Achieving "True" Risk Reduction through Effective Risk Management

Pete Nolte

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Office of the Deputy Assistant Secretary of Defense for Systems Engineering

16th Annual NDIA Systems Engineering Conference
Arlington, VA | October 31, 2013

DASD, Systems Engineering Mission

Systems Engineering focuses on engineering excellence − the creative application of scientific principles:

- To design, develop, construct and operate complex systems
- To forecast their behavior under specific operating conditions
- To deliver their intended function while addressing economic efficiency, environmental stewardship and safety of life and property

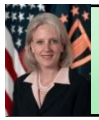
DASD(SE) Mission: Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected acquisition programs.

A Robust Systems Engineering Capability Across the Department Requires Attention to Policy, People and Practice

- ***US Department of Defense is the World's Largest Engineering Organization***
- ***Over 99,000 Uniformed and Civilian Engineers***
- ***Over 39,000 in the Engineering (ENG) Acquisition Workforce***

DASD, Systems Engineering

DASD, Systems Engineering
Stephen Welby
Principal Deputy Kristen Baldwin



Systems Analysis
Kristen Baldwin (Acting)

Addressing Emerging Challenges on the Frontiers of Systems Engineering

- Analysis of Complex Systems/Systems of Systems
- Program Protection/Acquisition Cyber Security
- University, FFRDC and Industry Engineering and Research
- Modeling and Simulation

Major Program Support
James Thompson

Supporting USD(AT&L) Decisions with Independent Engineering Expertise

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Reviews
- OIPT / DAB / ITAB Support
- Systems Engineering Plans
- Systemic Root Cause Analysis

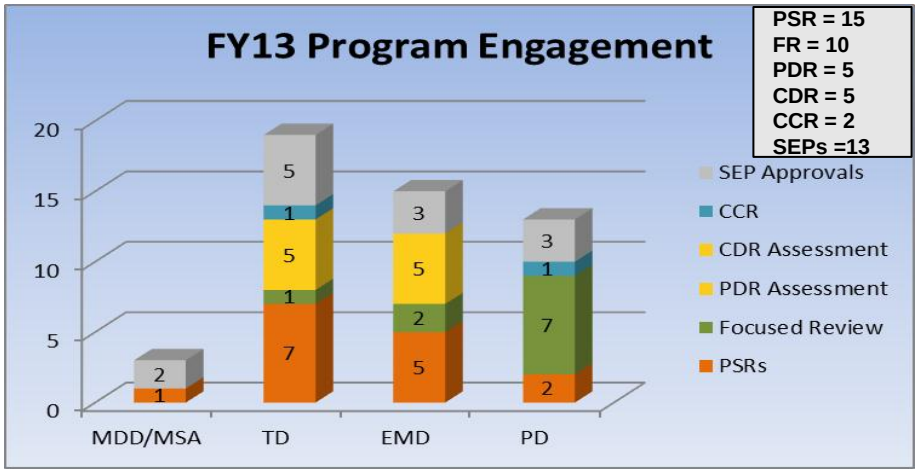
Mission Assurance
Vacant

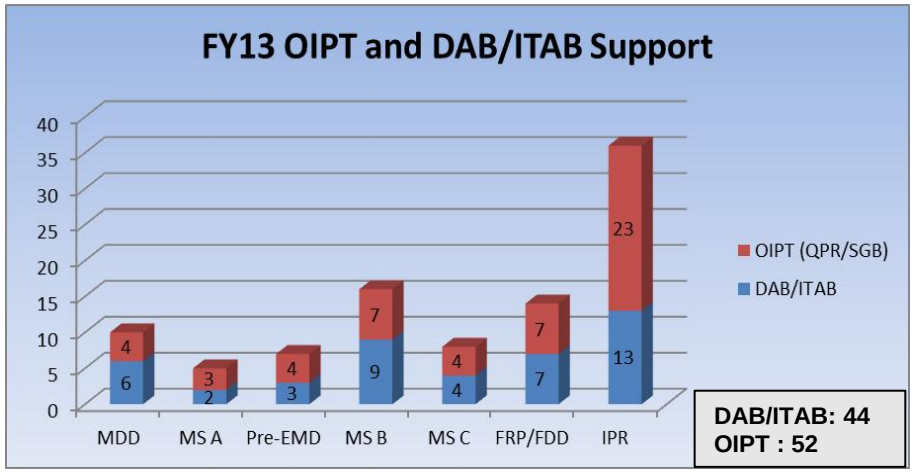
Leading Systems Engineering Practice in DoD and Industry

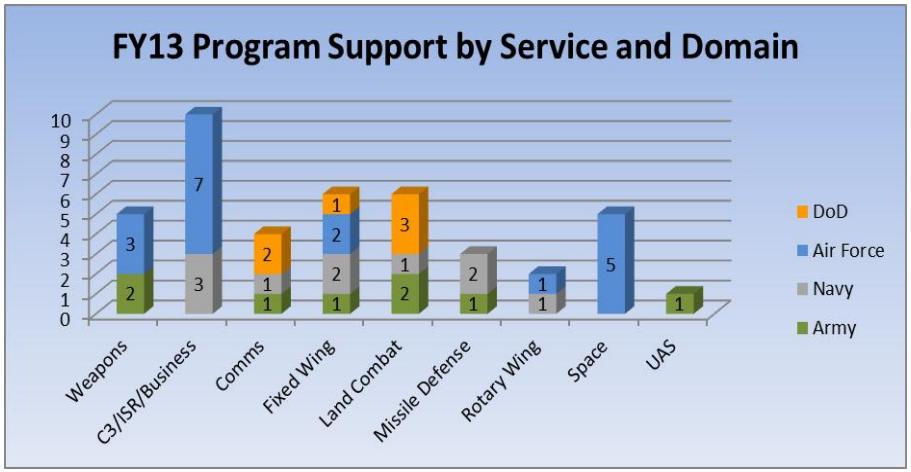
- Systems Engineering Policy & Guidance
- Development Planning/Early SE
- Specialty Engineering (System Safety, Reliability and Maintainability Engineering, Quality, Manufacturing, Producibility, Human Systems Integration)
- Counterfeit Prevention
- Technical Workforce Development
- Standardization

Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs

SE Program Engagements







MPS Program Engagements

- Program Support Reviews (PSR)
- SE Working Integrated Product Teams (WIPT)
- Technical Reviews
- Program Management Reviews
- Nunn McCurdy and Critical Change Reviews

MPS Products

- Systems Engineering Plans
- PSR and Focused Review Assessments
- Support of acquisition process and milestones
- Preliminary/Critical Design Review Assessments
- DASD(SE) Annual Report to Congress
- Systemic Root Cause Analysis

Negative Systemic Findings

- **Most prevalent Negative Systemic Findings seen on 25% or more of all major program reviews conducted between 2009-2013 (Post WSARA)**

Category	Negative System Finding	Air Force	Army	Navy	All DoD
3.2. Program Schedule	Program schedule is not realistic	57%	30%	35%	42%
2.1. Budget	Current program budget is not sufficient.	52%	0%	41%	38%
3.1. Acquisition Strategy	Acquisition strategy needs to be restructured or updated	30%	30%	35%	32%
3.2. Program Schedule	Program is unlikely to achieve schedule	43%	30%	6%	28%
4.7. Design V&V	TEMP/TES is immature or is late	48%	10%	12%	26%
4.7. Design V&V	Testing is incomplete or inadequate	30%	30%	24%	26%
5.1.4. R&M Performance	A reliability growth program is not in place	30%	20%	29%	26%
1.1. CONOPS	Current employment CONOPs are incomplete	26%	30%	24%	25%
3.4.2. Risk Management	Risk management tools and methodology are not sufficient	26%	20%	29%	25%
4.2. Requirements Development	Requirements are vague, poorly stated, or even not defined	30%	40%	12%	25%

- 53 major program reviews in data set
  - 23 Air Force
  - 10 Army
  - 0 Marine Corps
  - 17 Navy
  - 2 Other

Risk Management Findings

Oct 2013

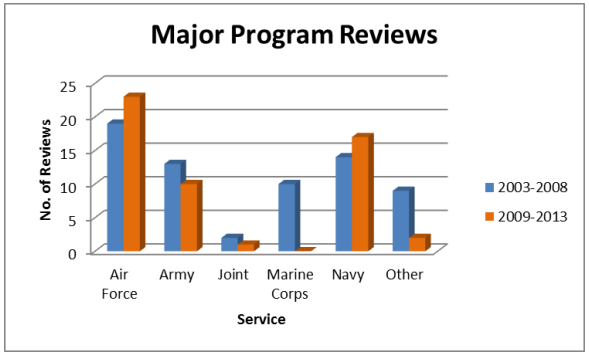
- **Risk Management Systemic Findings seen during Program Support Reviews.** ***Comparison of Pre & Post WSARA time frame***

Risk Management Systemic Finding	% of Program Reviews 2003-2008	% of Program Reviews 2009-2013
Management metrics are not collected, or are not collected frequently enough, or used to monitor program health	19%	8%
Not evident that a formal risk assessment has been performed.	13%	6%
Programs do not have adequate risk mitigation plans	13%	15%
Risk management tools and methodology are not sufficient	16%	25%
There is a lack of properly documented risk mitigation plans	18%	6%

Seeing improvements

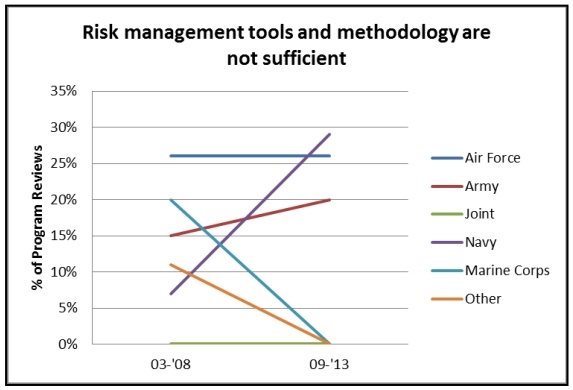
Read as: 25% of programs reviewed since 2009 have insufficient risk management tools and methodologies

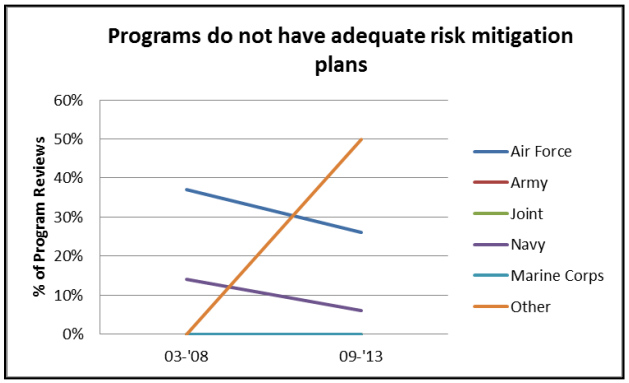
- **Trends over time indicate fewer programs showing evidence of risk management issues; improvements in risk assessment, risk mitigation.**
- **Tools & methods still area for further emphasis**



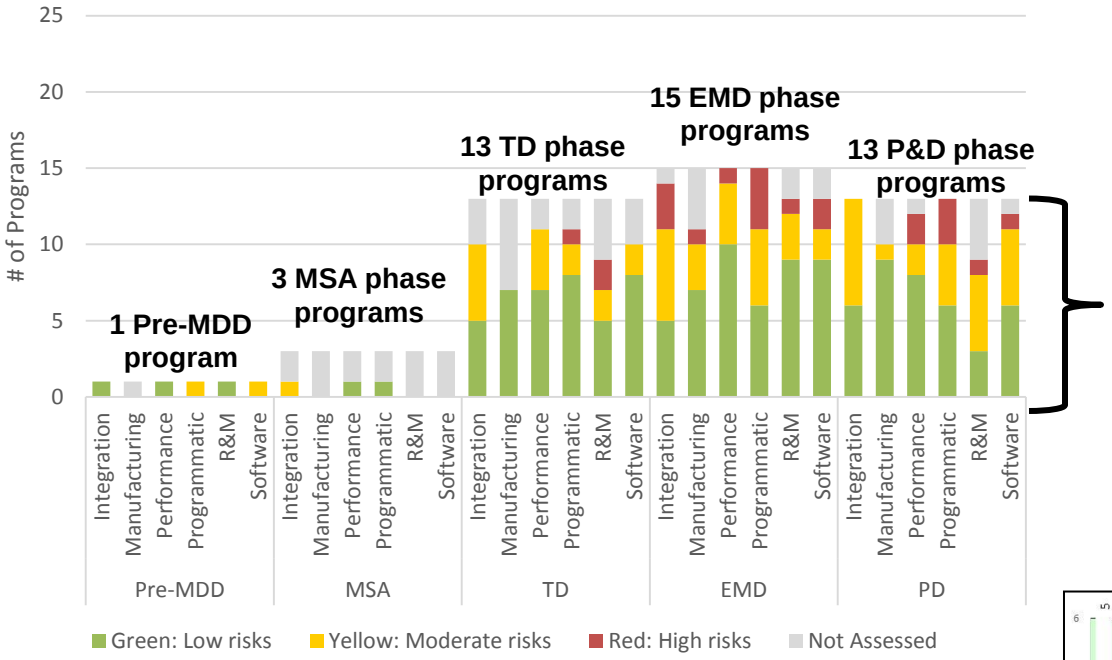
*Representative of data from 120 program reviews covering 12 domains and all Services

Risk Management issue trends over time - Services





SE Assessment of Risk
FY13 Annual Report Programs

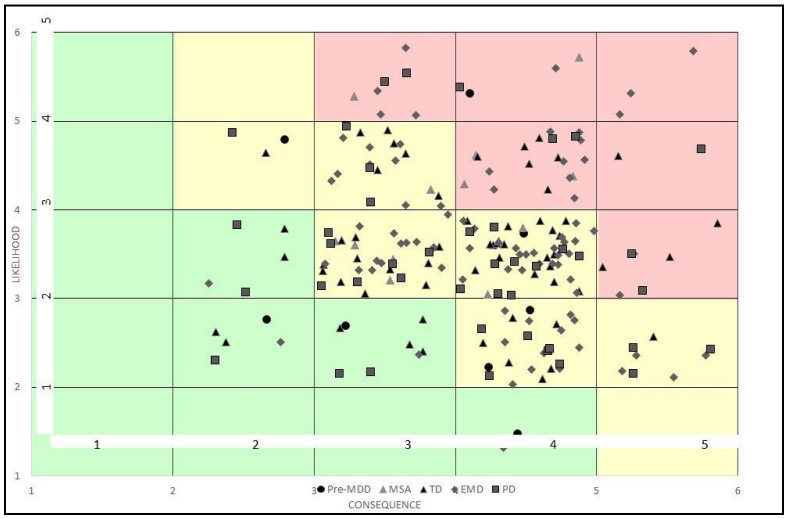


How to read this chart:

Of the 13 P&D phase programs in the annual report:

- Six are assessed as having low software risks
- Five are assessed as having moderate software risks
- One program is assessed has having high software risk
- One program's software risk was not assessed.

This risk cube depicts where program assessed risks fall by phase of a program



Schedule Findings

What we have seen in 2013:

External Pressures:

- Unrealistic demands on time to reach completion

Historical Norms:

- Of 168 Programs surveyed only 47 used historical norms to develop their schedule
- Schedules based on desires/hope instead of reality

Missing / Insufficient Artifacts:

- Of 40 schedules assessed, only 2 identified risks
- IMPs and IMSs artifacts not regularly updated
- Schedules lack detail needed for SRA

Missing Analysis:

- Of 7 risk registers reviewed, only one quantified risks
- Most likely, optimistic, pessimistic task analysis taking into account the probability of occurrence

What we could do better:

Better Planning :

- Develop program artifacts such as WBS, IMP, IMS, Risk Register and Risk Management Plan
- Leverage historical and similar program schedules
- Check the quality and traceability of each artifact

Schedule Realism:

- Identify the critical path and the impact of its delay on program completion
- Justify that time allocated between major activities is realistic and supported with historical evidence

Risk Management:

- Apply appropriate resources to risks - Integrate risk mitigation activities into the IMS/schedule

Change Management:

- Regularly update the IMS to better manage risk and gain confidence in the schedule

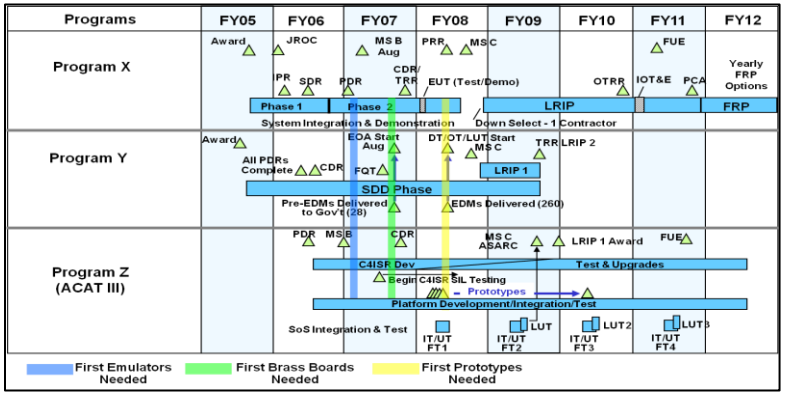
IN SHORT:

- Deficiencies in Schedule Planning
- Incomplete **Integrated Master Schedules**
- Missing Artifacts Prevents Performing **Schedule Risk Analysis**

Integration Risks
Putting the pieces together

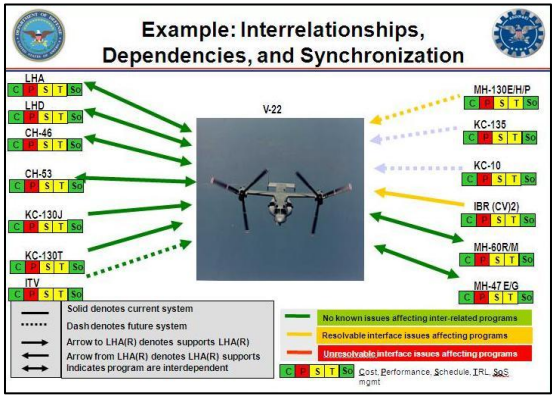
What we are seeing - common integration threads:

- Inadequate resources for integration / planning for integration
- Underestimated difficulty of software integration
- Lack of compliance with Memorandums of Agreement
- Lack of growth margins to accommodate the integration of additional capabilities
- Asynchronous schedules / Differing priorities from external programs leads to delays in establishing capabilities
  - No issues resolution process
  - Difference perspectives about health of linkages
  - Insufficient time for integration and test



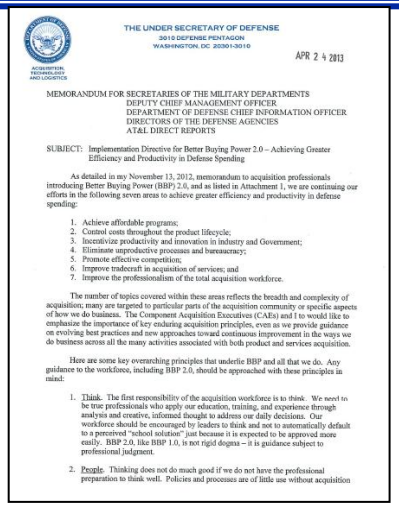
What we want to see

- Development of an Integration Plan and execute in a transparent manner.
- Involve Government stakeholders, especially the PM and the Chief Engineer– use MOAs
- Exploit contractor and government corporate memory (SMEs) to identify and avoid risks
- Establish Growth Requirements (SWaP-C)
- Plan for schedule, performance margin to accommodate integration issues
- Improved management of external dependencies
  - Quantitative reporting of program health metrics



True TD Phase Risk Reduction

The Problem



THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

APR 2 4 2013

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DEPUTY CHIEF MANAGEMENT OFFICER
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER
DIRECTORS OF THE DEFENSE AGENCIES
AT&L DIRECT REPORTS

SUBJECT: Implementation Directive for Better Buying Power 2.0 – Achieving Greater Efficiency and Productivity in Defense Spending

As detailed in my November 13, 2012, memorandum to acquisition professionals introducing Better Buying Power (BBP) 2.0, and as listed in Attachment 1, we are continuing our efforts in the following seven areas to achieve greater efficiency and productivity in defense spending:

1. Achieve affordable programs;
2. Control costs throughout the product lifecycle;
3. Incentivize productivity and innovation in industry and Government;
4. Eliminate unproductive processes and bureaucracy;
5. Promote effective competition;
6. Improve tradecraft in acquisition of services; and
7. Improve the professionalism of the total acquisition workforce.

The number of topics covered within these areas reflects the breadth and complexity of acquisition; many are targeted to particular parts of the acquisition community or specific aspects of how we do business. The Component Acquisition Executives (CAEs) and I to would like to emphasize the importance of key enduring acquisition principles, even as we provide guidance on evolving best practices and new approaches toward continuous improvement in the ways we do business across all the many activities associated with both product and services acquisition.

Here are some key overarching principles that underlie BBP and all that we do. Any guidance to the workforce, including BBP 2.0, should be approached with these principles in mind:

1. Think. The first responsibility of the acquisition workforce is to think. We need to be true professionals who apply our education, training, and experience through analysis and creative, informed thought to address our daily decisions. Our workforce should be encouraged by leaders to think and not to automatically default to a perceived "school solution" just because it is expected to be approved more easily. BBP 2.0, like BBP 1.0, is not rigid dogma – it is guidance subject to professional judgment.

2. People. Thinking does not do much good if we do not have the professional preparation to think well. Policies and processes are of little use without acquisition

Extract from Better Buying Power 2.0 (4/23/2013)

True Risk Reduction in TD

…the Government failed to require meaningful risk reduction during the TD phase … prototype TD programs meet nominal TRL 6 criteria, but without the needed connection to the risks in the product that will actually be built.

Implementing Should Cost

...."Should Cost" targets will be developed using sound estimating techniques

…Our goal should be to identify opportunities to do better and to manage toward that goal

In summary:

- Many TD phase technology maturation prototyping efforts did not reduce risk for eventual EMD end-items
- Focus on reducing risk - risk mitigation benefits of TD Phase prototyping must be explicit. Proving maturity of Critical Technologies needs to be closely coupled with risk reduction for EMD activities.

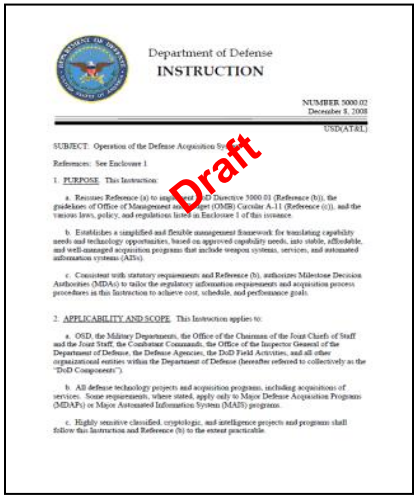
Key Factors:

- **Poor Government understanding of risk space:**
  TD phase investments did not target key risks or reduce uncertainty for EMD design
- **Government expectations were unstable:**
  Changes in requirements at EMD reduced relevance of TD phase investments
- **Acquisition strategy uncoupled between TD and EMD:**
  Contractor responses to EMD RFP did not make use of knowledge/ solutions/ technology matured during TD phase; EMD RFP selection criteria did not incentivize use of TD phase risk reduction

Technology Maturation & Risk Reduction Phase Activities

- **From the Draft Revised 5000.02:**
  - Purpose: Reduce technology, engineering, integration, and life cycle cost risk to the point that a decision to contract for full engineering and manufacturing development can be made with confidence in successful program execution for development, production, and sustainment.
  - Activities: Mix of activities intended to reduce the specific risks for the product to be developed. This includes additional design trades and requirements trades necessary to ensure an affordable product and an executable development and production program. Requirements, to include affordability, become firm during this phase.
- **Required Activities:**
  - Risk reduction prototypes (at the system level or at the technology, sub-components, or components level if appropriate) if they will materially reduce engineering and manufacturing development risk at an acceptable cost
  - Competitive prototyping of the system, or for critical subsystems prior to Milestone B is statutorily required for MDAPs and is a regulatory requirement for all other programs.
  - Prior to the Requirements Decision Point, the PM will conduct a systems engineering trade-off analysis showing how cost varies as a function of the major design parameters. The analysis will support the assessment of final requirements in the CDD. Requirements established by the Component must be consistent with life-cycle affordability goals.
  - Conducting preliminary design activities up to and including a Preliminary Design Review prior to source selection for the Engineering and Manufacturing Development Phase.

Draft DoDI 5000.02


Department of Defense
INSTRUCTION

NUMBER 5000.02
December 8, 2008
USD(AT&L)

SUBJECT: Operation of the Defense Acquisition System

References: See Enclosure 1

1. PURPOSE. This Instruction:

a. Reissues Reference (a) to implement DoD Directive 5000.01 (Reference (b)), the guidelines of Office of Management and Budget (OMB) Circular A-11 (Reference (c)), and the various laws, policy, and regulations listed in Enclosure 1 of this issuance.

b. Establishes a simplified and flexible management framework for translating capability needs and technology opportunities, based on approved capability needs, into stable, affordable, and well-managed acquisition programs that include weapon systems, services, and automated information systems (AISs).

c. Consistent with statutory requirements and Reference (b), authorizes Milestone Decision Authorities (MDAs) to tailor the regulatory information requirements and acquisition process procedures at this Instruction to achieve cost, schedule, and performance goals.

2. APPLICABILITY AND SCOPE. This Instruction applies to:

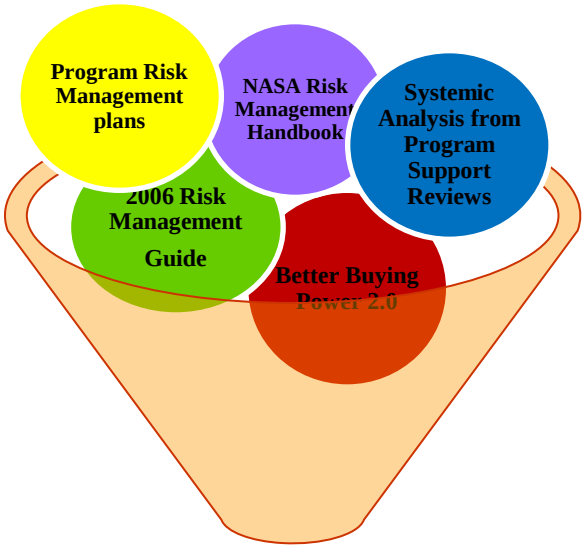
a. OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components").

b. All defense technology projects and acquisition programs, including acquisitions of services. Some requirements, where stated, apply only to Major Defense Acquisition Programs (MDAPs) or Major Automated Information System (MAIS) programs.

c. Highly sensitive classified, cryptologic, and intelligence projects and programs shall follow this Instruction and Reference (b) to the extent practicable.

Draft

Risk Management Guide Update



Insights informing the 2013 Risk Management Guide

2013 Risk Management Guide will enable "True Risk Reduction" via guidance on:

- Integration of risk management with other program management tools, such as the WBS, IMP, IMS and Technical Performance Measures
- Quantifying Risks
  - Identifying quantitative cost & schedule consequences on risk cube
- Issue management
- Opportunity Management
  - Facilitates obtainment of "Should" vice "Will" Costs
- Risk Mitigation activities:
  - Risk burn-down curves
  - Mitigating risks with external programs
- Mitigating common risks in each acquisition phase
- Schedule Health Checks, and Risk Assessments

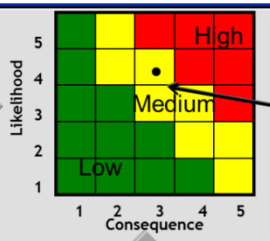
Services and Industry insights will be solicited

Quantifying Risks

What we have seen:

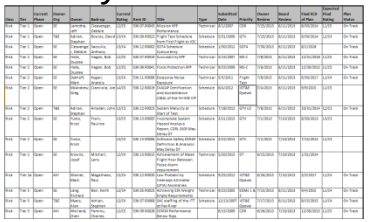
- Varying risk cube formats
- Risk statements don't clearly define the root cause of the event
- Risks confused with "issues" (realized risks)
- Program and technical risks confused
- Substantial cost risks reflected on risk cube
- Despite SEPs and Risk Management Plans containing cost and schedule criteria, many programs in practice do not use the criteria when locating risks on a risk cube
  - The guide provides additional guidance to identify the RDT&E, procurement, and O&S costs

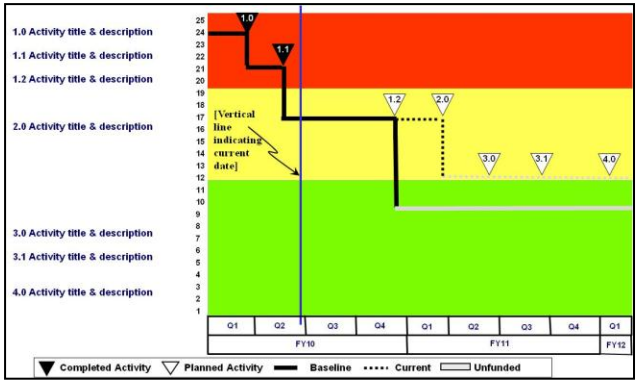
Level	Likelihood	Probability of Occurrence
1	Not Likely	≤ 10%
2	Low Likelihood	≤ 30%
3	Likely	≤ 50%
4	Highly Likely	≤ 70%
5	Near Certainty	≤ 90%



- ✓ Risk ID Number
- ✓ Risk Driver:
- ✓ Risk Handling Action:
- ✓ Closure Date:
- ✓ Cost Impacts:
  - ✓ RDTE
  - ✓ Procurement
  - ✓ Operations & Support
- ✓ Schedule Impacts:
  - ✓ Months

Level	Technical Performance	Schedule	Cost		
			RDT&E	Procurement	Operations & Support
1	Minimal or no consequence to technical performance	Minimal or no impact	Minimal or no impact < $A	Minimal or no impact < $A	Minimal or no impact < $A
2	Minor reduction in technical performance or supportability; can be tolerated with little or no impact on program	Able to meet key dates Slip <_months	Budget increase or unit production cost increase $A < $B	Budget increase or unit production cost increase $A < $B	Budget increase or unit production cost increase $A < $B
3	Moderate reduction in technical performance or supportability with limited impact on program objectives	Minor schedule slip. Able to meet key milestones with no schedule float Slip <_months	Budget increase or unit production cost increase $B< $C	Budget increase or unit production cost increase $B< $C	Budget increase or unit production cost increase $B< $C
4	Significant degradation in technical performance or major shortfall in supportability; may jeopardize program success	Program critical path affected Slip <_months	Budget increase or unit production cost increase $C < $D	Budget increase or unit production cost increase $C < $D	Budget increase or unit production cost increase $C < $D
5	Severe degradation in technical performance; cannot meet KPP or key technical/supportability threshold; will jeopardize program success	Cannot meet key program milestones Slip <_months	Exceeds APB threshold >$D	Exceeds APB threshold >$D	Exceeds APB threshold >$D





What we're doing about it:

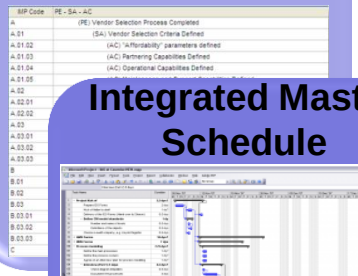
- Guide expanded to include quantitative assessments of the program cost and schedule impacts
  - Quantify associated RDT&E, Procurement and O&S costs on risk cube
  - Quantify schedule impacts in years or months
- Guidance on risk registers and risk burn-down curves

Fundamentals of Risk Management

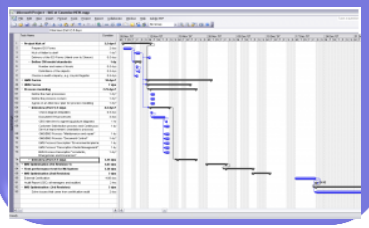
Must have linkage and traceability between IMP and IMS

- Roadmap for entire program

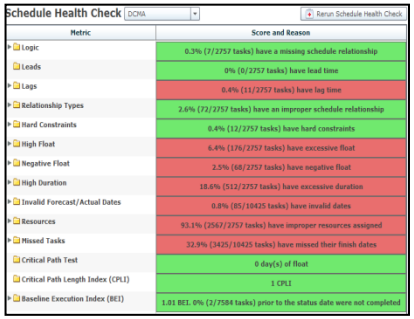
Integrated Master Plan



Integrated Master Schedule



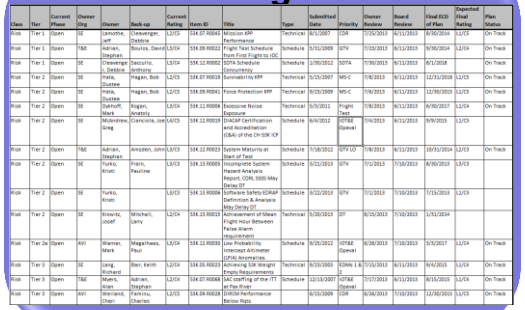
14-point Schedule Health Check



What this should have:

- Risk ID
- Likelihood & consequence
- Risk rating
- Status of designated handling plan
- Tiering

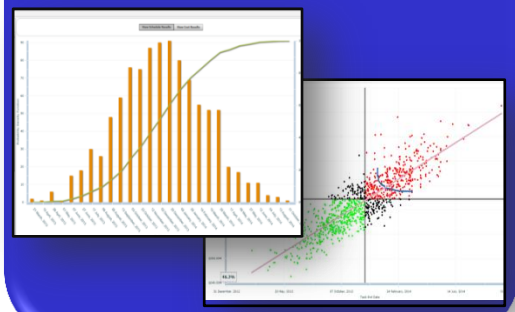
Risk Register



A good IMS has:

- Event driven tasks
- Predecessor/Successor relationships
- Realistic durations
- Allocated resources
- Should provide the critical path

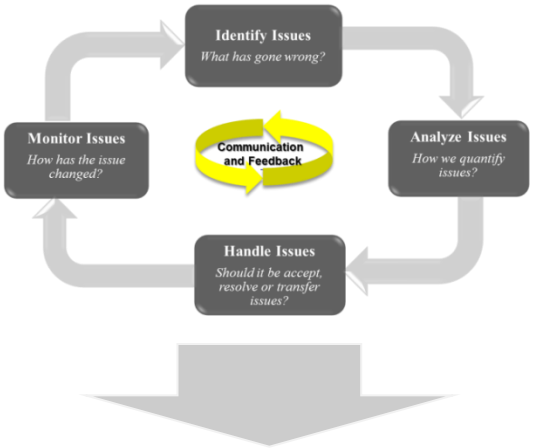
Schedule Risk Assessment

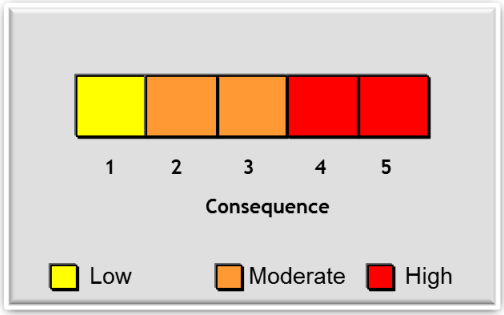


SRA Provides:

- Quantitative assessment of IMS critical path
- Monte Carlo simulation
- Best case, most likely and worst case schedule scenarios

Issue Management



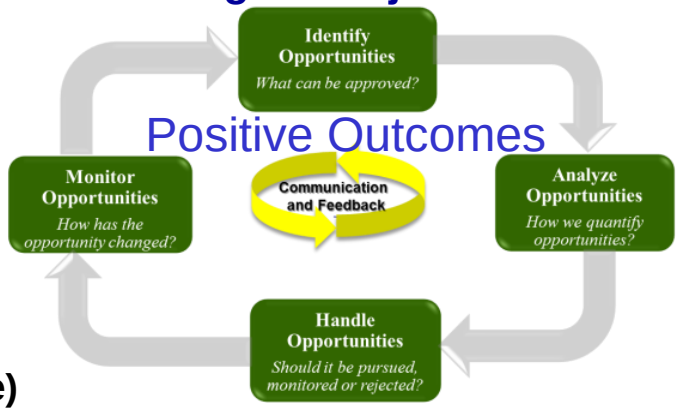


- **Issue**
  - An event or situation with negative consequences that have occurred
    - Issues are realized risks
  - Addressed during regular battle rhythm of program activities
- **Issue Management**
  - Fundamental to Program Management
  - Identifies and develops action plans to address impact on program
    - Issue mapped according to consequences
    - Options include resolving, transferring or accepting the issue
    - Resources applied to resolve an issue or minimize its consequences
  - Tracks issues and associated action plans
    - Ensure IPTs and functional teams have current knowledge of issues
- **Programs should have an issue management process separate and distinct from risk management process**
  - Don't confuse issues with risks

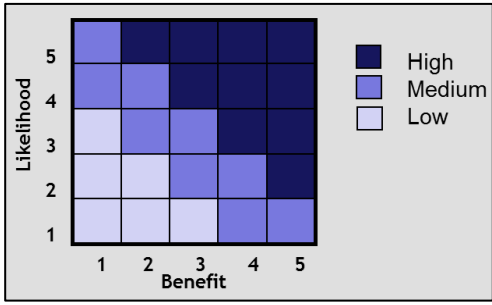
Rigorous Issue Management shifts management from reactive to proactive

Opportunity Management Supports Better Buying Power 2.0

- **Opportunity Management (OM) is a process used to identify, analyze, plan, implement and track initiatives that can yield improvements in the program's cost, schedule, and/or performance baseline through the reallocation of internal or external resources**
- **Better Buying Power and Opportunity Management have analogous objectives**
  - **Better Buying Power:**
    - **"Our goal should be to identify opportunities to do better and to manage toward that goal."**
    - **Eliminate non-value added requirements and processes**
  - **Opportunity Management Process:**
    - **Identify and implement initiatives to yield program improvements (cost, schedule, and/or performance)**
    - **Identifying opportunities start with forecasting potential enhancements within the program's technical mission, stakeholder objects and contract**



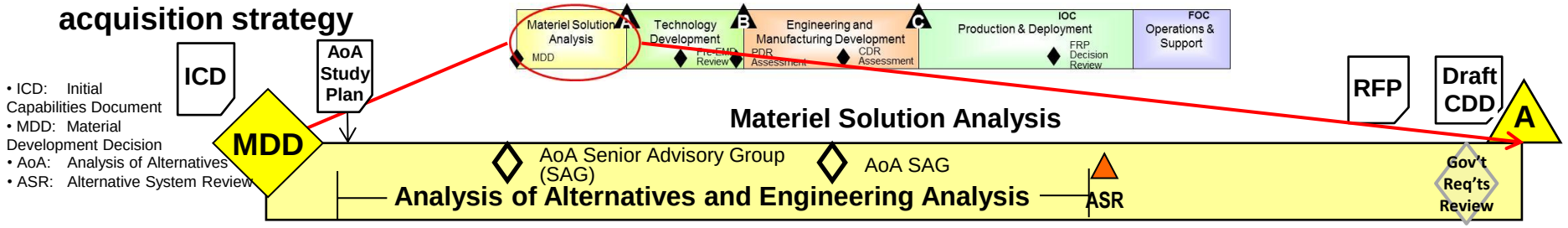
- **Opportunity management enables achieving "should" cost objectives**
- **Opportunities exist in every program, but often they are not thought of as an overall part of actively managing the system during its life-cycle**



Effective Opportunity Management* ⟺ *Successful Better Buying Power

Key Risk Reductions in MSA Phase

This phase conducts the analysis and other activities to choose the concept for the product to be acquired, to refine the requirements, and to conduct planning to support a decision on the acquisition strategy



Proactive risk reduction activities:

- Solicit feedback of maturity of technologies and requirements realism via Industry Days
- Limit critical technologies – identify alternative technologies in case off-ramps are needed
  - Conduct early SE assessments to assess technologies
- Develop design concepts to assess the state of the possible- informs requirements
- AoA study guidance should ensure technical and engineering risks are assessed for each technically feasible alternative
- Draft CDD is developed by MS A to baseline requirements for tradeoff analysis in TD phase
- Establish initial affordability goals

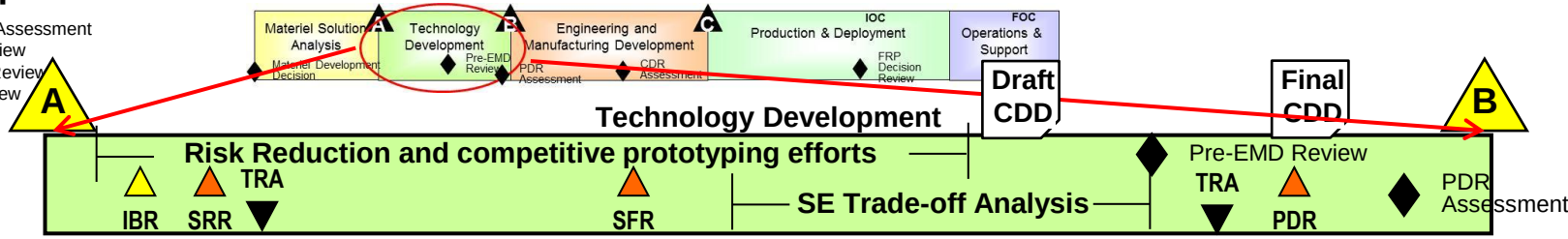
Proactive risk reduction activities (continued):

- Develop a low risk program schedule early in the program. The schedule should:
  - Be representative of historical programs vice being externally driven
  - Reflect appropriate phasing between activities, with some level of concurrency
- Program office and user should hold a government requirements review to ensure proper translation of requirements into the performance specification
- TD phase RFP solicits Integration Plan, IMS through prototype delivery, drawings, mature technologies, and SIL
  - Require TD phase contractors to identify problematic requirements and cost / schedule drivers early in TD phase

Key Risk Reductions in TD Phase

The purpose of this phase is to reduce technology, engineering, integration, and life cycle cost risk to the point that a decision to contract for full EMD can be made with confidence of success

- TRA: Technology Readiness Assessment
- IBR: Integrated Baseline Review
- SRR: System Requirements Review
- PDR: Preliminary Design Review



Proactive risk reduction activities:

- Risk reduction/competitive prototyping should be representative of end item design to have merit in informing trades and engineering risks
- Conduct early technology assessment
  - Ensure IMS includes resourced off-ramps for technologies that don't mature as planned
- Maintain vertical/horizontal communications
  - Hold regular WIPTs – have risks on agenda
  - Integrate external program into battle rhythm
- Conduct SE trade-off analysis prior to the Pre-EMD review to finalize CDD requirements
  - Include and garner support of senior leadership
  - Assess cost and schedule drivers
- Seek competency SME opinions more frequently than just SE technical reviews

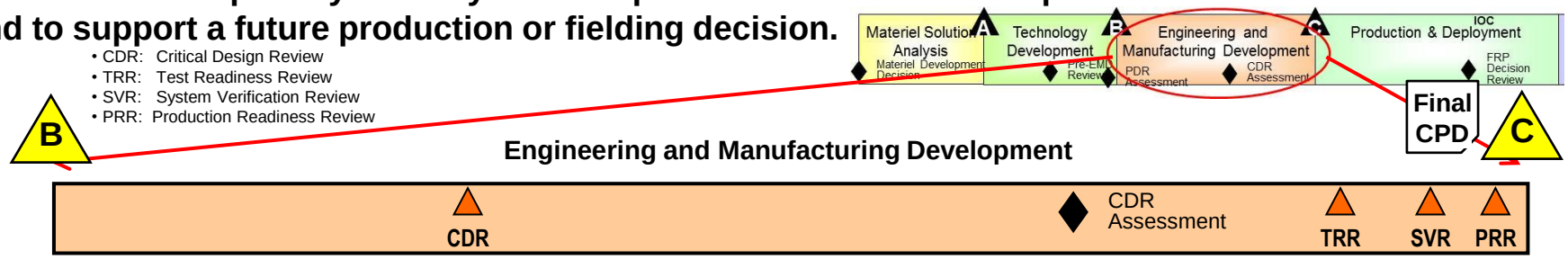
Proactive risk reduction activities (continued):

- Program should be guided by small set of KPPs/KSAs to preclude impacting the contractor's trade space
  - Develop a defined decision hierarchy for trade studies affecting KPP/KSAs to timely decide and mitigate risks
- Establish cost, schedule, and/or performance margins
- Conduct contractor shakedown testing prior to government handoff and testing
- Avoid urgency of need outweighing good engineering
- Adequately staff program with qualified personnel – identify key leaders shortfalls
- Conduct preliminary design activities through PDR prior to source selection for EMD phase
  - Prototyping and TRA should inform the PDR
  - The PDR should inform the CDD update
- Demonstrate system performance to support next financial commitment decision

Key Risk Reductions in EMD Phase

The purpose of the EMD Phase is to develop, build, and test a system or one or more increments of capability to verify that all operational and derived requirements have been met and to support a future production or fielding decision.

- CDR: Critical Design Review
- TRR: Test Readiness Review
- SVR: System Verification Review
- PRR: Production Readiness Review



Proactive risk reduction activities:

- Establish Interface Control Working Group
  - Identify internal and external interface requirements
  - Develop an Integration Plan to manage interfaces of new technologies with other system elements
  - Develop MoAs with external programs that contain "tripwires" for cost, schedule and performance
  - Resolve interface issues at lowest level possible
- Promote communications between PMs, contractors and IPTs to mitigate integration risks
- Establish realistic, event driven schedule
  - Establish schedule, performance, and cost margin
  - Conduct regular schedule risk assessments
- Understand how much work is being outsourced (risk stretches across entire team, not just prime)

Proactive risk reduction activities (continued):

- Reassess SE trade-off analysis from TD
- Avoid requirements creep. Push new requirements to the next increment
  - Requirements changes for CPD should be informed by DT/OT results, and the CDR
- Burn down integration risks– hot benches, SILs, prototypes
- Solicit insights from external review teams (Red Teams, PSRs, etc.) to provide recommendations to mitigate technology, integration and technical risks
- Keep cost team busy with quantifying the technical impact of "what if" drills such as 5%, 10%, 15% funding reductions

Summary

- **Risk management is foundational to the success of DoD acquisition programs**
  - Program engagements, including assessments, have shown an uneven application of risk management
- **Additional policy and guidance as well as oversight are intended to:**
  - Improve the application of risk and issue management application
  - Promote use of opportunity management to obtain “should” costs
  - Stimulate “TRUE” risk reduction activities in program planning to:
    - Mature requirements
    - Reduce technology, engineering, integration, and life cycle cost risks
    - Provide confidence when making financial commitments
    - Promote successful program execution throughout development, production, and sustainment phases

For Additional Information

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