Enhancing Performance Management via Metrics

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ODDR&E/Systems Engineering

13th Annual NDIA Systems Engineering Conference
San Diego, CA | October 28, 2010

Mission Context

Director, Systems Engineering
Steve Welby

Systems Analysis

"Weapon Systems Acquisition Reform Act of 2009"

S.454-10; d.(1): The development and tracking of detailed measurable performance criteria as part of the systems engineering master plans…

S.454-10; d.(3): A system for storing and tracking information relating to the achievement of the performance criteria and objectives specified…

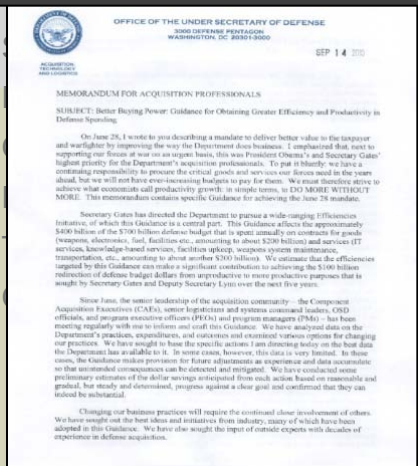
S.454-12; SEC. 103.b.(4): Evaluating the utility of performance metrics used to measure the cost, schedule, and performance of [MDAPS], and making such recommendations …to improve such metrics.

Major Program Support
James Thompson

- Program Support Reviews
- Systems Engineering Plans
- Program Technical Auditing
- OIPT/DAB/DSAB Support
- DAES Database Analysis and Support
- Performance Measurement
- Systemic Root Cause Analysis

Mission Assurance

AT&L Memo, 14SEP2010
Subject: Better Buying Power: Guidance for Greater Efficiency and Productivity in Defense Spending



OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

SEP 14

MEMORANDUM FOR ACQUISITION PROFESSIONALS

SUBJECT: Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending

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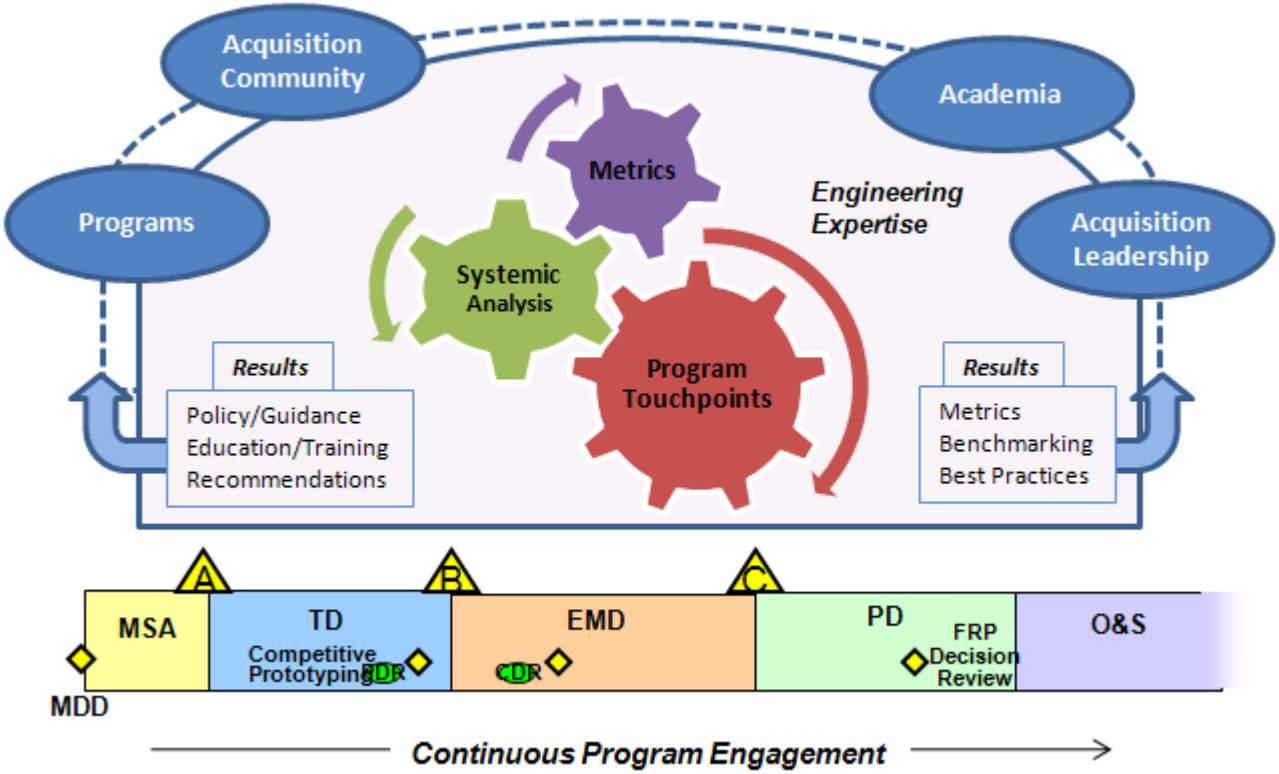
"…Set shorter program timelines and manage to them…"

"…remain cognizant of our programs' progress…and identify problems quickly…"

OUSD(AT&L) Systems Engineering
Major Program Support Directorate

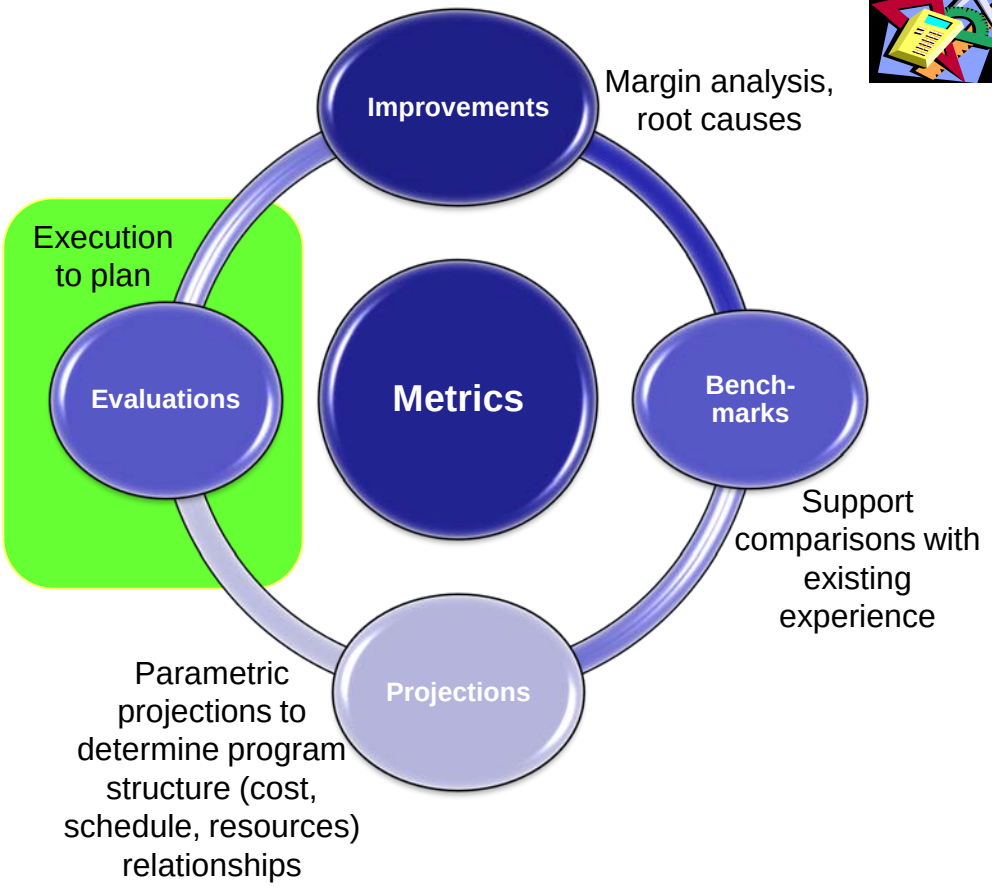


Program Touchpoints:

- Program Support Reviews (PSR), SE Working Integrated Product Teams (WIPT), Technical Reviews, SEP Reviews, PDR/CDR Assessments
- Integrating IPT (IIPT), Overarching IPT (OIPT)
- Defense Acquisition Board (DAB), Defense Acquisition Executive Summary (DAES), Nunn McCurdy Reviews

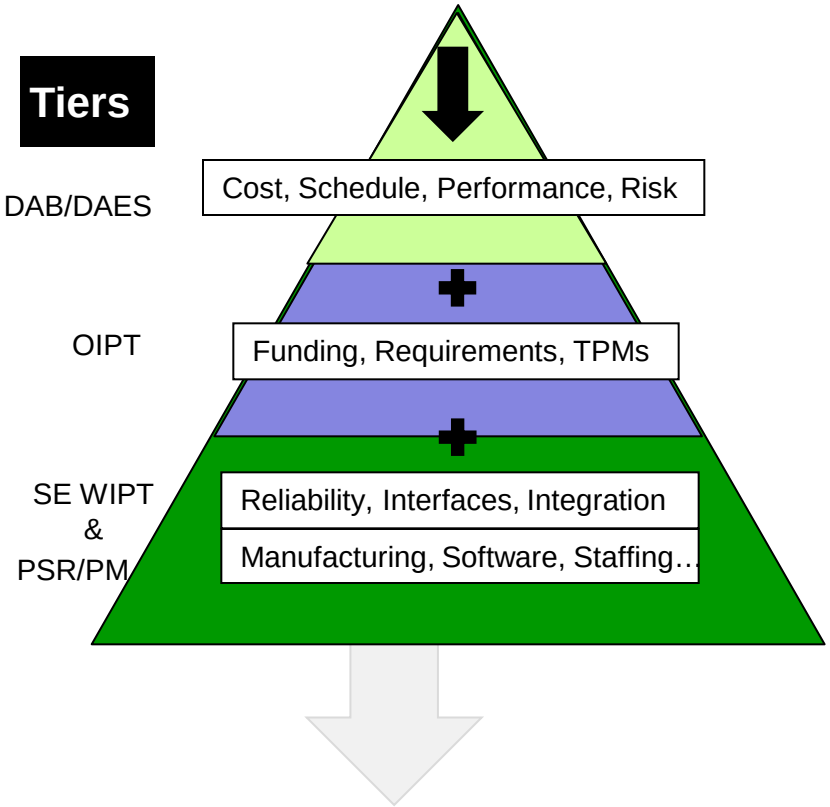
SE Metrics Goals
"What we are trying to achieve"

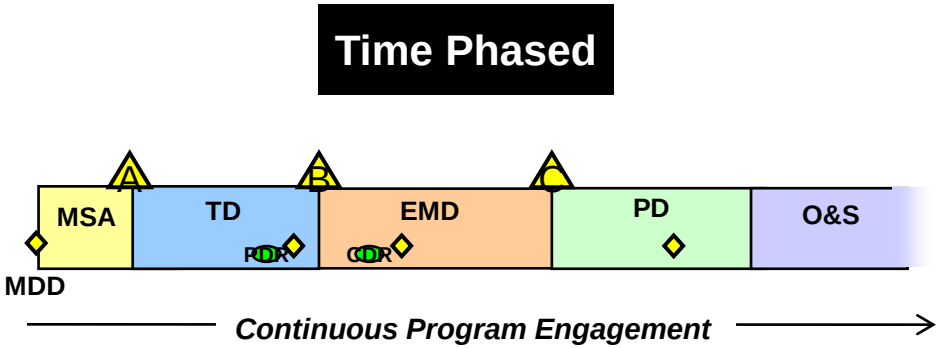
- Emphasize quantitative understanding consistent with Industry practice of system engineering
- Make visible relationships between system/equipment design objectives and performance
- Harness and use existing information for timely and better decisions at the appropriate levels



"To measure is to know."
"If you can not measure it, you can not improve it."
Lord William Kelvin (1824-1907)

Tiered and Time Phased Measures





Information needs vary by Tier

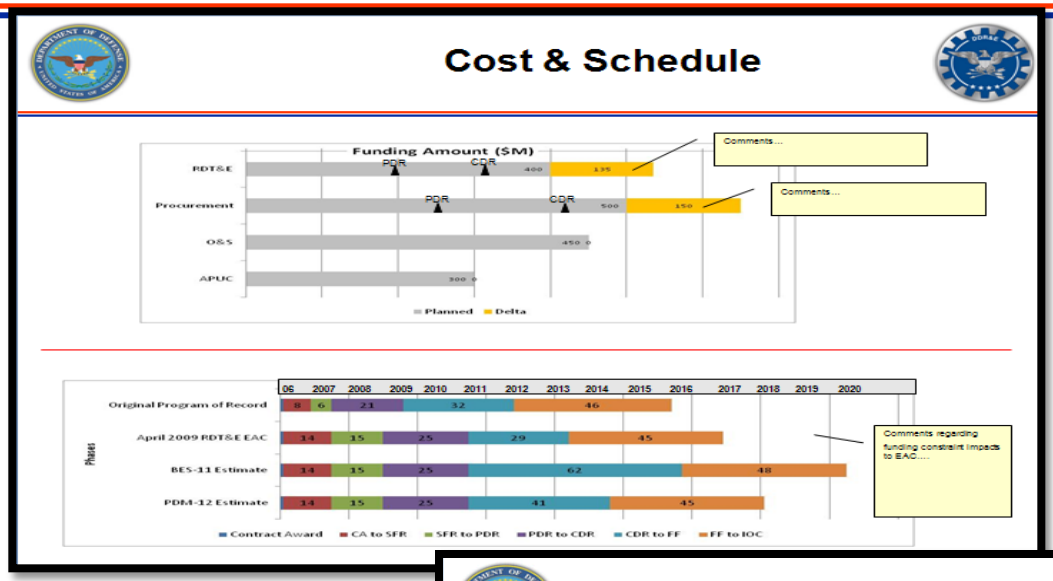
- Summary and roll-up information at highest tier
- Greater engineering detail and number of metrics provided at lowest tier

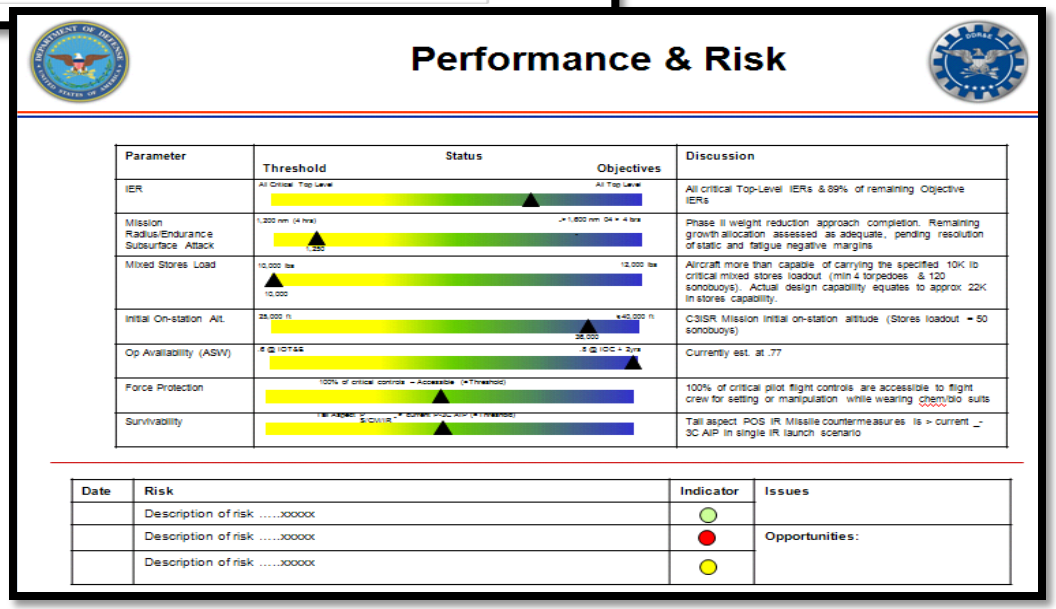
Metric relevancy based on lifecycle phase and events

- E.g. T&E metrics prevalent later
- Decisions based on time cycles (e.g. DAES every 3 months)

Top Tier: Senior Leadership Level

Sample Metrics

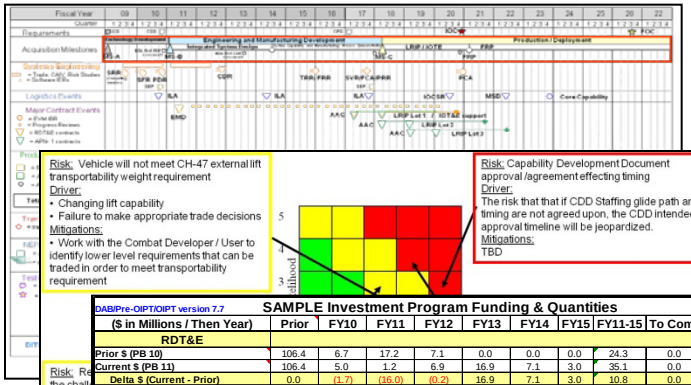




1. Top level understanding of program status
2. Execution to plan
3. Key risks
4. Adequacy of path forward to resolve risks/issues

Mid Tier: Principal Managers

Sample Metrics



Schedule

Risks

SAMPLE Investment Program Funding & Quantities

DAB/Pre-OIPT/OIPT version 7.7

($ in Millions / Then Year)	Prior	FY10	FY11	FY12	FY13	FY14	FY15	FY11-15	To Comp	Prog Total
RDT&E										
Prior $ (PB 10)	106.4	6.7	17.2	7.1	0.0	0.0	0.0	24.3	0.0	137.4
Current $ (PB 11)	106.4	5.0	1.2	6.9	16.9	7.1	3.0	35.1	0.0	146.5
Delta $ (Current - Prior)	0.0	(1.7)	(16.0)	(0.2)	16.9	7.1	3.0	10.8	0.0	9.1
Required $	110.0	7.0	17.0	7.0	0.0	5.0	10.0	39.0	0.0	156.0
Delta $ (Current - Required)	(3.6)	(2.0)	(15.8)	(0.1)	16.9	2.1	(7.0)	(3.9)	0.0	(9.5)
PROCUREMENT										

Cost

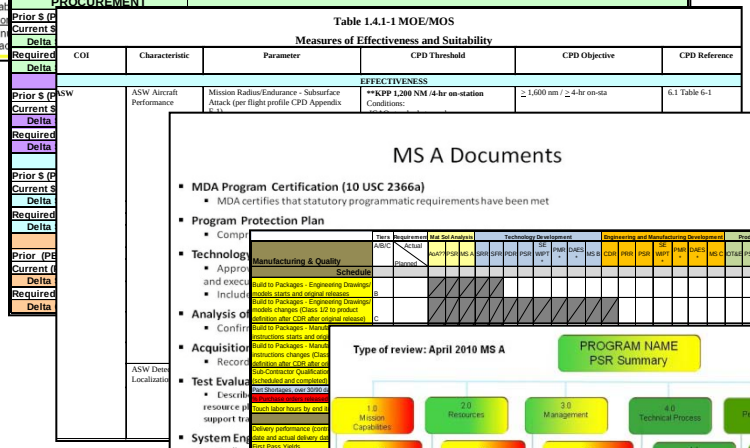


Table 1.4.1-1 MOE/MOS

Measures of Effectiveness and Suitability

COI	Characteristic	Parameter	CPD Threshold	CPD Objective	CPD Reference
		EFFECTIVENESS			
ASW	ASW Aircraft Performance	Mission Radius/Endurance - Subsurface Attack (per flight profile CPD Appendix	**KPP 1,200 NM /4-hr on-station Conditions:	≥ 1,600 nm / ≥ 4-hr on-sta	6.1 Table 6-1

T&E

Documentation Status

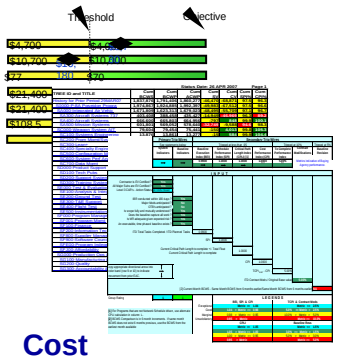
Manufacturing

PSR Scorecard

- **Top level findings and recommendations**
- **Metric summaries across wider breadth of engineering and management areas**
- **Insights on PM incorporation of recommendations**
- **Positive observations**

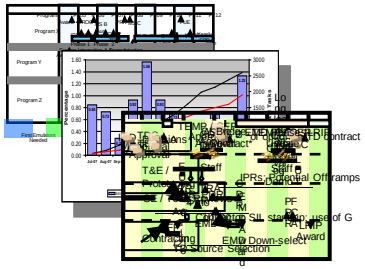
Lower Tier: Working Level

Sample Metrics



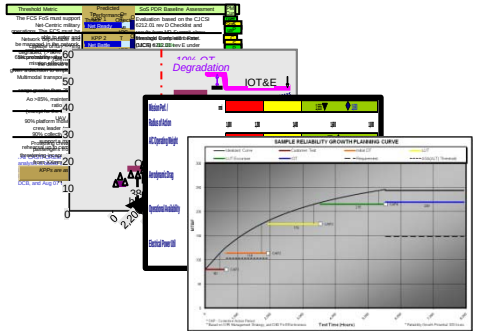
Cost

- EVMS Dashboard
- CPI-SPI
- Variances
- Burn rate
- Management Reserve



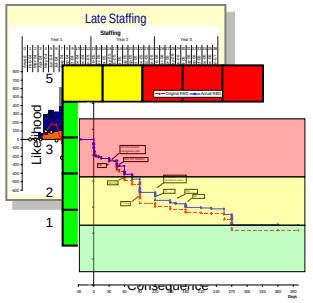
Schedule

- Tier 1
- Critical path
- Schedule risk assessment
- Late starts/finishes
- FoS/SoS schedules



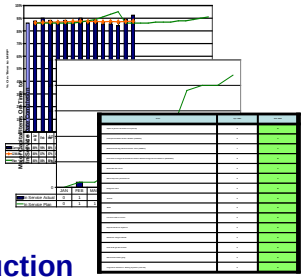
Performance

- KPP/KSA progress
- TPMs
- Reliability growth curve
- TRLs



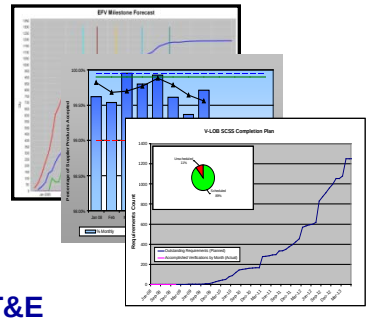
Management

- Staffing
- Risk cube and Burn-down curve
- Exit criteria



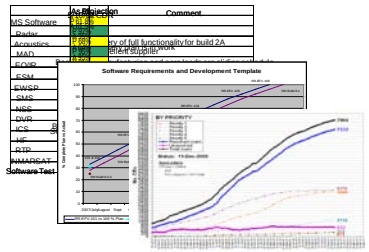
Production

- Build-to-Package completions
- Traveled work
- Supplier/Subcontractor Quality tests
- Scrap, Rework and Repair hours
- First pass yields
- Touch labor hours
- Etc.



T&E

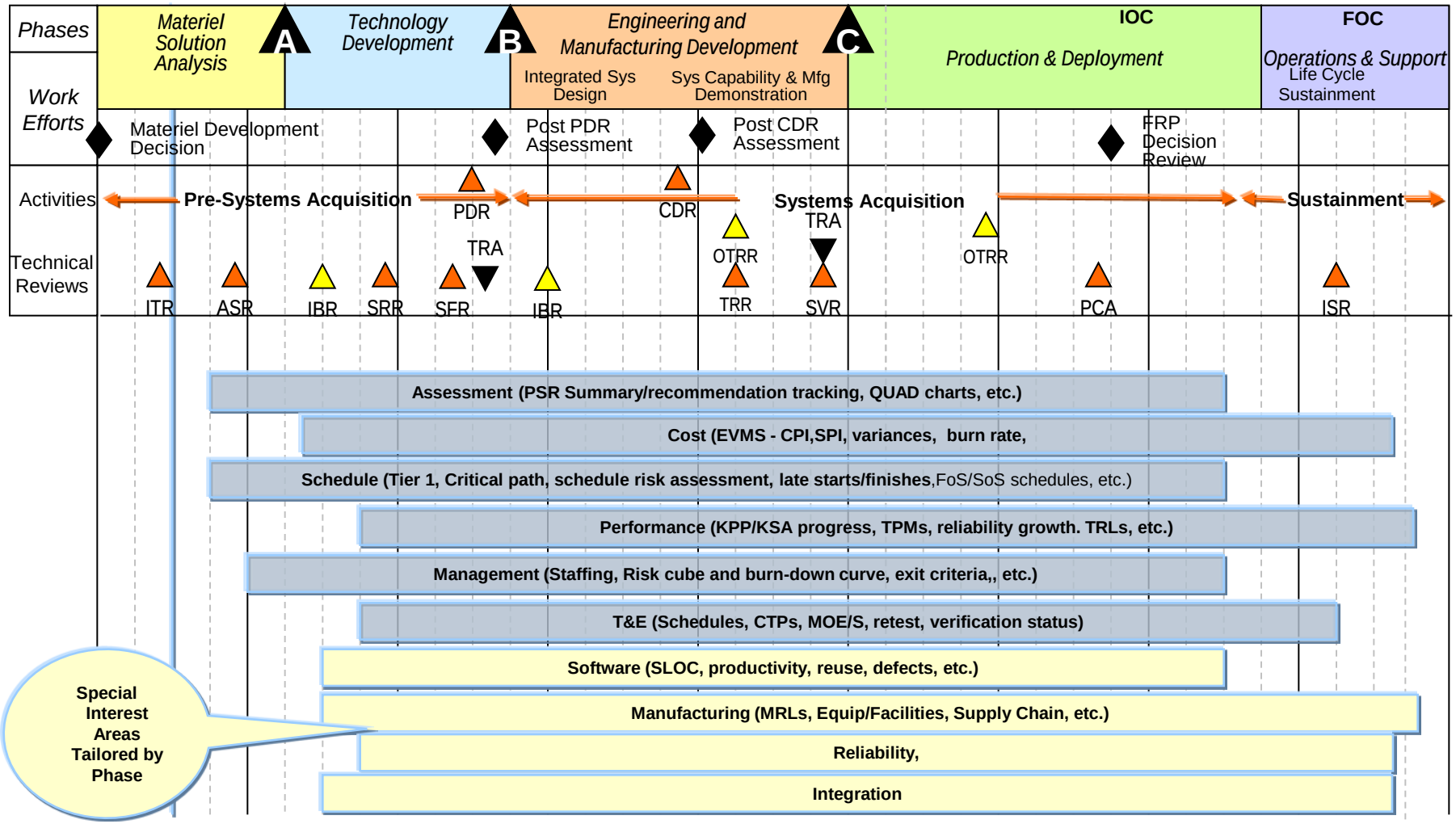
- Schedules
- CTPs
- MOE/S
- Retest
- Verification status



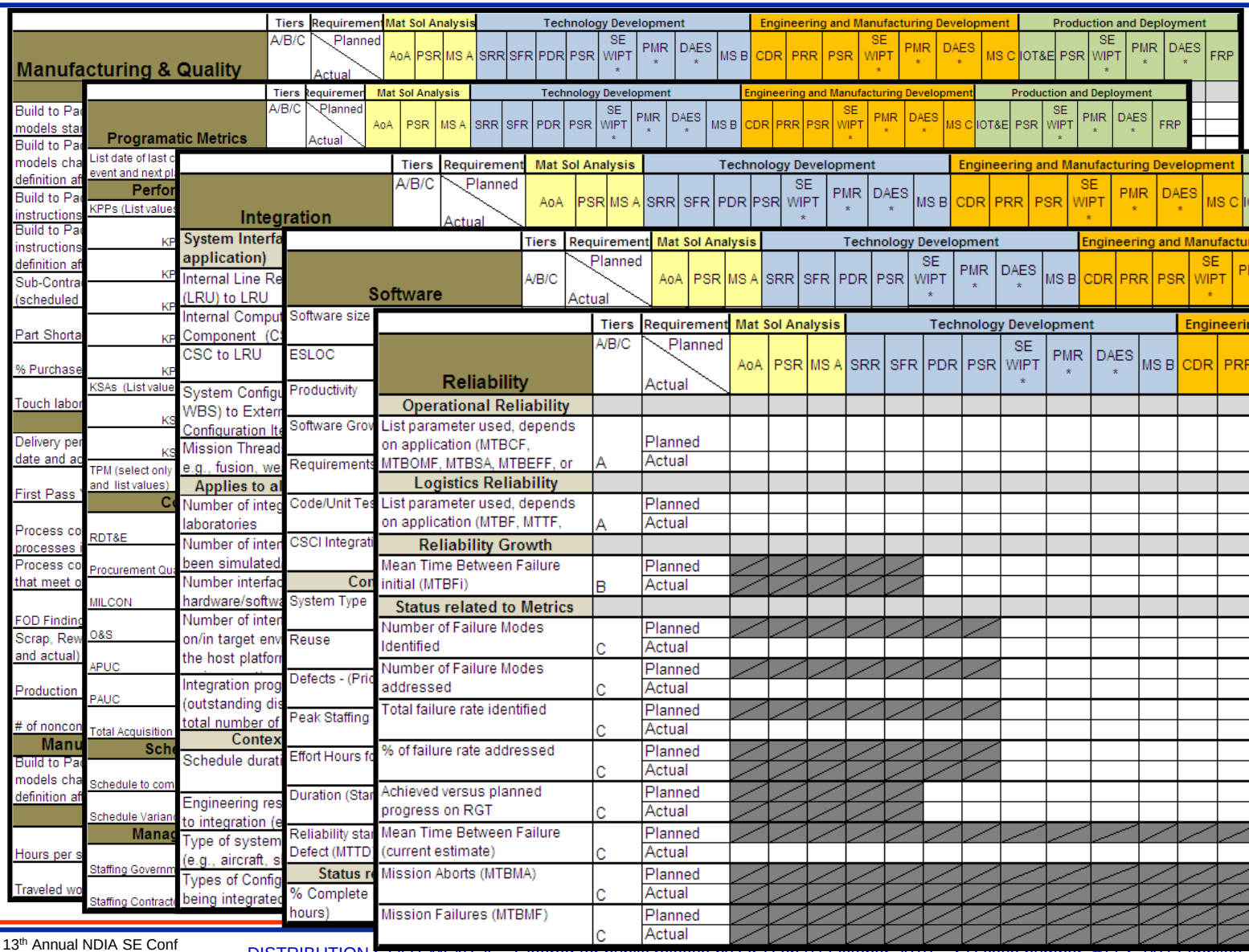
Software

- SLOC
- Productivity
- Reuse
- Defects

Time-based Metrics
Related to Lifecycle Activities



Sample Metrics (Notional)



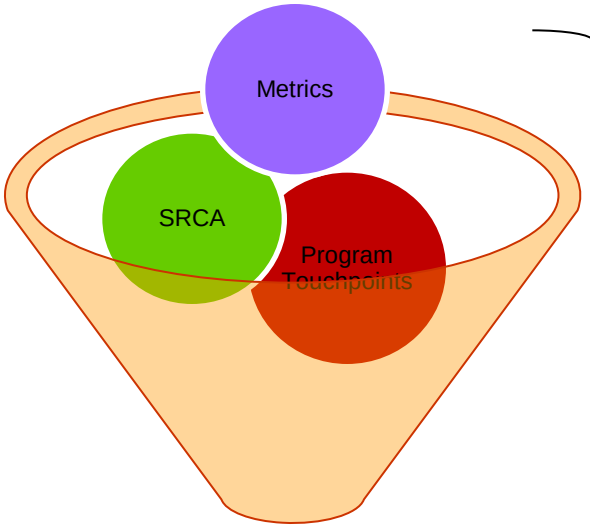
Systemic Root Cause Analysis Top Negative Findings

Sep. 2010

Rank	Systemic Finding	% Reviews
	Staffing – 50%, 4 (%of reviews, # of Systemic Findings)	
1	Marginal program office staffing	31
12	Program Office has clear lack of acquisition or specialized expertise	17
	Management – 77%, 17	
2	Progress is impeded by lack of good communications between Govt and contractors	24
9	Risk management tools and methodology are not sufficient	18
	Systems Engineering – 34%, 2	
3	Program has inadequate system engineering process	23
10	Incomplete or missing a systems engineering plan (SEP)	17
	Verification – 35%, 4	
4	Test schedule is aggressive/success oriented/ and highly concurrent	23
14	Testing is incomplete or inadequate	17
	Budget – 20%, 1	
5	Current program budget is not sufficient to execute the proposed program	20
	Requirements – 54%, 6	
6	Requirements are not stable	20
7	Requirements are vague, poorly stated, or not defined	20
8	Requirements creep	18
	Schedule – 44 %, 4	
13	Program does not have an IMS or does not have a current IMS	17
	Reliability –34%, 4	
18	Reliability is not progressing as planned or has failed to achieve requirements	14
26	Reliability test program is needed; Reliability growth program not in place	14
35	Reliability currently based on analytical predictions and won't be demonstrated until late in program	10

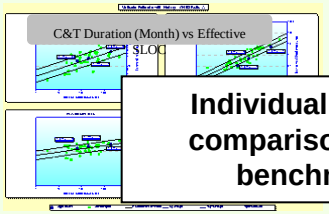
Analyzed in conjunction with quantitative metrics results

SE Metrics Context



Information to Inform Decision Making

AT&L History



Individual program comparison versus benchmarks

Systemic Root Cause Analysis

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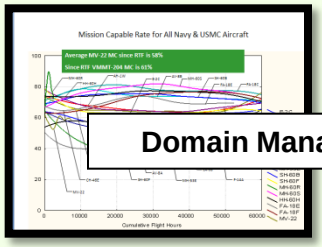
Performance Across Programs

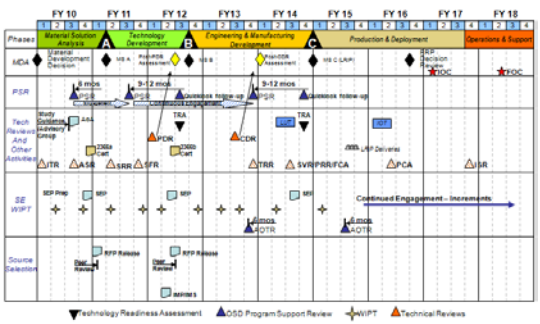


Domain Management

Information to Inform…

- Policy/Guidance
- Education/Training
- Recommendations
- Metrics/Benchmarking
- Best Practices

Feedback thru continuous program engagement



Conclusions

- **Corporately we need to…**
  - Improve our ability to track Execution to Plan
  - Provide better visibility to stakeholders
  - Provide framework for accurate and timely issue identification/prediction

…in order to

  - Reduce cycle time and get required capability to warfighter quicker, more effectively and within budget

For Additional Information

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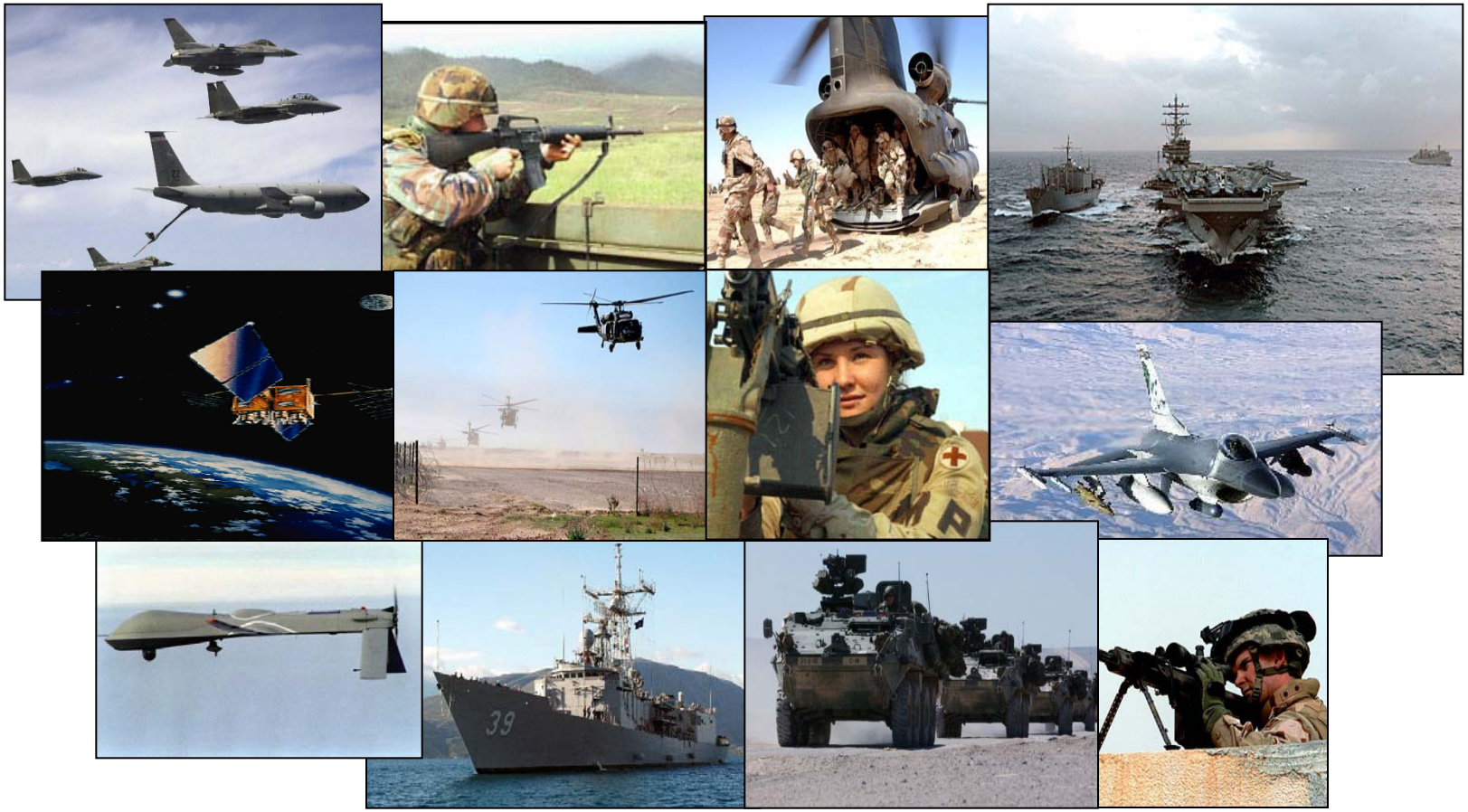
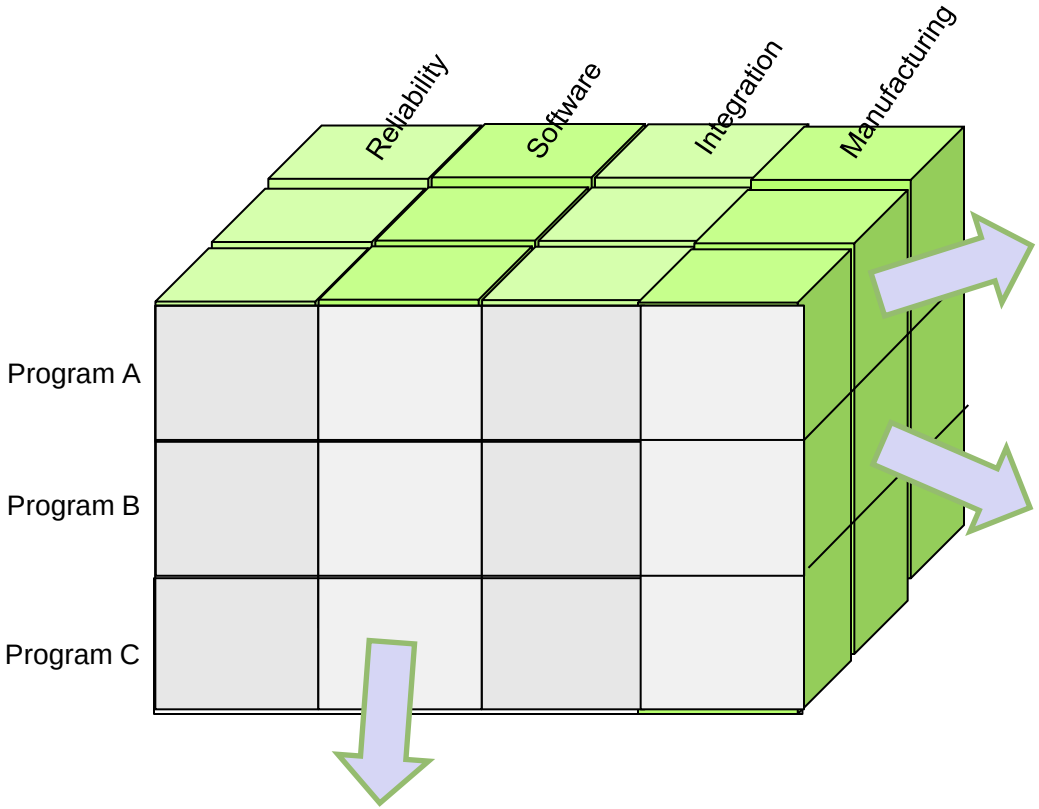
Systems Engineering: Critical to Program Success



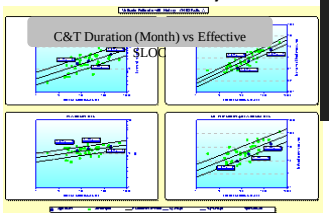
Innovation, Speed, and Agility

http://www.acq.osd.mil/se

SE Products (in Progress)

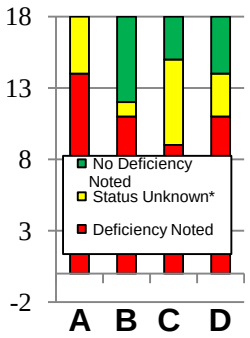


AT&L History



Individual program comparison versus benchmarks

Indicators



Performance Across Programs

Systemic Analysis

Systemic Findings 2010; Example - Software

- Software Development Plans do not exist, or lack needed information, outdated - 14% MDAP reviews conducted
- Significant variation in software development estimates – 13%
- Actual software reuse achieved significantly less than planned – 11%
- Lack of metrics prevent accurate awareness of software activities in each development phase – 10%
- Software requirements are ambiguous; not fully specified, developed and managed – 10%