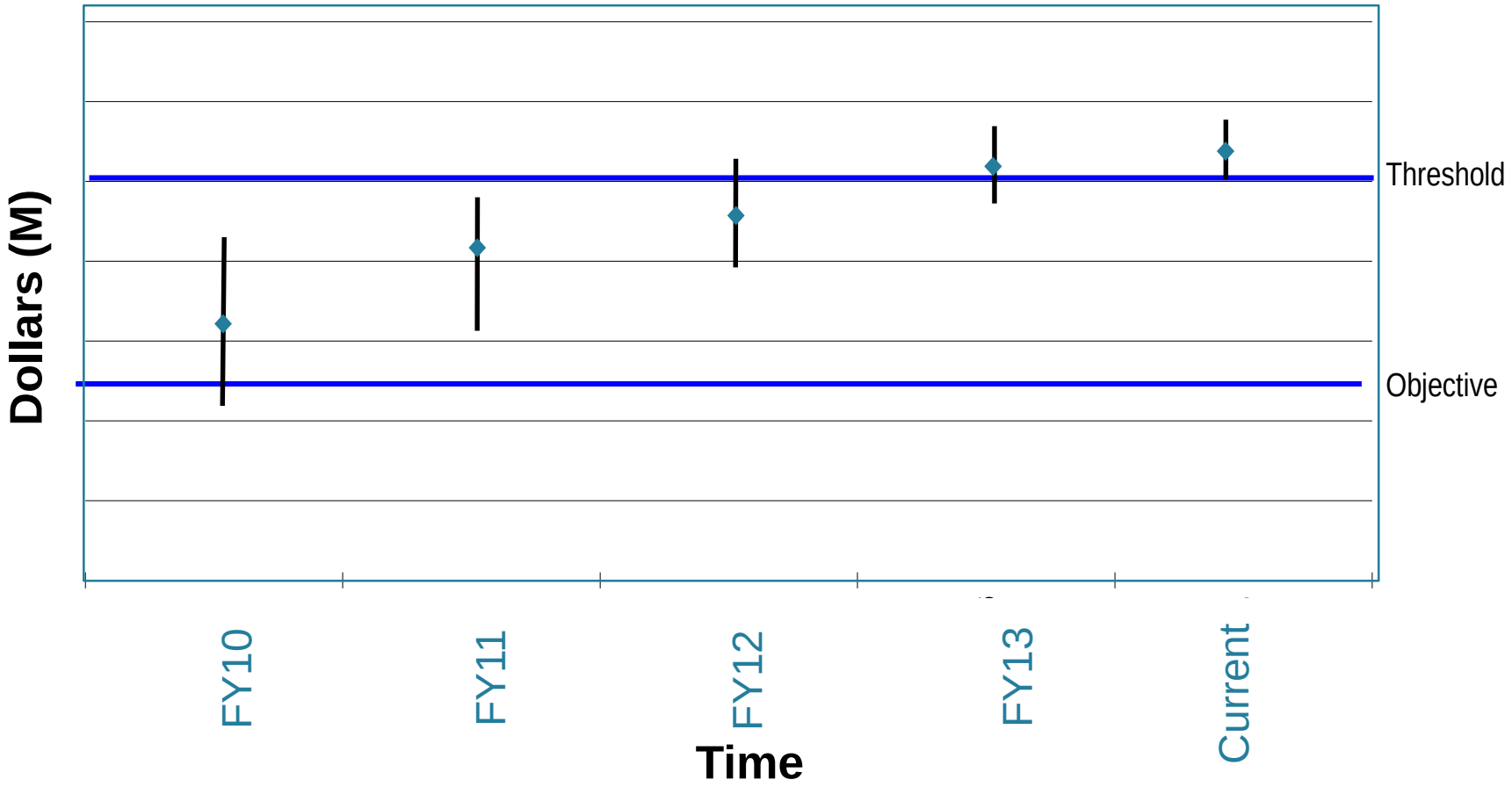
•In Breach: <40% chance of coming in under threshold
•Under-funded: < 35% chance of coming in under budget

Confidence Levels (5/6)
Sensitivity/Risk Drivers
"Tornado Chart"

- **We can also see what drives our cost uncertainty**
  - Big numbers with wide ranges – no surprise!
  - Does this coincide with your risk cube?



Confidence Levels (6/6)
Show Estimates as Ranges



Cost Estimating Requirements

"When…and a bit more of Why"

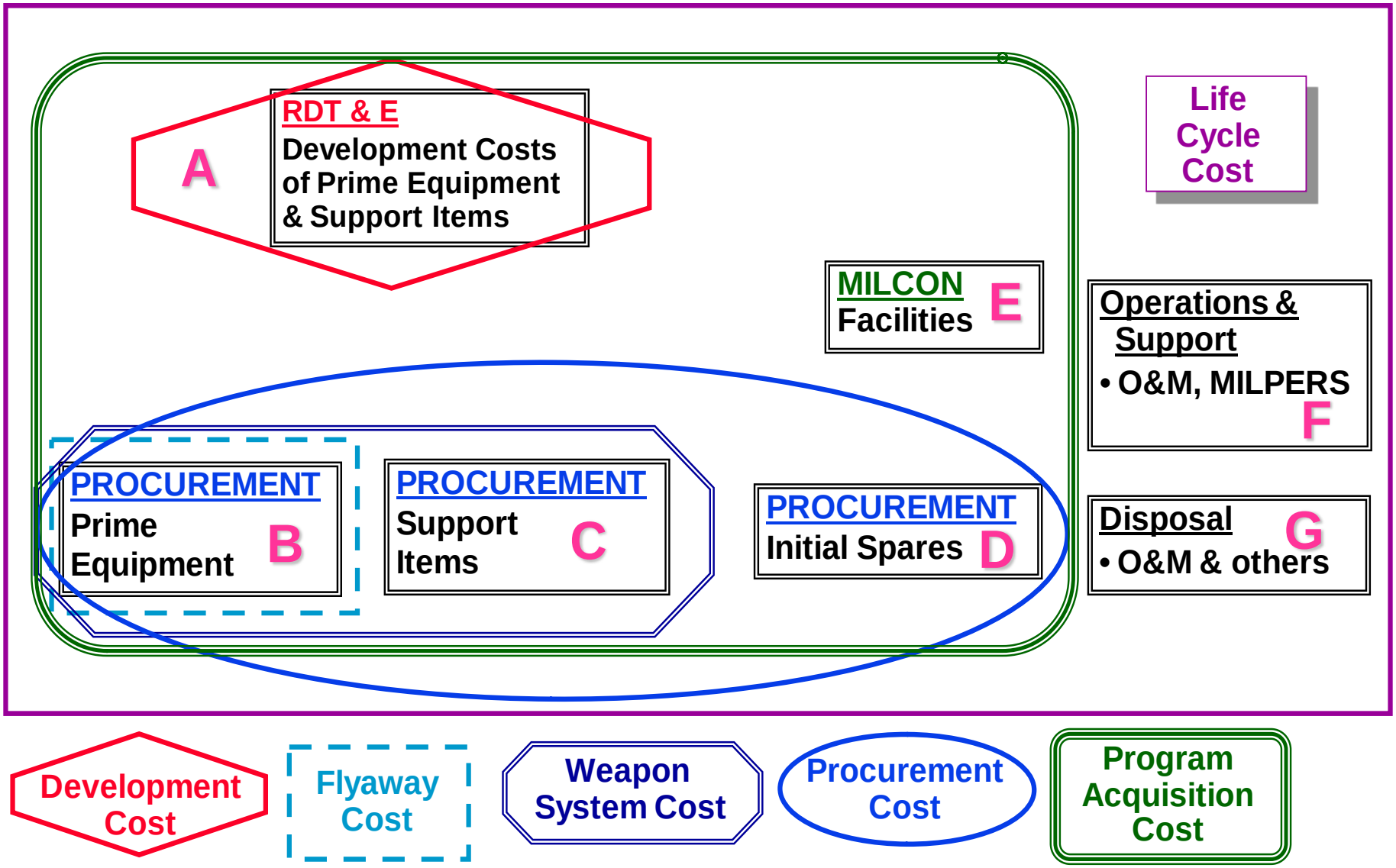
	ACAT IC & ID (MDAP)	ACAT IA (MAIS)
POE	Program initiation & all subsequent milestones, including FRP DR	Program initiation & all subsequent milestones - Includes Economic Analysis
CARD	Program initiation & all subsequent milestones including FRP DR - Draft 180 days prior to OIPT/milestone - Final 45 days prior to OIPT/milestone	Program initiation & whenever Economic Analysis is required - Draft 180 days prior to OIPT/milestone - Final 45 days prior to OIPT/milestone
CCE	MS A and all subsequent milestones including FRP DR	MS A and whenever an Economic Analysis is required
ICE	Required by law for all MDAP programs * - Prepared by OSD CAPE for ACAT ID, and ACAT IC at discretion of USD (AT&L) - Prepared by component cost agency (AFCAA, DASA-CE, NCCA) for ACAT IC (if no CAPE estimate) - In advance of any certification under Title 10, USC, Section 2366a (MS A) and Section 2366b (MS B) - In advance of any decision to enter low-rate initial production (LRIP) (MS C) or full-rate production (FRP DR) - In advance of any certification of MDAPs that experience critical cost growth (Title 10, USC, Sec 2433a) - In advance of any report of Critical Program Changes for MAIS (Title 10, USC, Sec 2445c(f))	

*ICE statutory requirement (Title 10, US Code, Sec 2434) and P.L. 111-23, May 22, 2009
Source: DoDI 5000.02, December 2008 and Weapon Systems Acquisition Reform Act of 2009

ACAT II & ACAT III: POE (and, at MDA discretion, an independent cost estimate prepared by the component cost agency) at program initiation and all subsequent milestones

AFCAA = Air Force Cost Analysis Agency
CAE = Component Acquisition Executive
CAPE = Cost Assessment & Program Evaluation
CARD = Cost Analysis Requirements Description
CCE = Component Cost Estimate
DASA-CE = Dep Asst Sec of Army (Cost & Economics)
FRP DR = Full Rate Production Decision Review
ICE = Independent Cost Estimate
MAIS = Major Automated Information System
MDA = Milestone Decision Authority
MDAP = Major Defense Acquisition Program
NCCA = Naval Center for Cost Analysis
OIPT = Overarching Integrated Product Team
POE = Program Office Estimate
USD(AT&L) = Under Secretary of Defense (Acquisition, Technology, & Logistics)

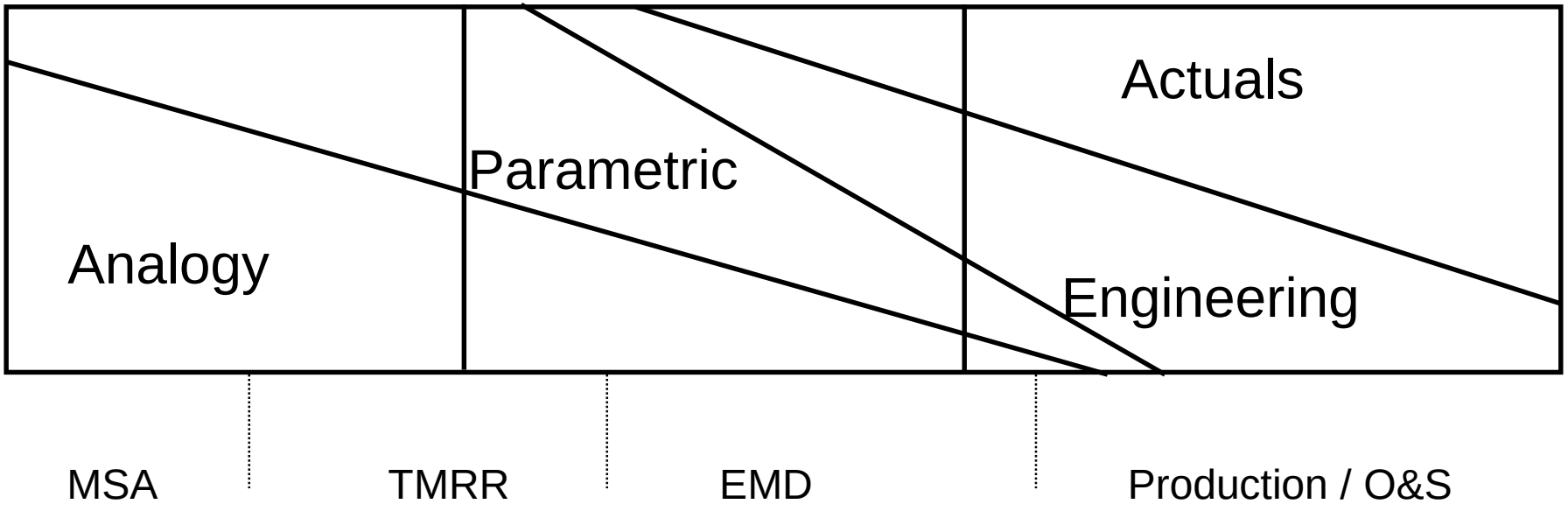
Life Cycle Cost Terms:
How Much Does Your Program Cost?



Cost Estimating Methods Appropriate to Acquisition Phases

GROSS ESTIMATES → *DETAILED ESTIMATES*

Materiel Solution Analysis	Tech Maturation & Risk Reduction	Engineering and Manufacturing Development	Production & Deployment



Should-Cost Management: Why and How

Why:

- Identify and eliminate process inefficiencies and embrace cost reduction opportunities
- Challenge "business-as-usual" approach, with its underlying assumption that program costs will grow to match the ICE

How:

- Scrutinize every element of program cost
- Look for cost reductions in repetitive activities
- Leverage learning curves
- Examine overhead and indirect costs
- Incentivize your contractor to identify and create cost reductions
- Tie savings to specific discrete and measurable items and initiatives that can be quantified and tracked

Defense AT&L, "Should Cost Management: Why? How?," Carter and Mueller, (Sep/Oct 2011).

Navy Should Cost Memo

ASN (RDA) Memo dated 19 Jul 11

- Should Cost
  - Covers all govt and contract costs throughout the entire life cycle of the program
  - Internal management tool for incentivizing performance
  - PM must ensure cross-functional involvement in development of the estimate
  - Drive productivity improvements into program during contract negotiation and program execution
  - Broader definition than FAR/DFARS Should Cost reviews which set realistic objectives for negotiating the immediate contract
  - Applies to ACAT I, II, and III programs
  - At a minimum, PMs expected to identify specific discrete measurable items or initiatives that achieve savings against the Will Cost estimate
  - MDA approves all Should Cost estimates and will expect PMs to manage, report, and track to these estimates-done at milestones, gate reviews/CSBs
  - Formal reporting in DASHBOARD and to AT&L/ARA through AV SOA
  - Pilot programs: F-35, E-2D, VXX, LCS, and Ohio Replacement
    - First programs to have funds distributed based on Should Cost baselines; delta held by service

Implement "Should Cost" Based Management

- Examples
  - Use of traditional operations research methods to identify and prioritize cost reduction opportunities (AIM-9X Program)
    - Fishbone diagram to conduct root cause analysis and identify cost drivers
    - Combined Pareto and Business Case Analysis to identify and prioritize best cost reduction opportunities
    - Discrete Plan of Action and Milestones developed for each actionable cost reduction initiative
    - Establish measurable targets, consolidate into SC baseline, and monitor progress
  - AIM-9X Active Optical Target Detector manufacturing improvements reduced unit production cost AIM-9X
  - DDG 51 shifted from sole source to performance specification-based competition for Main Reduction Gear (MRG) DDG-51
  - Guided Multiple Launch Rocket System (GMLRS) bundled FY12 and FY13 procurements GMLRS
  - Stryker used a bundle buy concept to achieve economies of scale by combining order for 294 Double V-Hulls (FY11) with 100 NBCRVs (FY12) Stryker
  - F-22 conducted Should Cost Reviews on vendor proposal to inform negotiations prior to major contract awards. F-22

Success Story - AIM-9X Block II

- Applied traditional operations research methods to identify and prioritize cost reduction opportunities
  - Fishbone diagram
  - Pareto Analysis
  - Plan of Action and Milestones
  - Establish measurable targets
  - Monitor progress
- Accelerated production deliveries
- Leveraged FMS for EOQ buys
- Active Optical Target Detector manufacturing improvements

Realized savings: $21M for Lot 11
Projected savings: $82M (FY11-15); $595M over program of record

Success Story – DDG 51 Shipbuilding Program

- **DDG 51 Main Reduction Gear (MRG)**
  - Existing sole source subcontractor exited market
  - Transferred data rights and equipment to new company
  - Negotiations between new company and prime contractors were unsuccessful
  - Navy ran separate, performance specification-based competition for MRGs
    - Will provide to shipbuilders as GFE

Estimated Savings: ~$400 Million, FY10-15

Success Story - GMLRS
Guided Multiple Launch Rocket System

- Bundled FY12 and FY13 procurements
  - Leveraged total quantities instead of independent annual quantities
  - Extending cost / pricing data through 31 Dec allowed PMO to execute FY13 procurement through contract mod to FY12 contract
    - Mod repriced FY12 FRP 7 Unitary rocket cost from $99.4K to $92.6K per rocket—a ~$23M savings in FY12
    - Mod avoided significant cost increase due to lower quantities in a FY13 stand alone contract—cost avoidance of ~$29.3M
- Alternative Warhead Should Cost approaches
  - Implemented test efficiencies
  - Shortened development schedule by 16 months (~32%)
  - Used rockets from inventory to build test articles
  - Aggressive contract negotiations

Realized savings: ~$52.3M for bundled procurements; ~$33.6M for Alternative Warhead Should Cost savings

Success Story - Stryker

- Bundle buy concept
  - Achieved economies of scale by combining order for 294 Double V-Hulls (FY11) with 100 NBCRVs (FY12)
  - Required senior leader authority to purchase on tight timeline
- Test cost efficiencies
  - Utilize existing test data
  - Combine test events

Realized savings: ~$18M bundle-buy; ~$7.7M test efficiencies (FY12)

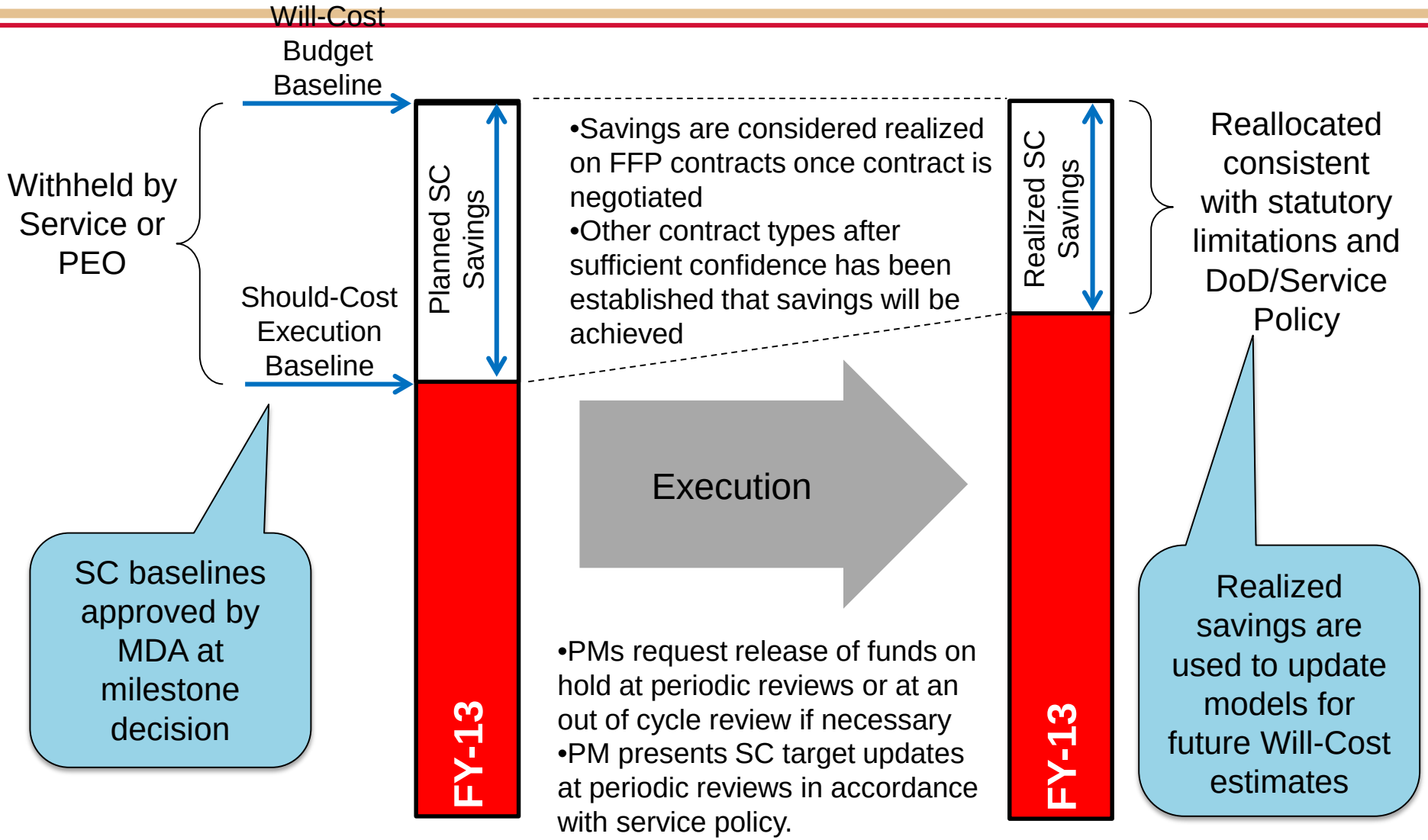
Success Story – F-22

- Conducted Should Cost analysis to inform negotiations prior to major contract award
  - Early validation tests enabled less oversight of sub-contractor development
  - Proposal SW development hours challenged based on contractor's advanced capability, process, and language experience
  - Number of contract vehicles reduced (i.e. CLINS, DO's, etc.)
  - Implemented defined promotion criteria for tests passed, requirements met, and number of known defects before code is promoted across phases and locations

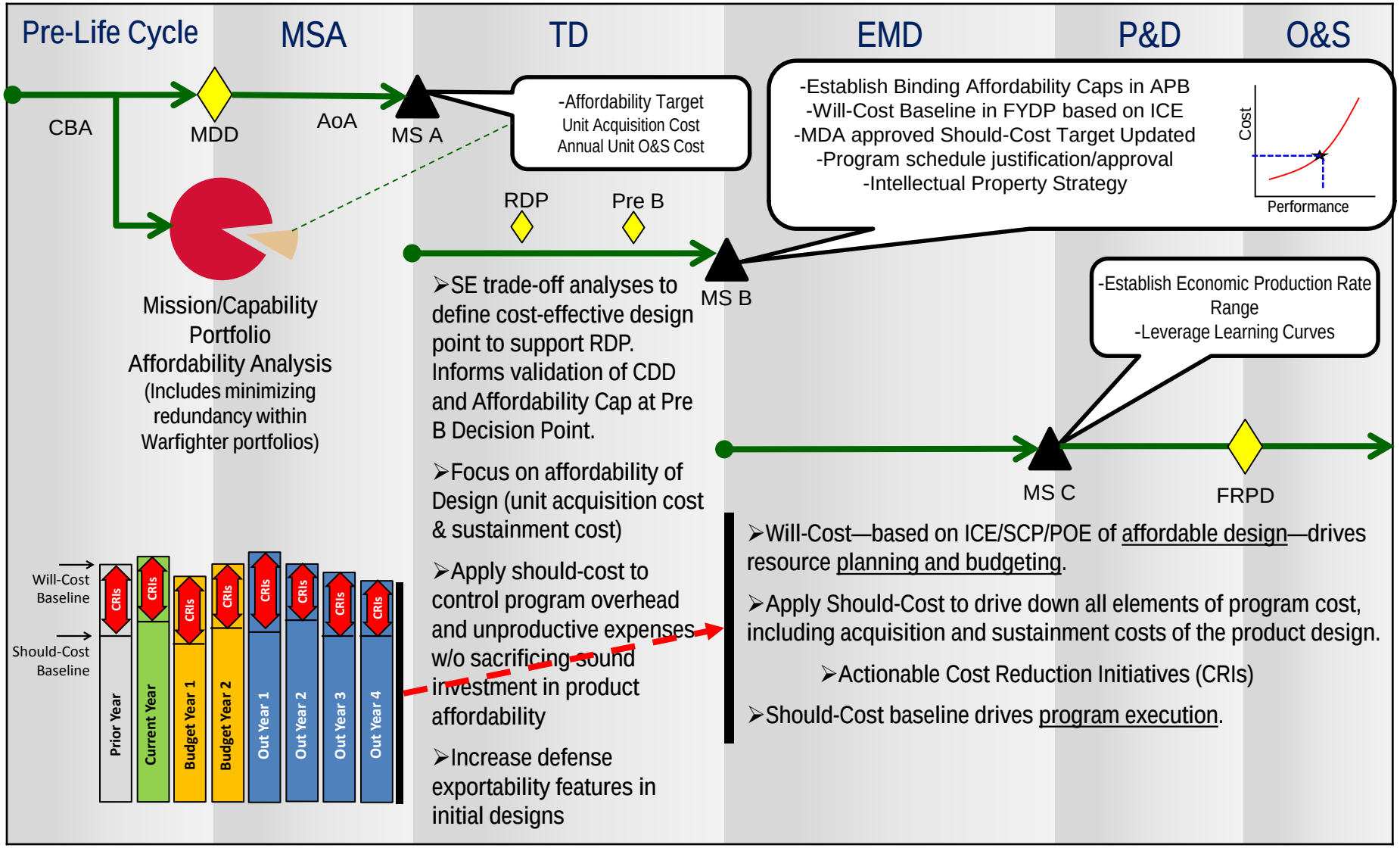
*Savings applied to Life Support System and Auto-Ground Collision Avoidance System unfunded requirements

Projected savings: $32M for Increment 3.2A (negotiated CPIF contract price compared to Will Cost)*

Savings Related to Should-Cost



Affordability & Should-Cost



Affordability or Should Cost?

"Affordability as a requirement" directs that we establish quantified goals for unit production cost and sustainment costs for our products, driven by what the Department or Service can pay. We should set these goals early and use them to drive design trades and choices about affordable priorities…

"Should-cost" asks us consciously to do something different…to continuously fight to lower all our costs, wherever that makes sense. Should-cost is a tool to manage all costs throughout the life cycle and it operates in parallel with the effort to constrain our requirements appetites…Should-cost is focused on controlling the cost of the actual work that we are doing and expect to do.

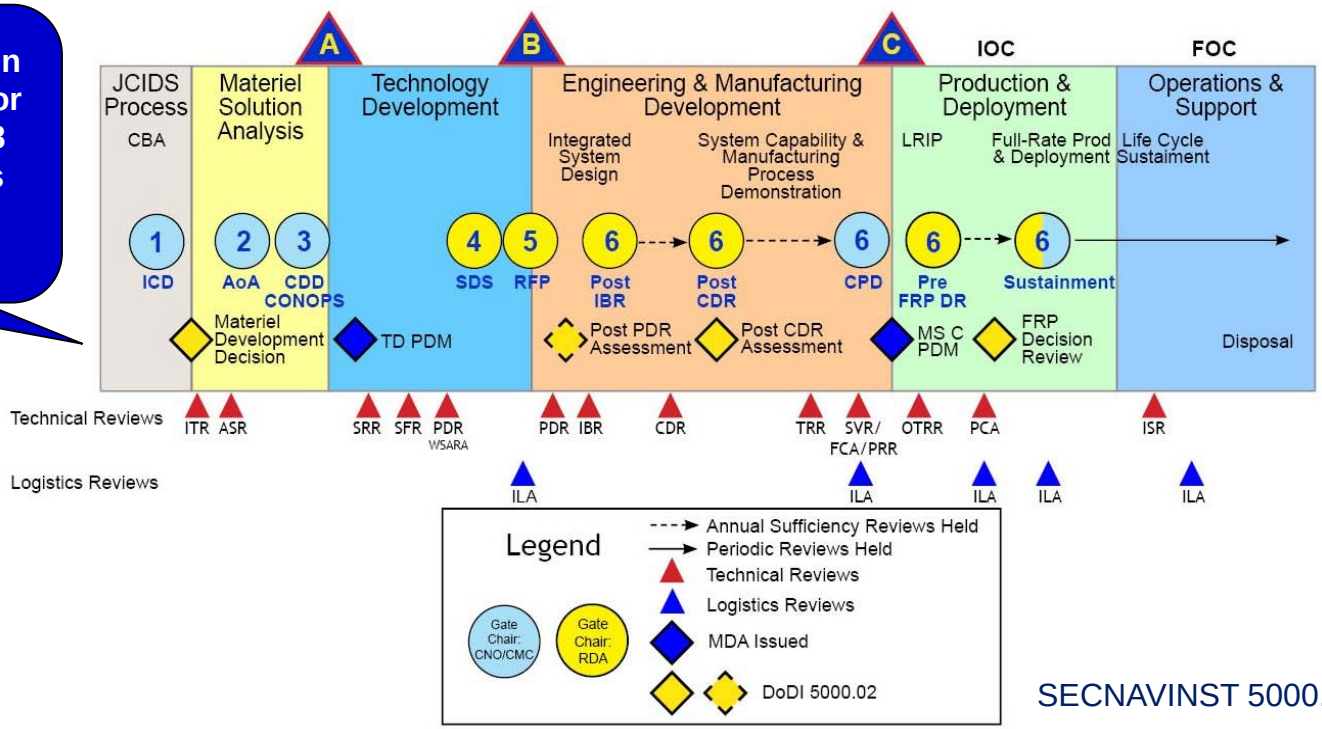
- USD(AT&L) Memo, "Should-cost and Affordability" Aug 24, 2011

Implement "Should Cost" Based Management

- Key Takeaways
  - A *continuous and sustainable Should-Cost estimating process* is a vital program management tool
  - Immediate short-term savings should not come at the expense of long-term degradation of effectiveness or suitability
  - Investments that result in long-term returns in production or sustainment efficiency should be considered and are appropriate uses of should-cost savings
  - Realized SC savings generally have been reinvested in the original program
  - Savings from SC efforts often used to fund the inevitable program "unknowns"
  - Stability of Will-Cost baselines are a challenge to effective SC management; Continuing Resolutions and budget cuts affect SC initiatives
  - Program access to the right expertise is key to conducting SC activities
  - Submitting SC proven practices and lessons learned provides valuable and worthwhile help to other programs – AND the Department!
  - USD(AT&L) Memo, "Should Cost Management in Defense Acquisition," Aug 6, 2013

Navy Military Needs "Gate" Process

Requirements inception in OPNAV Resource Sponsor (N2/6, N4, N9, etc.) & N-8 capabilities & resources integration



SECNAVINST 5000.2

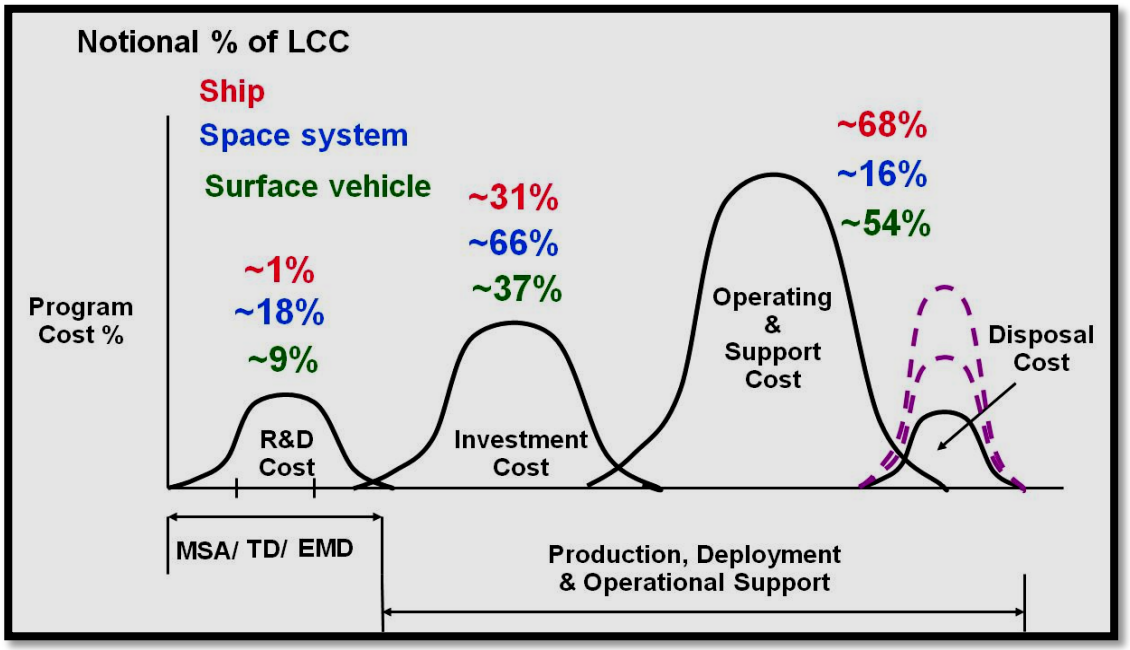
- **The Resources and Requirements Review Board reviews and decides Navy Requirements and Resources Issues in 'Two Pass, Six Gate' process**
  - **First Pass - led by CNO (or CMC)**
    - **Gate 1: ICD; Gate 2: AoA ; Gate 3: CDD & CONOPS; Gate 6: CPD**
  - **Second Pass – led by CAE**
    - **Gate 4: Sys Design Spec; Gate 5: RFP Rel; Gate 6: In-Process/Sufficiency Review**
- **Fleet Forces Command, with PACFLEET, is Fleet advocate for requirements**

Affordability

- Defense Acquisition Guidebook (DAG)
  - 3.2.1 Affordability Considerations
    - Objectives and thresholds established in APB; use for CAIV
    - MDA certifies MDAP programs under 10 U.S.C. 2366b
  - 3.2.2 Affordability Assessments
    - Per DoDI 5000.02 Encl 4, Table 3: Required at MS B and MS C for all ACAT programs
    - Typically conducted by resource analysts in the DoD component headquarters
    - DoD component (or even DoD-wide) corporate perspective
      - Projected funding and manpower over the FYDP
      - How the program fits in to the long range planning for the mission area (e.g., the "sand" charts)
  - 3.2.3 Full Funding
    - Pre-MS B: Fund the most likely cost for the phase
    - Post-MS B: Fund the program's most likely costs for all appropriations in the FYDP
- USD(AT&L) views on Affordability Assessments per COL Gonzalez in ARA, 18 Jul 2012
  - How likely are future costs to exceed projected funding?
  - What does the enterprise have to give up in order to buy this?

Life Cycle Cost

- Life Cycle Cost (LCC) is the entire cost to the Government for a system over its entire life.
- Three ways to look at LCC:
  - WBS
  - Appropriation
  - LCC Categories:
    - R&D
    - Investment
    - O&S
    - Disposal



WSARA's Cost Direction

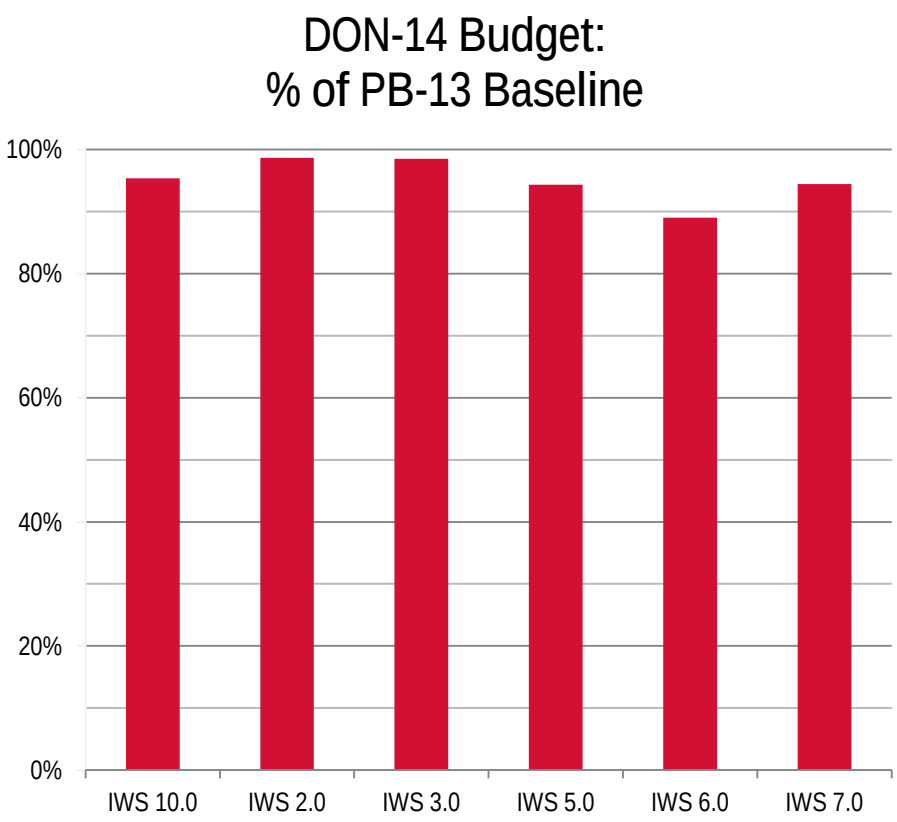
- Trade-offs among cost, schedule and performance before JROC approves MDAP (sec 201)
- Certification of MDAPs at MS A & B IAW 2366a & 2366b (sec 201/204)
- Annual report to SECDEF and Congress analyzing previous year's MDAP cost estimation and analysis activities (sec 101)
- Tightened "Nunn-McCurdy" for breached MDAPs (sec 205)
- Root Cause analysis on MDAPs when discrepancies and Nunn-McCurdy breaches occur (sec 103)
- MS A cost estimate tracking/reporting: 25% or more cost or sch growth post MS A, prior to MS B (sec 204)
- Report on all funding changes as a result of cost growth (sec 206)
- Adds more elements to EVM (sec 301)
- Requires two new reports on growth in O&S and how DoD collects financial information on MDAPs (sec 304)

Cost tasks have widened and deepened

Mr. Richard Hartley, Deputy Assistant Secretary of the Air Force (Cost and Economics), DoDCAS, 19 Feb 2010

CVN 78 PARM Review Summary

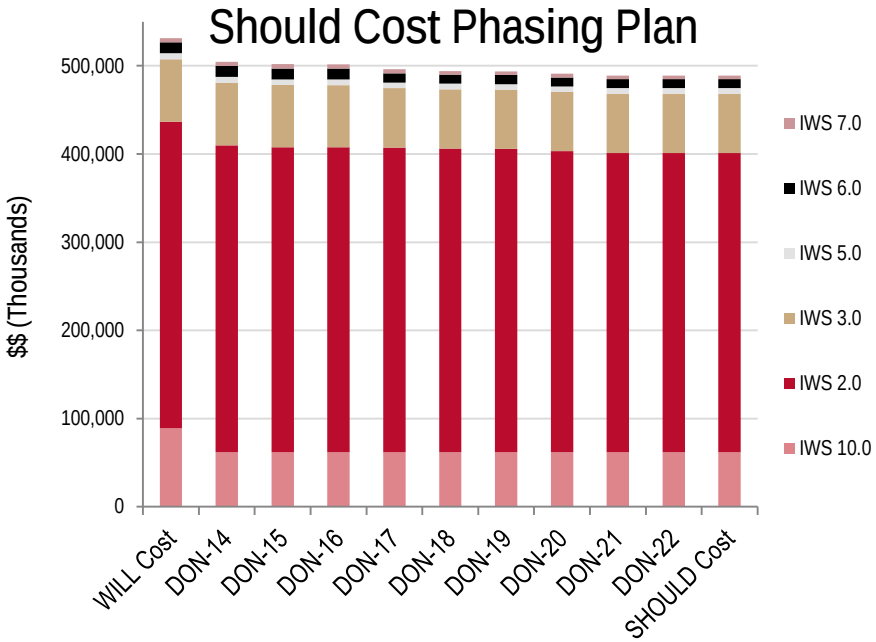
PARM	CVN 78 7300 Reduction Summary		
	PB-13 ($k)	DON-14 ($k)	Delta ($k)
IWS 10.0	**$120,469**	**$114,865**	**($5,604)**
SSDS	$90,265	$88,075	($2,190)
CSI	$30,204	$26,790	($3,414)
IWS 2.0	**$517,791**	**$510,922**	**($6,869)**
DBR	$491,797	$486,797	($5,000)
☑ SEWIP Block 2	$22,333	$21,106	($1,227)
☑ AN/SPS-73(V)12	$3,661	$3,019	($642)
IWS 3.0	**$46,692**	**$45,993**	**($699)**
CIWS	$18,160	$17,755	($405)
RAM	$13,935	$13,911	($24)
GMLS	$14,597	$14,328	($269)
IWS 5.0	**$7,768**	**$7,325**	**($443)**
☑ CV/TSC	$7,131	$6,699	($432)
☑ UQN-4A	$207	$207	($1)
☑ WQC-2A	$429	$419	($10)
IWS 6.0	**$11,881**	**$10,575**	**($1,306)**
CEC	$8,910	$8,768	($141)
DSVL	$560	$78	($482)
RLGN	$2,411	$1,729	($682)
IWS 7.0	**$5,920**	**$5,591**	**($329)**
BFTT	$5,920	$5,591	($329)
TOTAL	$710,520	$695,271	($15,249)

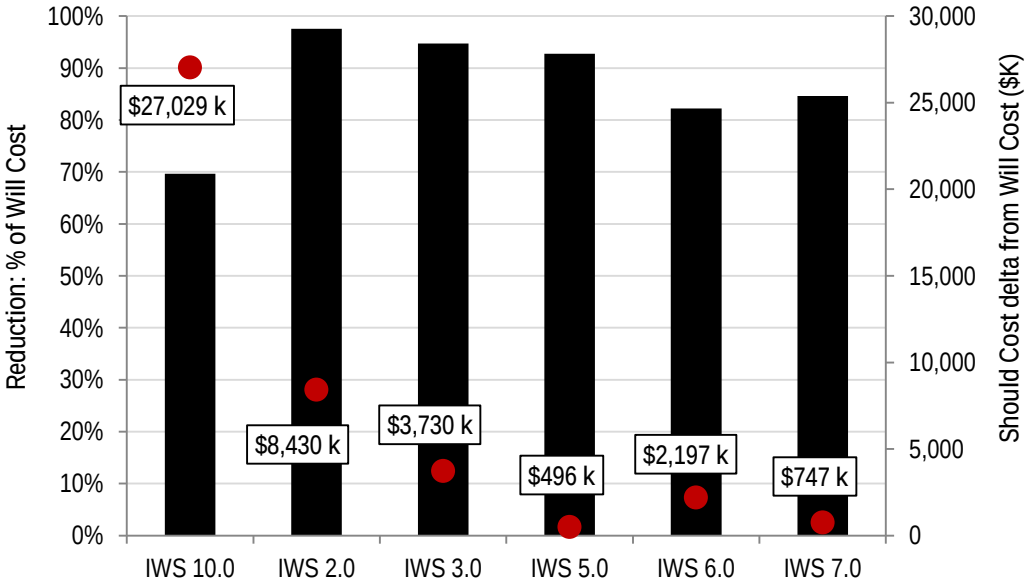


CVN 79 PARM Review Summary

CVN 79 PARM SHOULD Cost ScoreCard - IWS Rollup												
Should Cost Plan ($K)	WILL Cost	DON-14	DON-15	DON-16	DON-17	DON-18	DON-19	DON-20	DON-21	DON-22	SHOULD Cost	Delta
IWS 10.0	89,007	61,978	61,978	61,978	61,978	61,978	61,978	61,978	61,978	61,978	61,978	(27,029)
IWS 2.0	347,683	347,683	345,571	345,500	345,373	344,277	343,805	341,324	339,253	339,253	339,253	(8,430)
IWS 3.0	70,814	70,814	70,748	70,648	67,285	67,084	67,084	67,084	67,084	67,084	67,084	(3,730)
IWS 5.0	6,827	6,827	6,331	6,331	6,331	6,331	6,331	6,331	6,331	6,331	6,331	(496)
IWS 6.0	12,334	12,334	12,319	12,319	10,393	10,317	10,252	10,164	10,137	10,137	10,137	(2,197)
IWS 7.0	4,864	4,834	4,834	4,834	4,834	4,117	4,117	4,117	4,117	4,117	4,117	(747)
TOTAL	**531,529**	**504,471**	**501,782**	**501,610**	**496,194**	**494,105**	**493,568**	**490,999**	**488,900**	**488,900**	**488,900**	**(42,629)**

*Preliminary results subject to change upon signature of final scorecard (SEWIP & CEC)



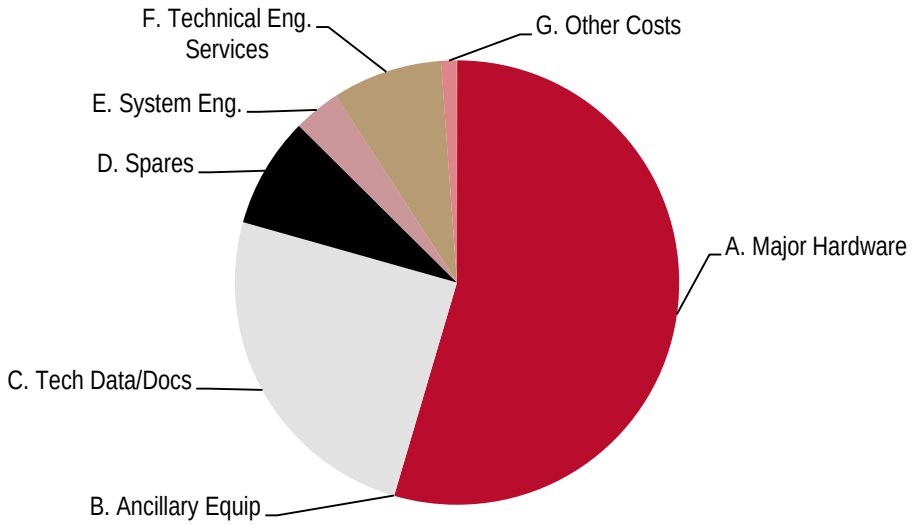


CVN 79 PARM Review Summary

CVN 79 PARM SHOULD Cost ScoreCard: Savings Opportunities by Category								
Opportunities ($k)	A. Major Hardware	B. Ancillary Equip	C. Tech Data/Docs	D. Spares	E. System Eng.	F. Technical Eng. Services	G. Other Costs	TOTAL
IWS 10.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
IWS 2.0*	**2,000**	**0**	**3,820**	**1,040**	**535**	**1,035**	**0**	**8,430**
IWS 3.0	**3,364**	**0**	**50**	**217**	**0**	**0**	**100**	**3,730**
IWS 5.0	**496**	**0**	**0**	**0**	**0**	**0**	**0**	**496**
IWS 6.0*	**1,936**	**0**	**0**	**0**	**0**	**210**	**50**	**2,197**
IWS 7.0	**717**	**0**	**0**	**0**	**0**	**0**	**30**	**747**
TOTAL	**8,513**	**0**	**3,870**	**1,257**	**535**	**1,245**	**180**	**15,601**

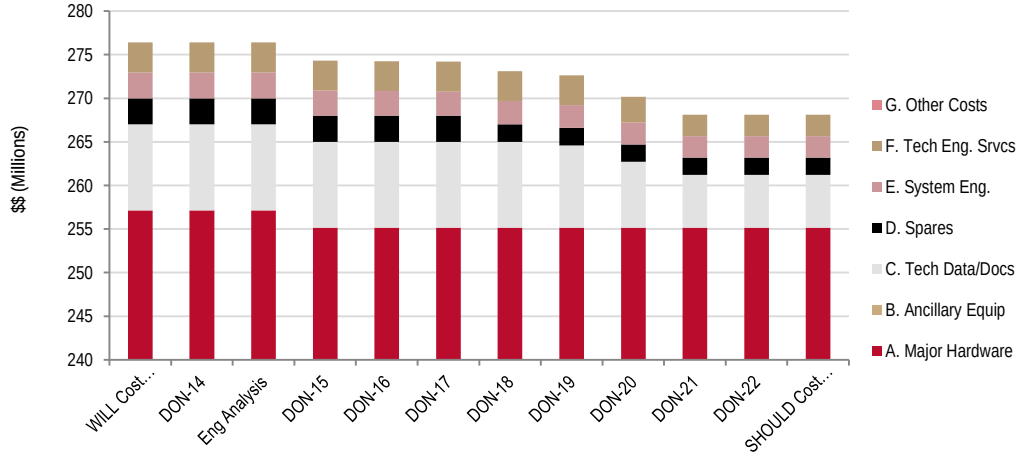
*Preliminary results subject to change upon signature of final scorecard

Potential Savings by Category



CVN 79 PARM Should Cost Scorecard
IWS 2.0: DBR

CVN 79 PARM SHOULD Cost ScoreCard												
Dual Band Radar(DBR)	MPM: CAPT Douglas W. Small						PAPM: CDR John V. Funn					x1-XXXX
IWS X.X	NRE	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	CTC	TOTAL ($K)
WILL Cost (Current Budget Plan)	1,131.2	257,914.3	1,061.3	627.9	3,562.0	2,099.1	2,101.8	1,685.3	3,857.9	3,493.5	-	**276,403.1**
A. Major Hardware	1,131.2	257,139.3										**257,139.3**
B. Ancillary Equipment												**-**
C. Technical Data and Documentation			268.5	340.1	294.4	889.9	868.3	214.9	3,493.5	3,493.5		**9,863.1**
D. Spares					3,000.0							**3,000.0**
E. System Engineering		775.0	792.8	287.8	267.6	273.8	280.1	286.5				**2,963.6**
F. Technical Engineering Services						935.4	953.4	1,183.9	364.4			**3,437.1**
G. Other Costs												**-**
Should Cost Plan	WILL Cost Baseline	DON-14 6/14/12	Eng Analysis 9/15/12	DON-15 3/31/13	DON-16 3/31/14	DON-17 3/31/15	DON-18 3/31/16	DON-19 3/31/17	DON-20 3/31/18	DON-21 3/31/19	DON-22 3/31/20	SHOULD Cost Target
A. Major Hardware	257,139.3	257,139.3	257,139.3	**255,139.3**	255,139.3	255,139.3	255,139.3	255,139.3	255,139.3	255,139.3	255,139.3	**255,139.3**
B. Ancillary Equip	-	-	-	-	-	-	-	-	-	-	-	**-**
C. Tech Data/Docs	9,863.1	9,863.1	9,863.1	9,863.1	9,863.1	9,863.1	9,863.1	**9,463.1**	**7,563.1**	**6,063.1**	6,063.1	**6,063.1**
D. Spares	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	3,000.0	**2,000.0**	2,000.0	2,000.0	2,000.0	2,000.0	**2,000.0**
E. System Eng.	2,963.6	2,963.6	2,963.6	**2,892.2**	**2,820.7**	**2,749.3**	**2,677.9**	**2,606.5**	**2,535.0**	**2,463.6**	2,463.6	**2,463.6**
F. Tech Eng. Srvcs	3,437.1	3,437.1	3,437.1	3,437.1	3,437.1	3,437.1	3,437.1	3,437.1	**2,937.1**	**2,437.1**	2,437.1	**2,437.1**
G. Other Costs	-	-	-	-	-	-	-	-	-	-	-	**-**
TOTAL	276,403.1	276,403.1	276,403.1	274,331.7	274,260.2	274,188.8	273,117.4	272,646.0	270,174.5	268,103.1	268,103.1	**268,103.1**
Hardware RIYD:	26-Apr-2018	**Hardware Contract Award Date:**			<DATE>	**Primary Hardware Vendor:**			Raytheon			



Opportunity Management Plan

Date	Event & Description of Opportunity	Confidence
Mar-13	*Hardware - Assumes 2-Lot System concurrent but w/DDG 1002	20%
Mar-13	Hardware - Reduced ECP & Equipment Refresh by $2.0M	20%
Mar-13	Systems Eng - Reduced manning by $500K($71.4K ea, FY13- FY19)	20%
Mar-16	Spares - Reduced by $1.0M for Interim Spares	20%
Mar-17	Tech Data/Docs - Reduced Gov't Team during FAT by $800K($400k/yr, FY18-FY19) & reduce Onboard T&E by $3.0M($1.5M/Yr. FY18-FY19)	20%
Mar-18	Tech Eng. Srvc - Reduced by $1.0M($500K/yr, FY18-FY19)	50%

BACK-UP
ROBERTA'S CHARTS

Cost Analysis Players & Products

"Who"

- Program Office
  - Program Office Estimate (POE)
  - Cost Analysis Requirements Description (CARD)
- Service Cost Agencies
  - Component Cost Estimate (CCE)
- OSD Cost Analysis Improvement Group (CAIG)
  - Independent Cost Estimate (ICE)
- Contractors
  - Internal estimates for bids, etc
  - Contract Funds Status Report (CFSR)
- User
  - Analysis of Alternatives (AoA)

Acquisition Program Cost Estimate

"What…and a bit of Why"

- Cost Estimates provide:
  - The basis for the program's budget
  - A basis for program/alternative comparison
  - High visibility - Everyone can relate to a dollar amount

- Cost Estimates are used:
  - In reports to Congress and OSD (SAR, UCR, DAES)
  - In Analysis of Alternatives (AoA)
  - In Resource Allocation Process (PPBE)
  - By Acquisition Management to make programmatic decisions

- Cost Estimates are important because:
  - Cost growth can have negative impact upon the program, to include program cancellation
  - Costs, under CAIV, are supposed to remain constant

Cost Estimating Methods

	ANALOGY	PARAMETRIC	ENGINEERING	ACTUAL COSTS
WHAT	1:1 Comparison	Statistical Analysis	"Bottoms-up estimate	Extrapolation from actuals
HOW	Adjust analogous system cost *or* create cost factor	Apply statistical methods to cost of 2 or more systems; i.e. Develop CER	Estimate at lowest cost level & sum costs by WBS	Use trend from your current contract to estimate your final system $
WHEN	Early in Dev MS A, B	MS B	MS C, FRP LRIP, Prototypes Mods	Late in Program FRP Mods
PROs	Fast Inexpensive Easy to change	Great Acceptance Easy to do "What-If" drills	Comprehensive Detailed	Cost data exists Very Accurate Very Objective
CONs	Subjective Uncertain Risky	Constrained by historical data	Slow Labor Intensive Expensive	Prototype / Production Too late for use in budgeting

Weapon System Acquisition Reform Act (WSARA) of 2009

(Sec 206: Critical Cost Growth in MDAPs)

- Requires root cause analysis
- Directs Dir, CAPE to assess
  - Projected cost of current requirements
  - Projected cost with reasonable mod to requirements
  - ROM for reasonable alternatives
  - Need to reduce funding for other programs due to this cost growth
- SecDef will terminate the program unless certification is submitted before the end of 60-day period after due date of the SAR to Congress
- Adds 5th item for certification
  - The program is a higher priority than programs whose funding must be reduced to accommodate the growth in the cost of the program
- Actions if program not terminated
  - Restructure that addresses root cause and ensures mgt structure is acceptable
  - Rescind most recent Milestone approval (or space program Key Decision Point)
  - Require a new Milestone approval (or KDP)
- Actions if program terminated (submit a report to Congress)
  - Reasons for termination
  - Alternatives considered to address program problems
  - The course the Department plans to pursue to meet any continuing joint military requirements

Learning Curve - Calculations

Degree of Learning = 10%, or a 90% learning curve

1st unit		**= $150,000**
2nd unit	= **$150,000** * .90	= ***$135,000***
4th unit	= ***$135,000*** * .90	= $121,500
8th unit	= $121,500 * .90	= $109,350
16th unit		= $98,415
32nd unit		= $88,574
64th unit		= $79,716
128th unit		= $71,745
256th unit		= $64,570
512th unit		= $58,113
1024th unit		= $52,302

Cost of **1024** units = **$63,563,322**

As the quantity of a product produced doubles, the effort per unit to produce the unit goes down at a fixed rate.

Learning Curve -- Calculations

Impact of Different Learning Curve and First Unit Cost

	Baseline	Alternative 2	Alternative 3
First unit cost	$150K	$150K	$140K* *
Learning curve %	90%	91%*	90%
Total cost of 1,024 units	$63,563.3K	$66,362.8K	$59,325.8K
Delta between Baseline and alternatives		+$2,799.5K	-$4,237.8K

* Larger learning curve = savings less (9% vs. 10%)

* * Smaller first unit cost = total savings is greater.

“What If” Drills and ROMs

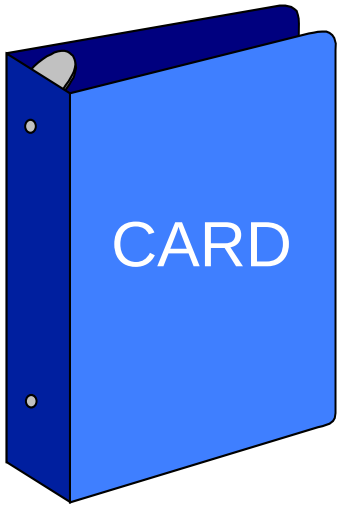
- “What If” Drill
  - What’s your process?
  - How is it done and who does it?
  - How do you control external information flow?

- Rough-Order-of-Magnitude (ROM)
  - What’s your process?
  - Level of fidelity
    - How do you know?
    - How would anyone else know?

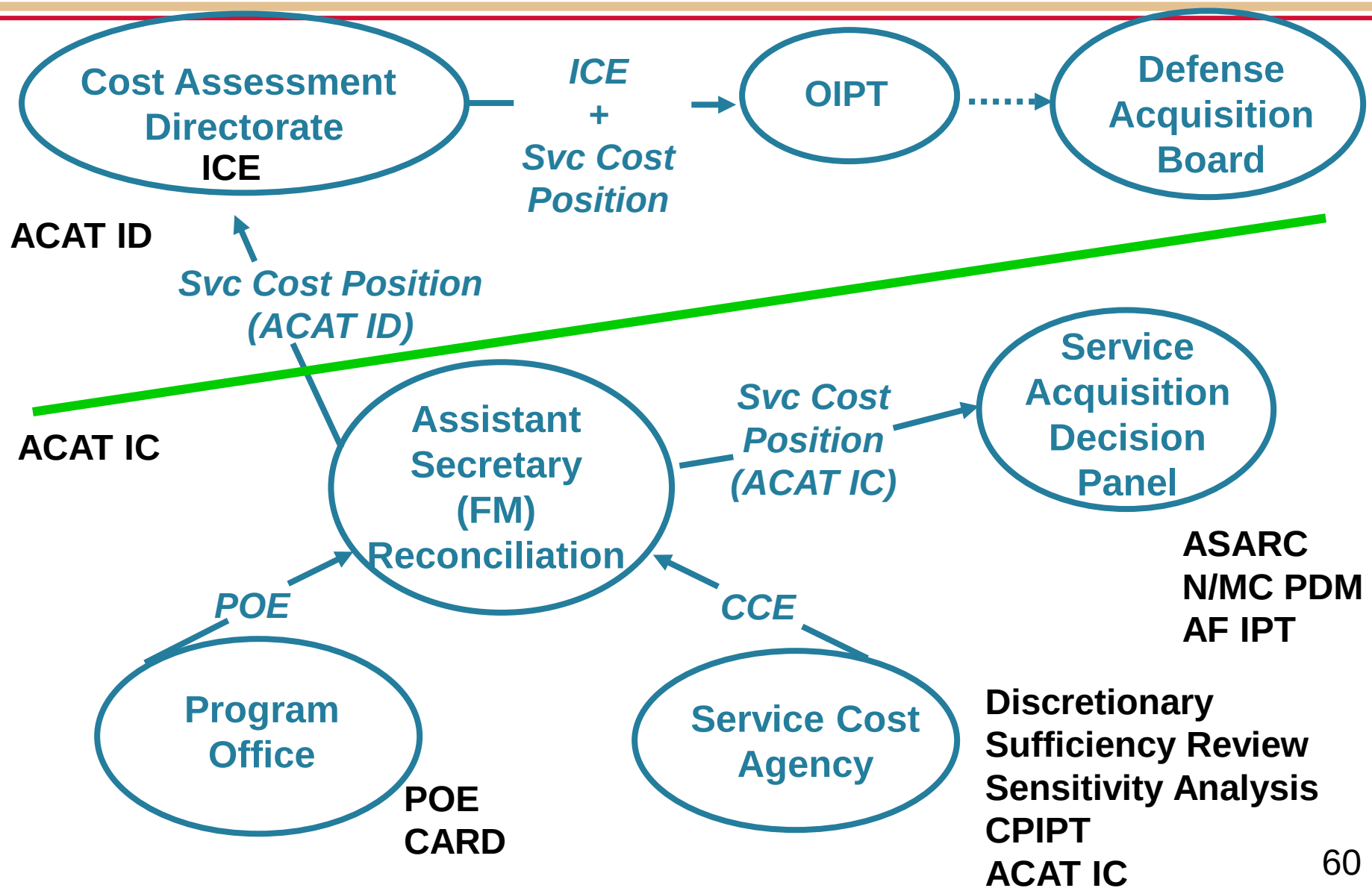
- Be careful of implied precision
- Must include contractor costs + OGC + risk

Included in the CARD

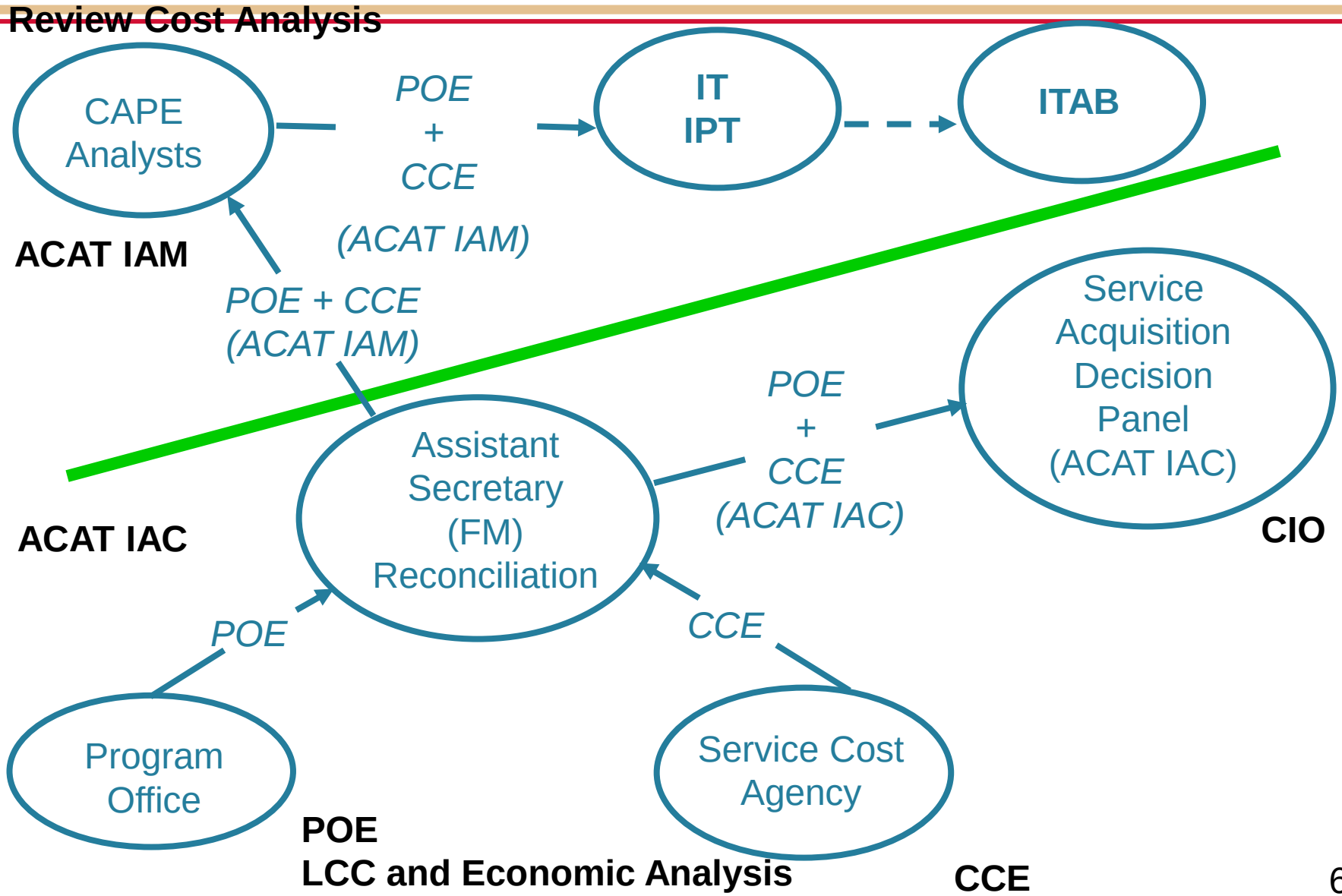
- System Overview
- Risk
- System Operational Concept
- Quantity Requirements
- System Manpower Requirements
- System Activity Rates
- System Milestone Schedule
- Acquisition Plan and/or Strategy
- System Development Plan
- Element Facilities Requirements



MDAP Cost Review Process



MAIS Cost Review Process



Cost Analysis Organizations

NAVY
Naval Center for Cost Analysis
NCCA (FMB-6) Rm 4C449
1000 Navy Pentagon
Washington, DC 20350-1000
(703) 692-4899 DSN 222 - 4899

http://www.ncca.navy.mil

AIR FORCE
Air Force Cost Analysis Agency (AFCAA)
Crystal Gateway North, Suite 403
201 12th Street
Arlington, VA 22202-4306
(703) 604 - 0387 DSN 664-0387

Internet access now thru AF Portal (requires registration) https://www.my.af.mil

ARMY
DASA for Cost & Economics (DASA-CE)
1421 Jefferson Davis Hwy, Suite 9000
Arlington VA 22202-3259
(703) 601-4202 DSN 329-4202

http://www.asafm.army.mil/ceac/ceac.asp

OSD
Cost Assessment Directorate
OSD CAPE, Room BE779, 1800 Pentagon
Washington, DC 20301
(703) 695 - 0721 DSN 225-0721

http://www.pae.osd.mil

CONTRACT FUNDS STATUS REPORT (DD Fm 1586)

- Source: Defense Acquisition Guidebook (Ref 11.3.2.1)
- Purpose of CFSR is to assist Program Managers in:
  - Updating and forecasting contract funds requirements
  - Planning and decision making on funding changes in contracts
  - Developing funds requirements and budget estimates in support of approved programs
  - Determining funds in excess of contract needs available for deobligation
  - Obtaining rough estimates of termination costs
  - Determining if sufficient funds are available by fiscal year to execute the contract
- No specific dollar threshold specified but…generally
  - Applicable to non- firm fixed priced contracts
  - Greater than $ 1.5 Million (in then year dollars)
- All ACAT I programs: MUST have contractor submit to OSD EVM Central Repository (CR)

Contract Funds Status Report

CONTRACT FUNDS STATUS REPORT *(Dollars in _____)*

1. CONTRACT NUMBER	3. CONTRACT FUNDING FOR FOR FY	5. PREVIOUS REPORT DATE	7. CONTRACTO *(Name, Address and zip code)*	9. INITIAL CONTRACT PRICE a. TARGET b. CEILING
2. CONTRACT TYPE	4. APPROPRIATION	6. CURRENT REPORT DATE	8. PROGRAM	10. ADJUSTED CONTRACT PRICE a. TARGET

11. FUNDING INFORMATION

LINE ITEM / WBS ELEMENT a	APPROPRIATION IDENTIFICATION b	FUNDING AUTHORIZED TO DATE c	ACCRUED EXPENDITURES OPEN COMMITMENTS TOTAL d	CONTRACT WORK AUTHORIZED			FORECAST			TOTAL REQUIREMENTS k	FUNDS CARRY OVER l	NET FUNDS REQUIRED m
				DEFINITIZED e	NOT DEFINITIZED f	SUBTOTAL g	NOT YET AUTHORIZED h	ALL OTHER WORK I	SUBTOTAL j			

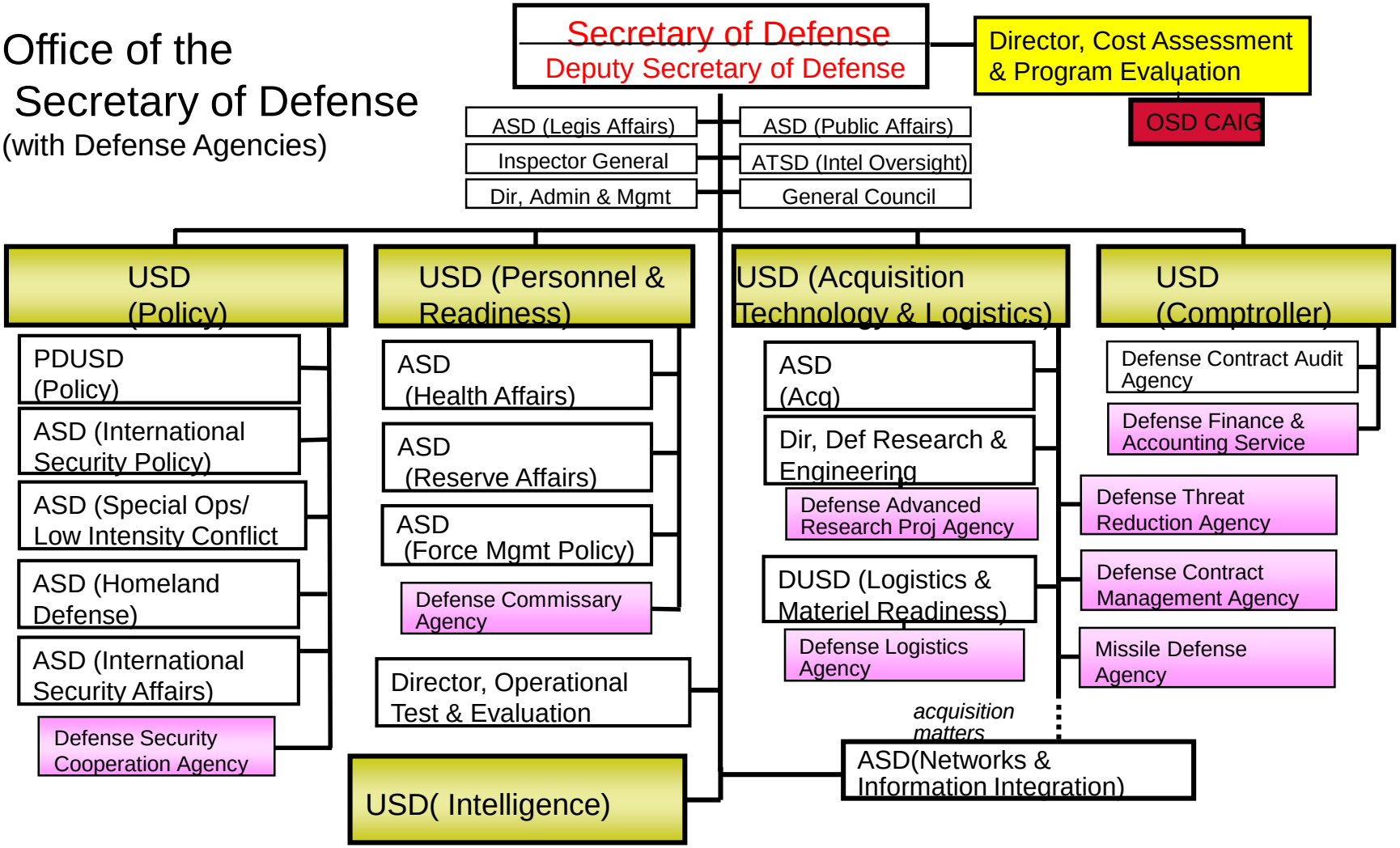
12. CONTRACT WORK AUTHORIZED *(With Fee/Profit)* - ACTUAL OR PROJECTED

	ACTUAL TO DATE										AT COMPLETION
a OPEN COMMITMENTS											
b ACCRUED EXPENDITURES											
c TOTAL *(12a + 12b)*											
13. FORECAST OF BILLINGS TO THE GOVERNMENT											
14. ESTIMATED TERMINATION COSTS											

15. REMARKS

Page ____ of ____ Pages

Office of the Secretary of Defense
(with Defense Agencies)



Cost & Software Data Reporting (CSDR)

- Data reporting owned by OSD CAPE DCARC (Defense Cost and Resource Center)
  - DCARC Mission: Collects historical Major Defense Acquisition Program cost and software resource data and makes those data available for use by authorized government analysts to estimate the cost of ongoing and future government programs, particularly DoD weapon systems.
  -
- Required CDRLs for all ACAT I, ACAT IA, Pre-MDAP and Pre-MAIS programs Post MS A
- Requirement to develop CSDR plan for all applicable contracts prior to RFP release
  - Plan establishes MIL-HDBK 881A compliant WBS used for CSDR and EVM reporting
- CDRLs for Hardware: Contract Cost Data Report (CCDR)
- CDRLs for Software: Software Resources Data Report (SRDR)

CSDR Requirements Specified in DoD Instruction 5000.02 and DoD Manual 5000.04-M-1

Contractor Cost Data Reporting (CCDR)

- DD form 1921 series that collects data on
  - Recurring vs non-recurring costs by WBS
  - Functional Cost-Hour and Progress Curve Report
  - Plant-wide business-base data (recently reestablished)
- Required by DoDI 5000.02, Encl 4,Table 4
- For all contracts and subcontracts
  - Valued at more than $50M (then year dollars)
  - Regardless of contract type
  - ACAT I, ACAT IA, Pre-MDAP and Pre-MAIS Post MS A
  - Discretionary for other high interest/high risk contracts of $20M-$50M (TY$)
    - Discretion of DoD PM with approval by Chair, CAIG
  - Possible waiver from the Chair, CAIG if either
    - Procurement of commercial systems OR
    - Non-commercial system, competitively awarded, FFP contract as long as competitive conditions continue to exist

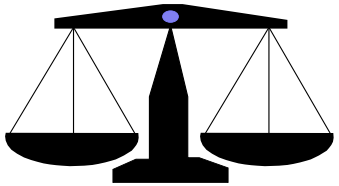
Software Resources Data Report (SRDR)

- DD Form 2630 series
  - Initial govt report (2630-1)
  - Initial developer report (2630-2)
  - Final developer report (2630-3)
- Required by DoDI 5000.02, Encl 4, Table 4
- For all contracts and subcontracts
- Valued at more than $20M (then year dollars)
- Regardless of contract type
- ACAT I, ACAT IA, Pre-MDAP and Pre-MAIS Post MS A
- Discretionary for other high interest, high risk contracts of below $20M (TY)
  - Discretion of DoD PM with approval by Chair, CAIG

Cost As An Independent Variable (CAIV)

BASIC CONCEPT

- Essential to balance three significant parameters or variables in acquisition programs:
  - Performance satisfying operational requirements
  - Affordable Life-Cycle Cost
  - User Acceptable Schedule



- Under CAIV philosophy, performance and schedule are dependent on cost
- Source:
  - DoDD 5000.01, The Defense Acquisition System, May 2003, E1.1.4
  - Defense Acquisition Guidebook (DAG), Para 3.2.4

Cost Drivers

- Any item for which a small change in the parameters will cause a large change in the cost.
- Any item which is subject to large variation causing a large change in the cost.
- Any item with a high risk (high probability of problems).
- Anything with a very large quantity.

The key to understanding estimates.