



DoD Systems Engineering Update

Mr. James Thompson

Director, Major Program Support

Office of the Deputy Assistant Secretary of Defense

for Systems Engineering

NDIA SE Division Meeting, June 18, 2014



Performance of the Defense Acquisition System (2014 Report)



Performance of the Defense Acquisition System, 2014

PERFORMANCE OF THE DEFENSE ACQUISITION SYSTEM

2014 ANNUAL REPORT



JUNE 13, 2014

Approved for public release; distribution unlimited

- **From the Foreword:**

In our second annual report on acquisition performance, we focus on incentives—particularly those from contract types and profits or fees—in addition to updating our prior analysis for which recent data might affect the statistical results. Most of the development and production on acquisition programs is conducted by industry under contract to the government. Therefore, we examine various incentive techniques to see how effective they are at driving cost, schedule, and technical performance.

- **Conclusions**

- Not all incentives work.
- “Cost-plus versus fixed-price” is a red herring.
- CPIF and FPIF contracts perform well and share realized savings.
- FFP contracting requires knowledge of actual costs.
- Competition is effective—when viable.
- Production margins may help minimize development time.

Performance of the Defense Acquisition System, 2014 Annual Report. Washington, DC: Under Secretary of Defense, Acquisition, Technology, and Logistics (USD[AT&L]), June 13, 2014. (<http://www.acq.osd.mil/docs/Performance-of-Defense-Acquisition-System-2014.pdf>)



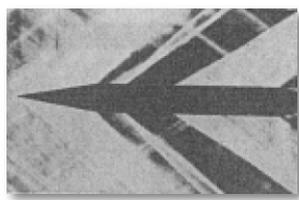
Risk Management in DoD Programs



Our Nation's Capabilities are Critically Dependent on Risk Management



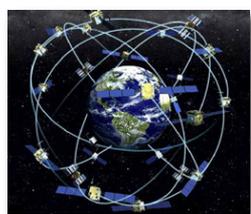
Powered flight



Supersonic flow



Communications



Global positioning



Stealth / LO



Long-endurance ISR



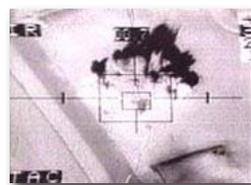
Gas turbine engine



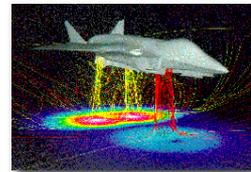
Night attack



ICBMs



Precision strike



Computer simulations



High-power lasers



Aerial refueling



High-speed flight



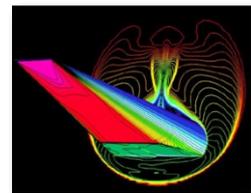
Space ISR



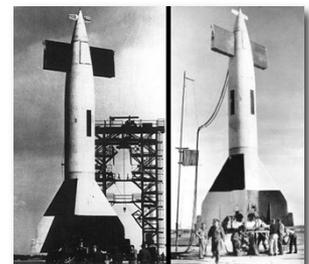
Space launch



Directed energy



Hypersonics



Rocket flight



Long-range radar



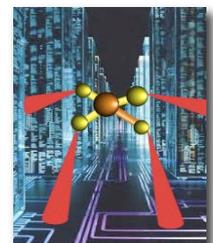
5th-gen fighters



Blended wing-body



Unmanned systems



Cyber operations



Risk

“A prudent person foresees the danger ahead and takes precautions. The simpleton goes blindly on and suffers the consequences.”

– *Proverbs 27:12*

“The sea is dangerous and its storms terrible, but these obstacles have never been sufficient reason to remain ashore... Unlike the mediocre, intrepid spirits seek victory over those things that seem impossible... It is with an iron will that they embark on the most daring of all endeavors... to meet the shadowy future without fear and conquer the unknown.”

– *attributed to Ferdinand Magellan, Explorer (c. 1520)*

“A ship in harbor is safe, but that is not what ships are built for.”

– *attributed to J.A. Shedd, circa 1928*



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 Support

Systems Engineering Plans

Systemic Root Cause Analysis

Development Planning/Early SE

Program Engagements

Mission Assurance
Vacant

Leading Systems Engineering Practice in DoD and Industry

Systems Engineering Policy & Guidance

Development Planning/Early SE Policy

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



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

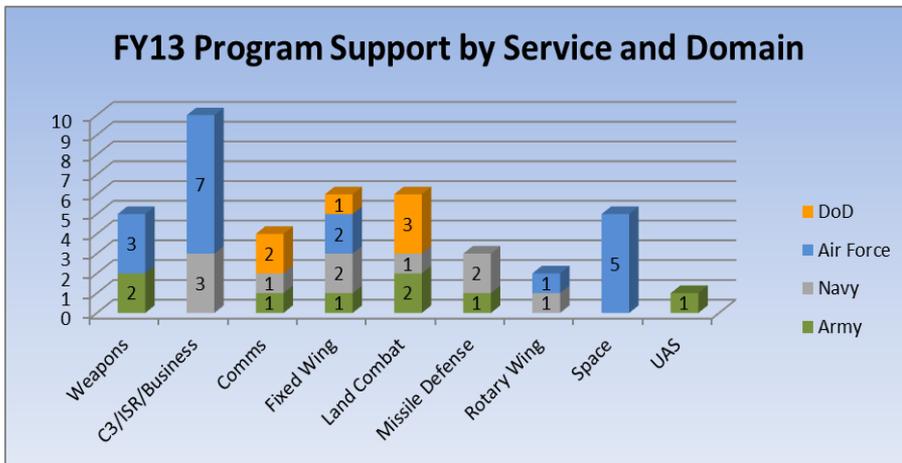
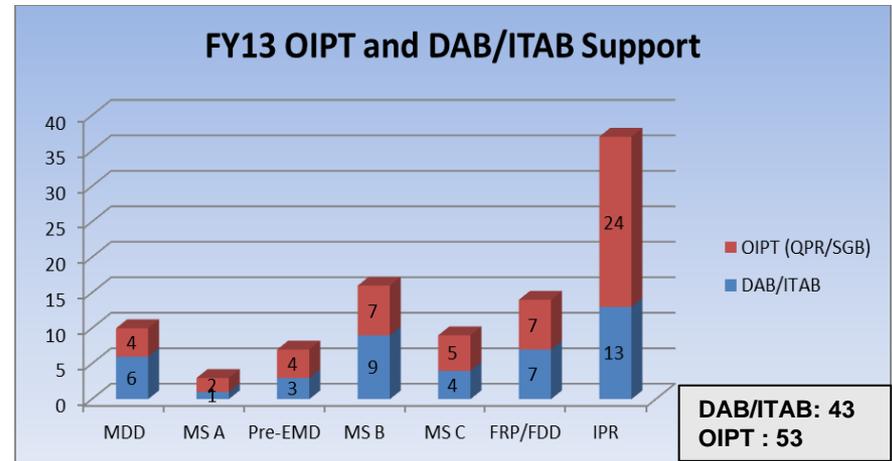
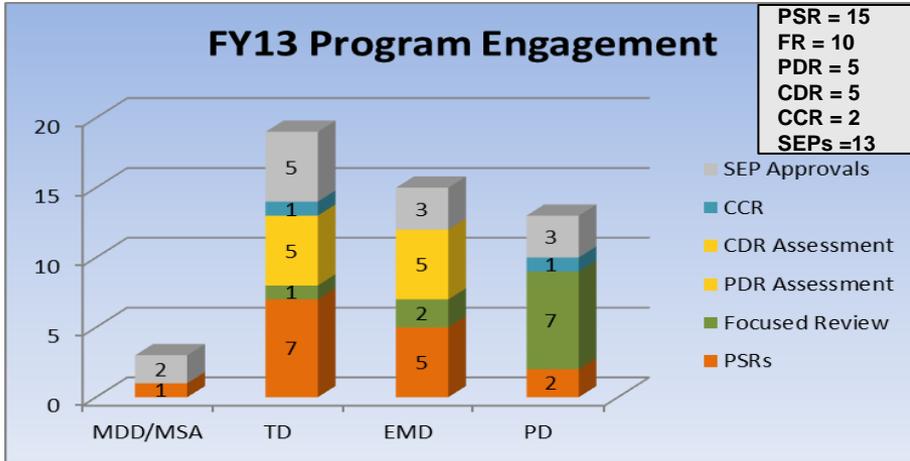
DASD(SE) Mission: Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected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

- ***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***

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



SE Program Engagements



Program Engagements

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

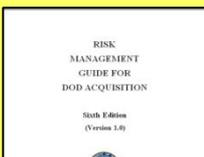
Products

- Systems Engineering Plans
- PSA 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

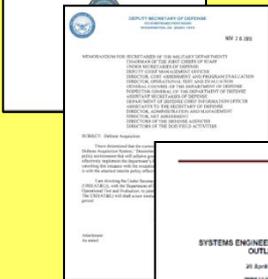


Risk Management in DoD

Policy



Risk Management Guide (RMG) 2006

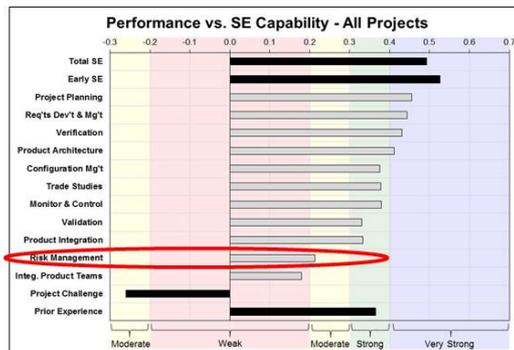


Interim DoDI 5000.02, 2013

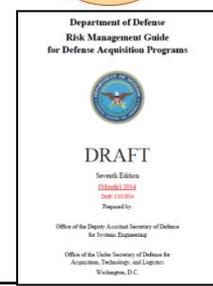


SEP Outline April 2011

Practice



Evolving Approaches/ Initiatives



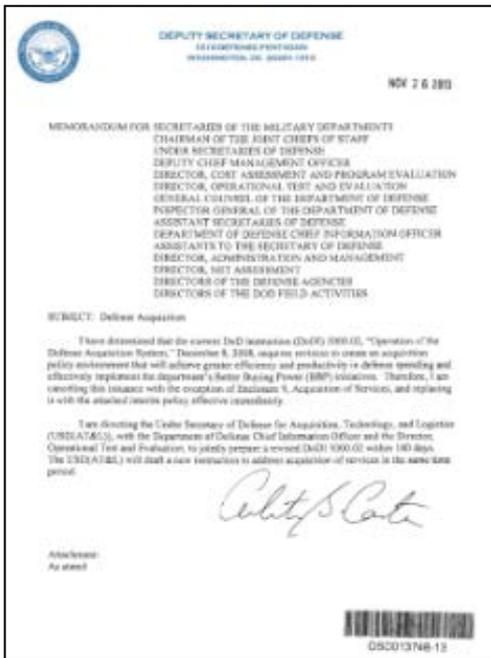
Today's presentation focuses on the status of DoD Risk Management in major acquisition programs, what we see in practice, and initiatives to improve



DoDI 5000.02 Links Risk Management to Goals for Each Phase



Interim DoDI 5000.02, 2013



• Materiel Solution Analysis Phase

- “AoA solutions, key trades between cost and performance, affordability analysis, risk analysis, and planning for risk mitigation are key activities in this phase”

• Technology Maturation and Risk Reduction 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 EMD can be made with confidence”

• Engineering and Manufacturing Development Phase

- “EMD completes all needed hardware and software detailed design; systemically retires any open risks; builds and tests prototypes or first articles to verify compliance with capability requirements; and prepares for production or deployment

• Production and Deployment Phase

- “Prior to entry....demonstration that the production design is stable and will meet stated and derived requirements, based on acceptable performance in developmental test; an operational assessment; mature software capability consistent with the software development schedule; no significant manufacturing risks...”

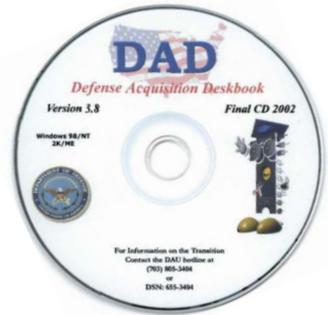
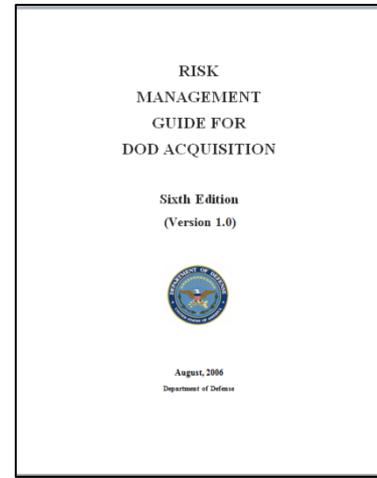
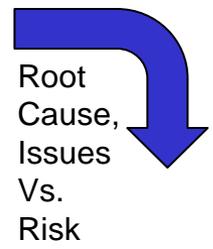
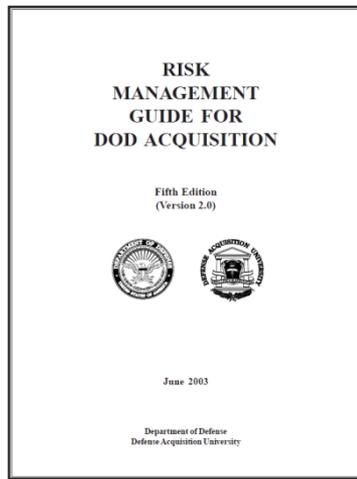
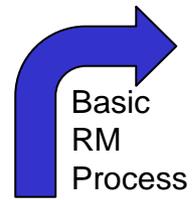
The primary DoD Acquisition Policy document, DoDI 5000.02, focuses on managing and reducing risks



Engineering Risk Management Evolution



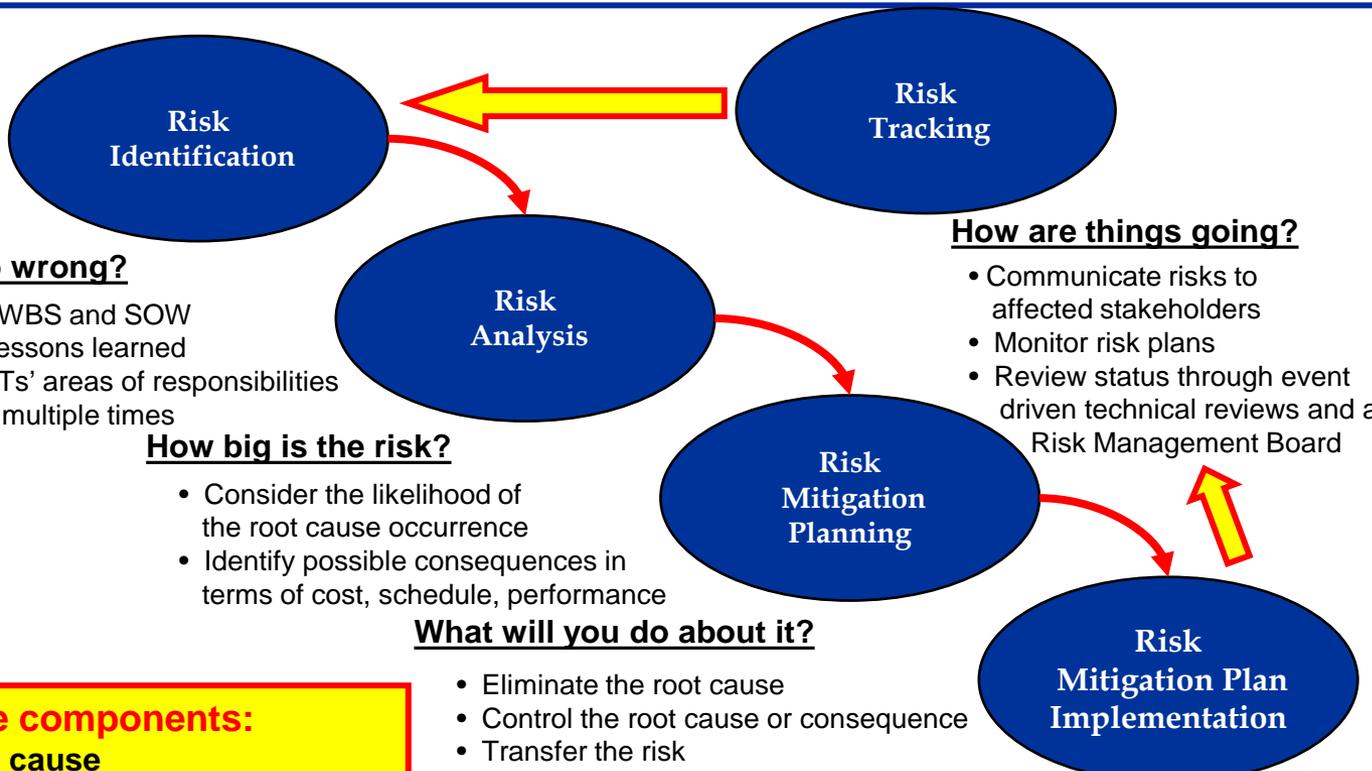
OSD Risk Working Group



Last update to Risk Management Guide in 2006



Current DoD Risk Management



What can go wrong?

- Study the WBS and SOW
- Examine lessons learned
- Review IPTs' areas of responsibilities
- Ask "why" multiple times

How big is the risk?

- Consider the likelihood of the root cause occurrence
- Identify possible consequences in terms of cost, schedule, performance

What will you do about it?

- Eliminate the root cause
- Control the root cause or consequence
- Transfer the risk
- Assume the level of risk

How are things going?

- Communicate risks to affected stakeholders
- Monitor risk plans
- Review status through event driven technical reviews and a Risk Management Board

Risk has three components:

- A future root cause
- A probability (likelihood) of the future root cause occurring
- The consequence (or effect) of the future occurrence

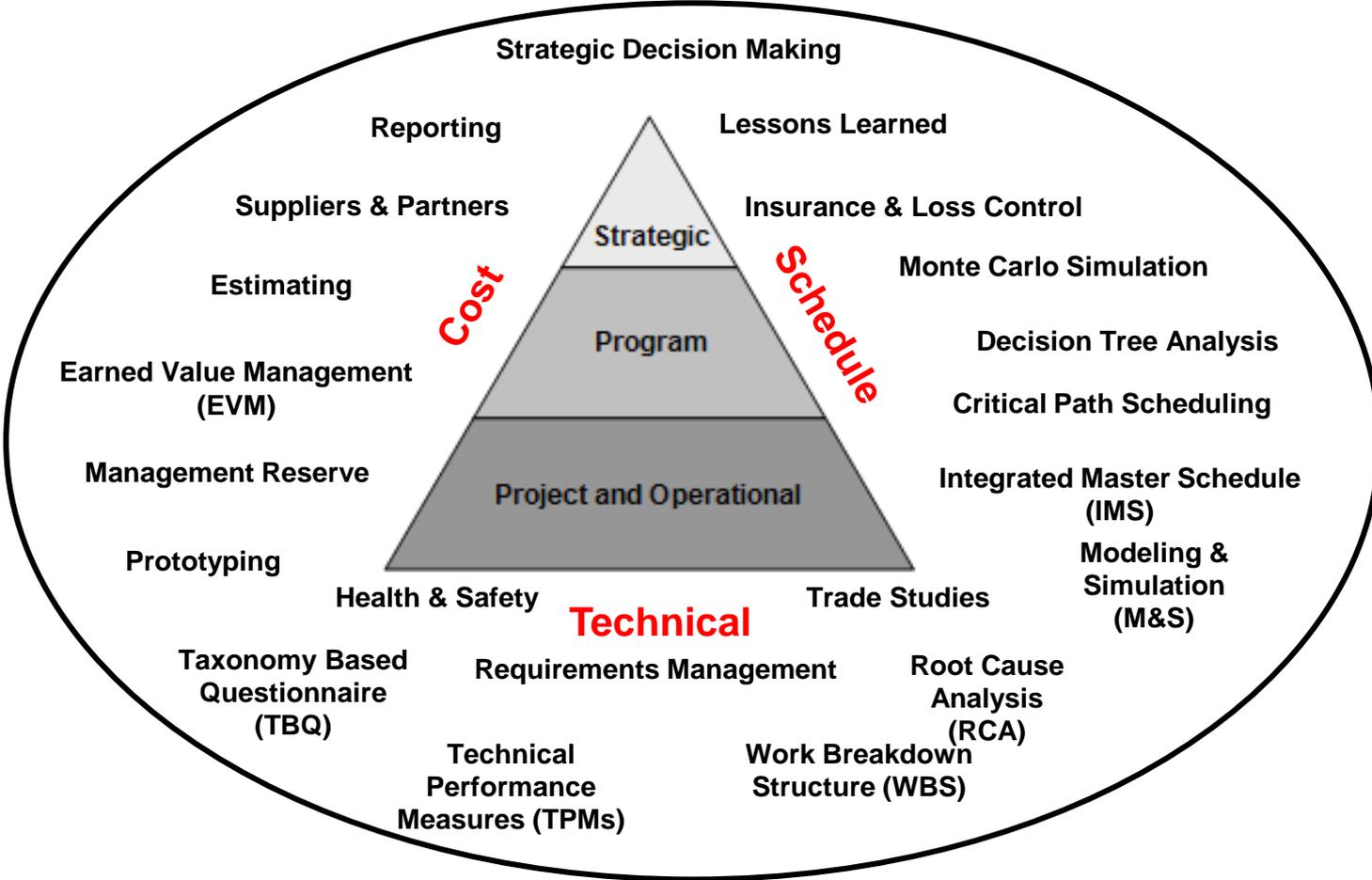
How is the planned risk mitigation being implemented?

- Determine what planning, budget, and requirements changes are needed
- Provide a coordination vehicle with management and other stakeholders
- Document changes

The greatest risk of all is to take no risk at all!



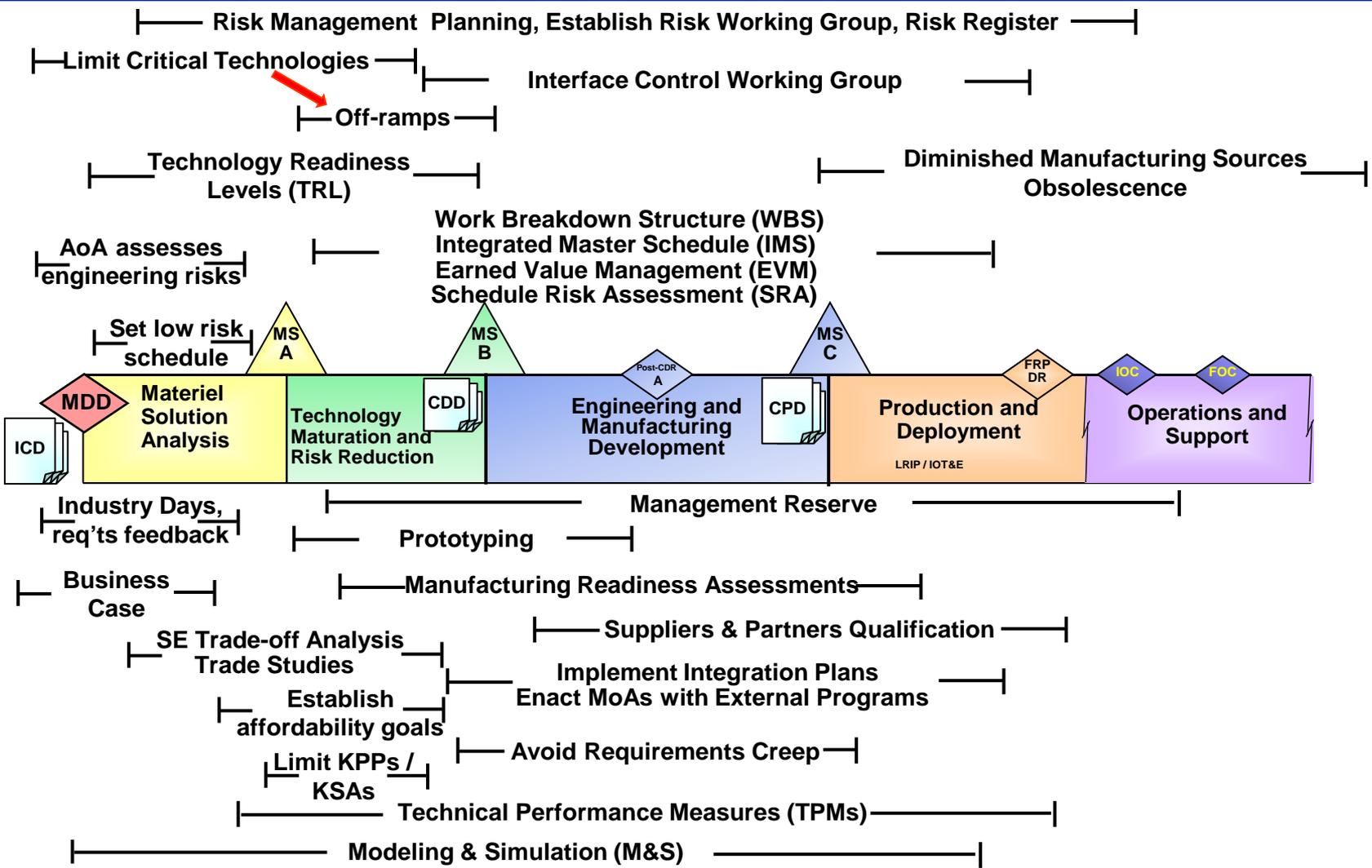
Formal Risk Management Tools and Techniques



But tools and techniques alone are not enough to help us effectively manage risk



Risk Management Tools and Techniques



Tools and techniques alone are not enough to help us effectively manage risks



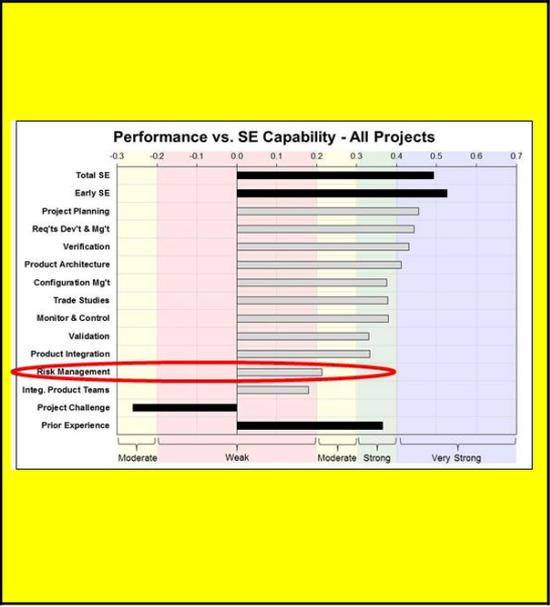
Policy

Risk Management Guide (RMG) 2006
Sixth Edition (Version 1.6)

Interim DoDI 5000.02, 2013

SEP Outline April 2011

Practice



Evolving Approaches/ Initiatives

Department of Defense Risk Management Guide for Defense Acquisition Programs

DRAFT

Sixth Edition
October 2014
Date 10/14/14
Prepared by:
Office of the Deputy Assistant Secretary of Defense for Systems Engineering
Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
Washington, D.C.



Risk Management Systemic Findings

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

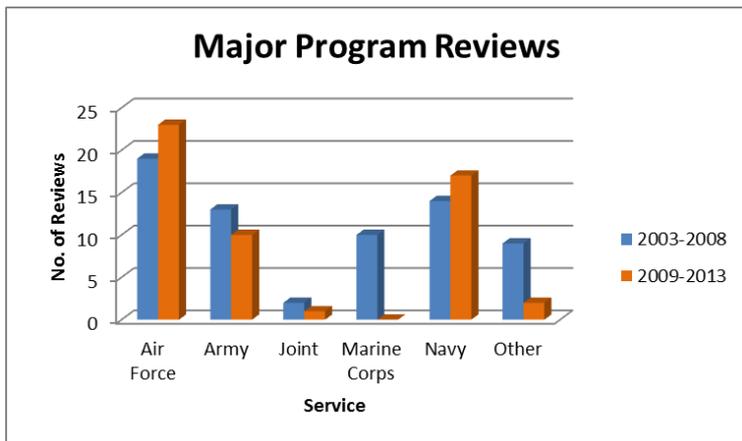
Oct 2013

Risk Management Systemic Finding	% of Program Reviews	
	2003-2008	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

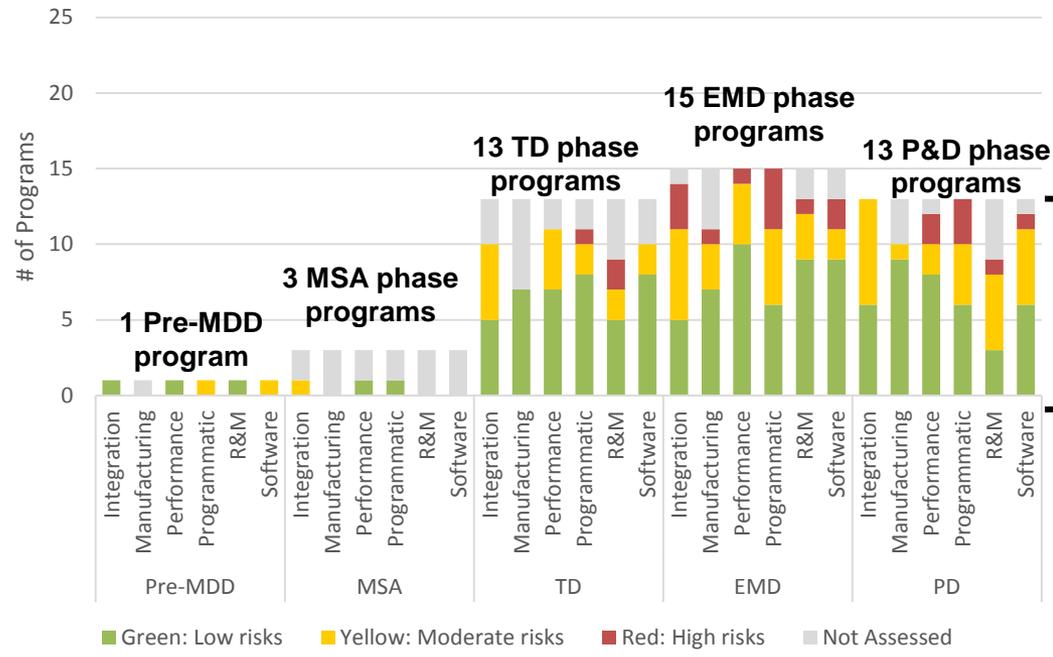
- Trends over time indicate fewer programs showing evidence of risk management issues; improvements in risk assessment, risk mitigation.
- Tools & methods still area for further emphasis



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



SE Assessment of Risk FY13 Annual Report Programs

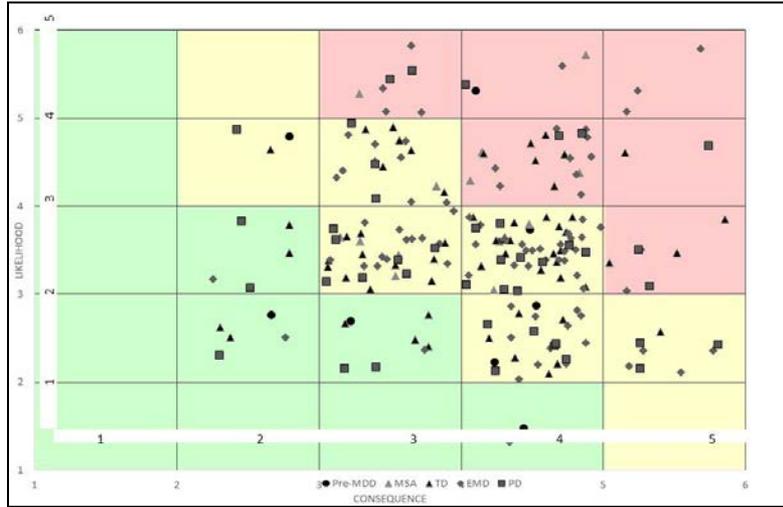


How to read this chart:

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

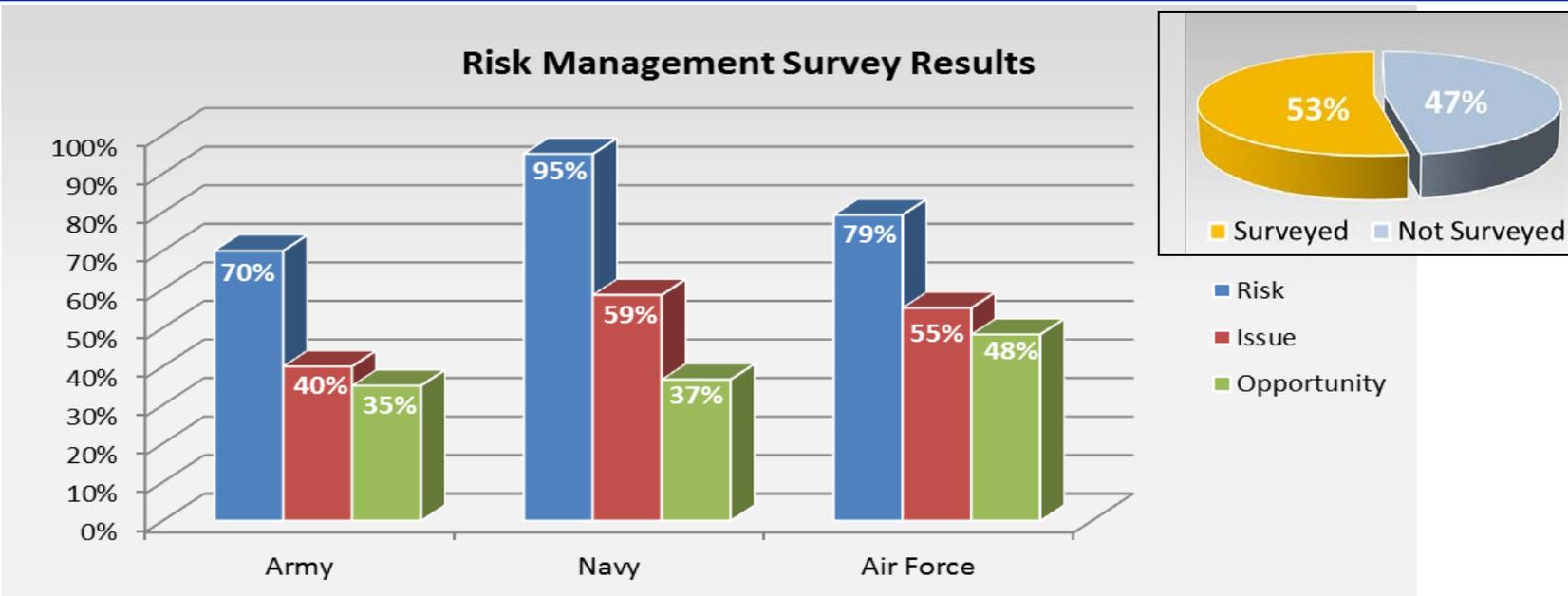
- Six are assessed as having low software risks
- Five are assessed as having moderate software risks
- One program is assessed has having high software risk
- One program's software risk was not assessed.

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





2014 MPS Risk Management Survey



- 84% (76 of 90) programs we surveyed currently have documented Risk management processes
 - 20 Army, 41 Navy, and 29 Air Force Programs
- 53% (48 of 90) programs have documented processes for managing Issues
- 40% (36 of 90) programs have documented processes for managing Opportunities

82% of programs surveyed are assessed as implementing their Risk Management practices in accordance with their documented plans



Deep Dive Assessment of Risk Management on 10 Programs



How well are programs planning and executing DOD RM Guidance?

Process Area	Program A		Program B		Program C		Program D		Program E		Program F		Program G		Program H		Program I		Program J		Overall	
	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E
Identification*	Green	Red	Yellow	Red	Green	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Green	Green	Yellow
Analysis	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Mitigation Planning	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Mitigation Plan Implementation*	Green	Yellow	Red	Red	Green	Green	Red	Red	Green	Green	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Green	Green	Yellow
Tracking	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
RM Preparation Planning	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Overall

- Sampled programs are planning in accordance with DOD Risk Management guidance
- However, some programs struggle in execution of Risk Identification and Risk Mitigation Plans
 - Programs not actively opening and closing risks
 - Wide range of program level tracked risks from more than 80 to less than 10
 - Mitigation activities not linked to IMS

Program's Plans						Risk Management Practices					Program's Execution					
1	2	3	4	5	Don't Know	1 = Strongly Disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly Agree	1	2	3	4	5	Don't Know
<i>Risk Identification</i> is conducted to answer the question "What can go wrong?".																
				X		1. Employs a formal and repeatable process to identify risks.									X	
		X				2. Identifies root causes that could adversely affect the ability of the program to meet cost, schedule, and performance goals.							X			
			X			3. Decomposes the program into relevant areas at a sufficient level of detail to succinctly identify risks.							X			
			X			4. Classifies risks into appropriate categories and distinguishes between risks and issues.									X	
			X			5. Identifies risks continuously throughout each phase of the program.							X			
			X			6. Explores root causes against objective measures.										X



NDIA SE Effectiveness Study

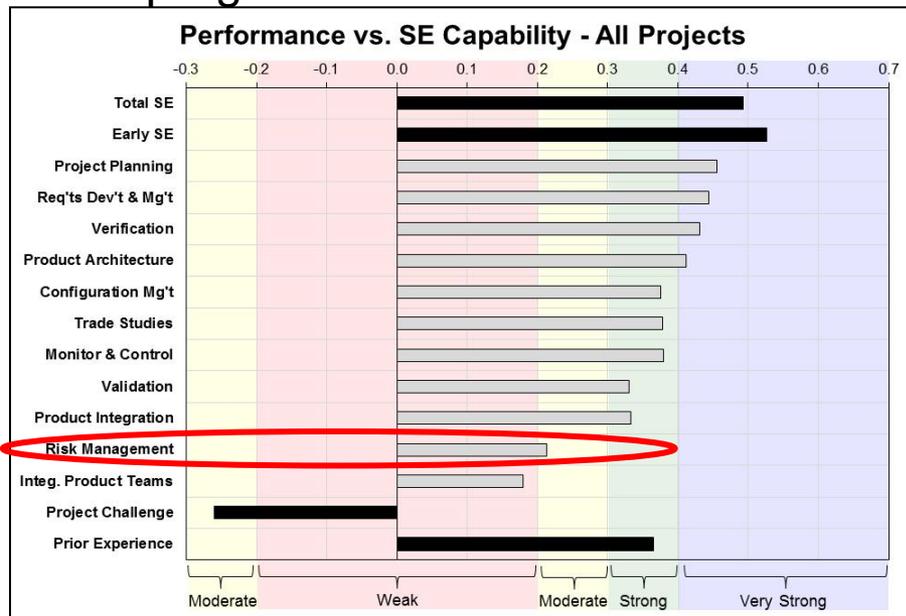
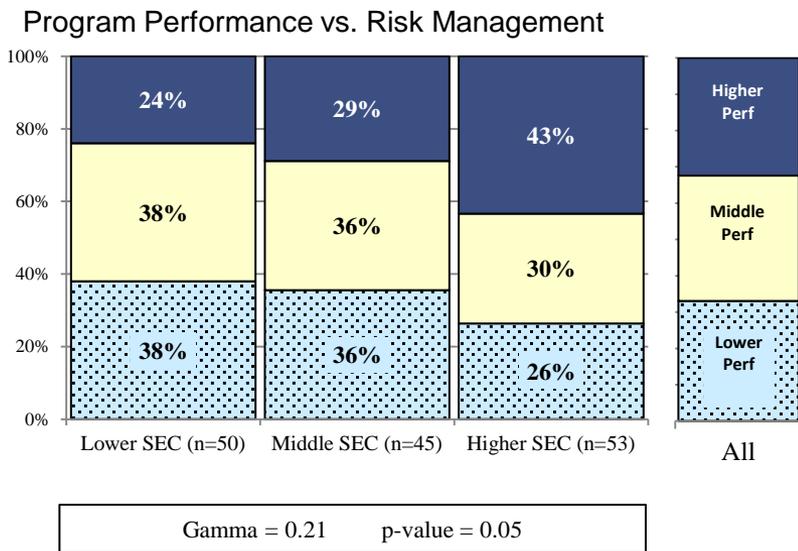


Reference: Quantifying the Effectiveness of SE, J. Elm, 1 Nov 2013

2012 SE Effectiveness Study (NDIA, IEEE-AESS, and SEI) found:

- Better Risk Management yields better programs

However, the survey found the acquisition community doesn't see a strong link between risk management and program success





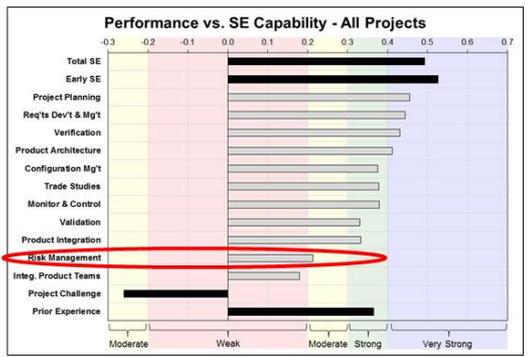
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Technology Readiness Assessment (TRA) Policy Evolution



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

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

MAY 11 2011

MEMORANDUM FOR COMPONENT ACQUISITION EXECUTIVES

SUBJECT: Improving Technology Readiness Assessment Effectiveness

As I noted in my "Better Buying Power" memorandum last year, the process for conducting Technology Readiness Assessments (TRAs) has strayed from its original intent and should be reformed. TRAs should focus only on technology maturity, as opposed to engineering and integration risk, and the responsibility for ensuring that technology maturity risk is adequately identified and mitigated should rest with the Program Manager (PM), Program Executive Officer, and Component Acquisition Executive, subject to ASD(R&E) review.

New instructions for conducting TRAs are contained in updated "TRA Guidance" (<http://www.acq.osd.mil/ddre/publications/docs/TRA2011.pdf>). Some of the significant changes from prior TRA procedure are as follows:

- A TRA is required for Major Defense Acquisition Programs (MDAPs) at Milestone (MS) B (or at a subsequent milestone if there is no MS B) to support the independent review and assessment by the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)). The ASD(R&E) will determine whether the technology of the program has been demonstrated in a relevant environment to support the MS Decision Authority (MDA)'s certification under 10 U.S.C. § 2366b. TRAs for the ASD(R&E) are not required for Major Automated Information System programs, non-MDAPs, or MDAP MS C decisions, except for MDAPs entering the acquisition system at MS C. However, MDAs for all programs are required to ensure that technology risk has been reduced to acceptable levels prior to entering engineering development or design for production. Acquisition Category II-IV programs should conduct TRAs in accordance with relevant Component direction by tailoring the "TRA Guidance" as appropriate.
- A TRA will be conducted and reported by the PM who will select a team of subject matter experts to assist in conducting the TRA. The PM will align the process by which critical technologies are identified and evidence of technology maturity is acquired with the program's schedule and resources.
- A preliminary version of the TRA final report will be presented at the pre-MS B MDA Review prior to RFP release for the EMD phase.
- The PM will submit a TRA final report through the appropriate Component Acquisition Executive to the ASD(R&E) who will evaluate the report as part of the basis upon which the ASD(R&E) will make recommendations to the MDA. Based on the advice of the ASD(R&E), the MDA will determine whether to certify technology

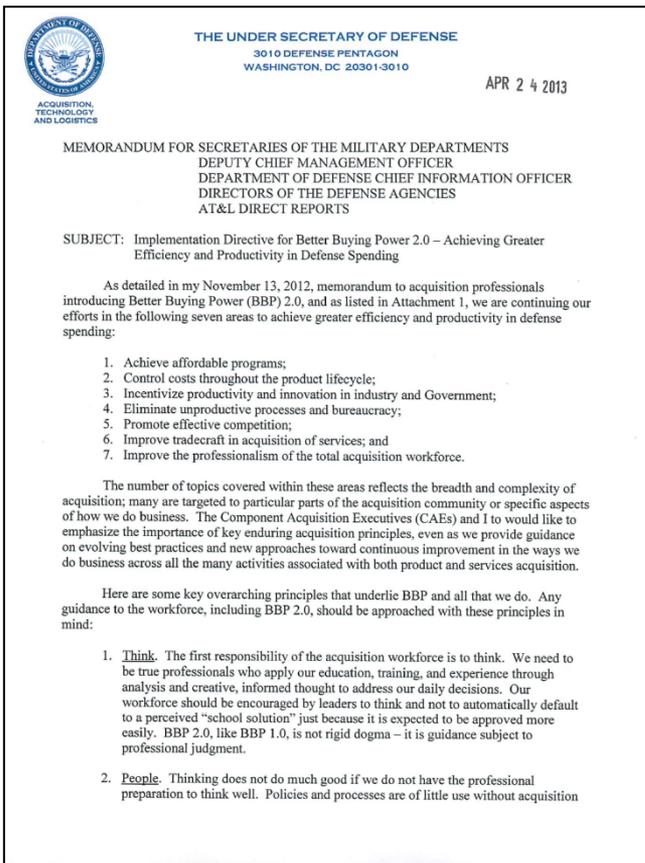
“As I noted in my "Better Buying Power" memorandum last year, the process for conducting Technology Readiness Assessments (TRAs) has strayed from its original intent and should be reformed. TRAs should focus only on technology maturity, as opposed to engineering and integration risk, and the responsibility for ensuring that technology maturity risk is adequately identified and mitigated should rest with the Program Manager (PM), Program Executive Officer, and Component Acquisition Executive, subject to ASD(R&E) review.

Reference: USD AT&L Memo, "Improving Technology Readiness Assessment Effectiveness," May 11, 2011

Technology Readiness Assessments are necessary, but insufficient



Infusing Better Buying Power 2.0 into Risk Management Guide



Reference: USD(AT&L) memo, Implementation Directive for Better Buying Power 2.0, Apr 24, 2013

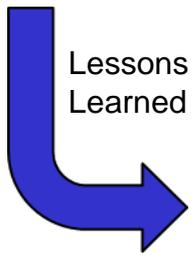
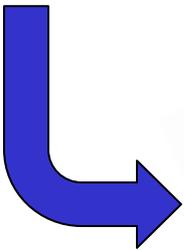
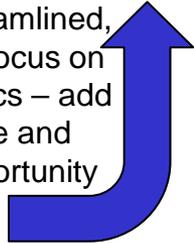
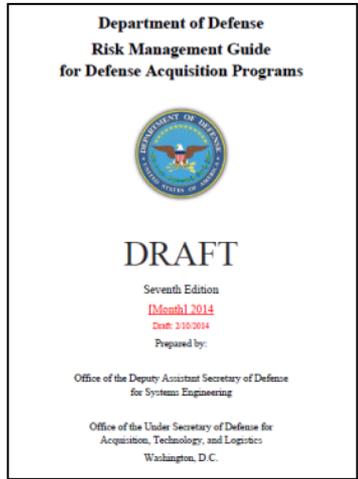
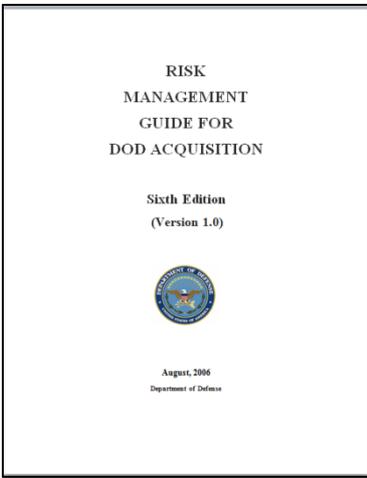
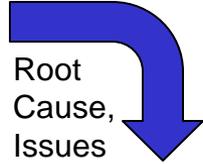
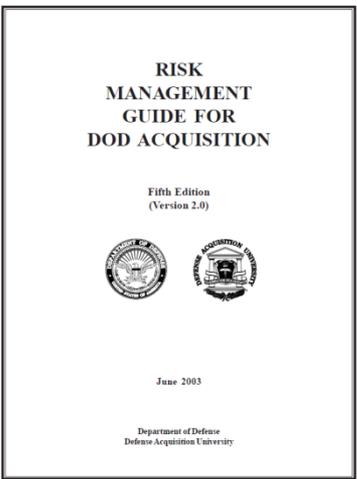
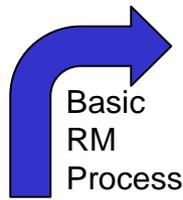
- **Opportunity Management**
 - “Our goal should be to identify opportunities to do better and to manage toward that goal”
- **True TD phase risk reduction**
 - Prototyping during TD can be a valuable tool to reducing risk prior to EMD, but only if the prototyping is focused on reducing the specific technical risks in the design for the product that will be designed and tested in EMD”
 - “Prototype attributes and components should be directly traceable to and reflective of the risks inherent in the products to be designed...”
 - “...in many cases, the Government failed to require meaningful risk reduction during the TD phase”
- **Strong partnerships with Requirements Community**
 - “Acquisition leaders need to understand user priorities, and requirements leaders need to understand cost performance trade-offs and technical risk implications”
- **Reducing Decision making cycle time**
 - “There have been attempts to use arbitrary cycle times to constrain programs; however, these constraints have often been unrealistic and done more harm than good by leading to high risk schedules and acquisition approaches”



Engineering Risk Management Evolution



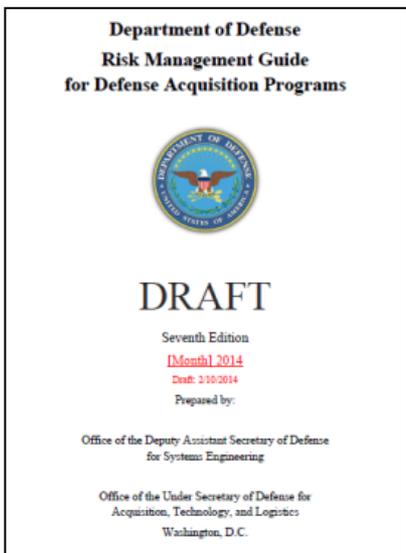
OSD Risk Working Group



Practical application of Risk, Issue and Opportunity Management



Draft Risk Management Guide Considerations



Scope

- (Technology)
- Engineering
- Integration

Management

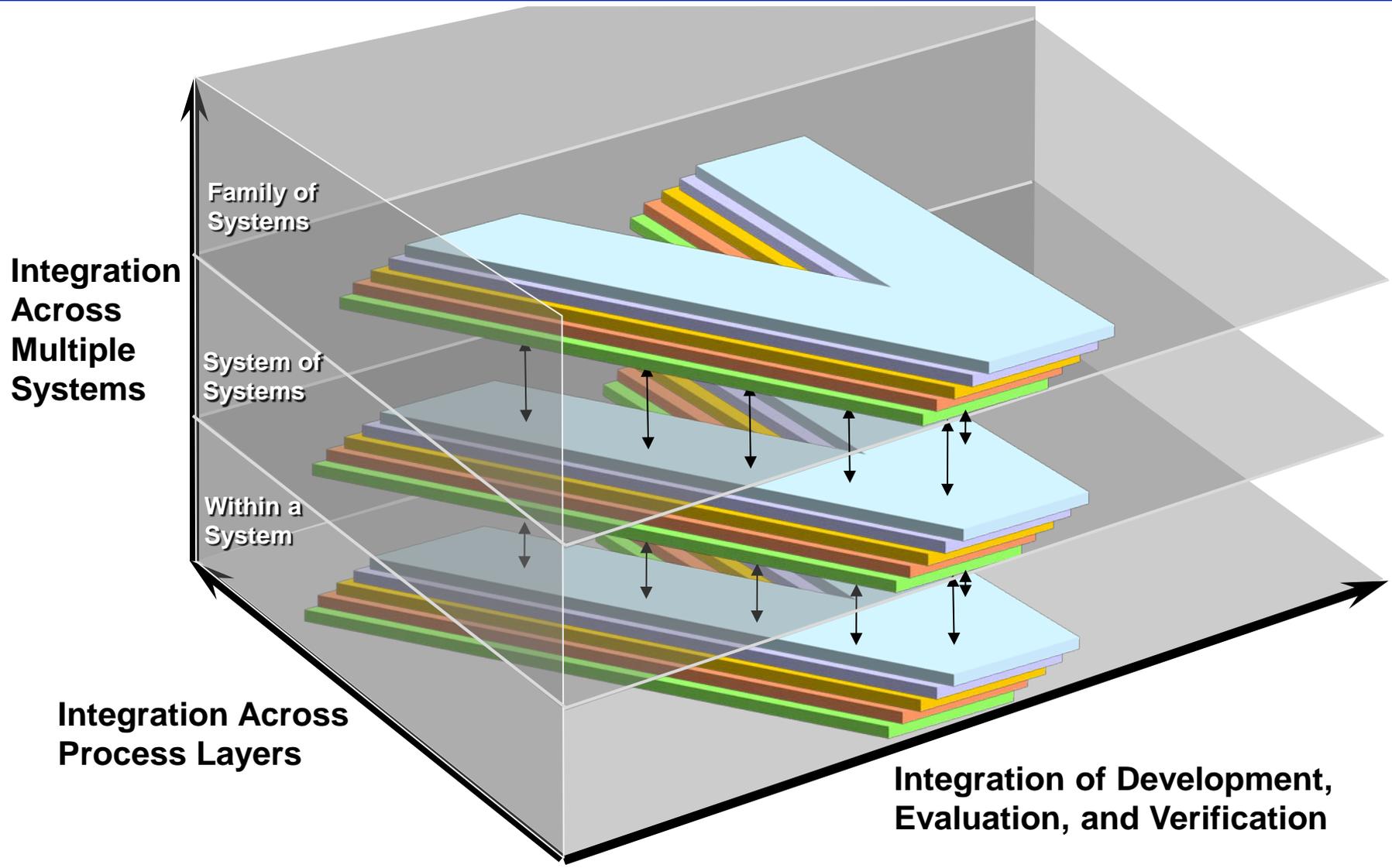
- Risks
- Issues
- Opportunities

Foundation

- Fundamentals
- Quantification
- Integration of Risk Management with other tools
- Leading Indicators/Metrics
- Best Practice Templates

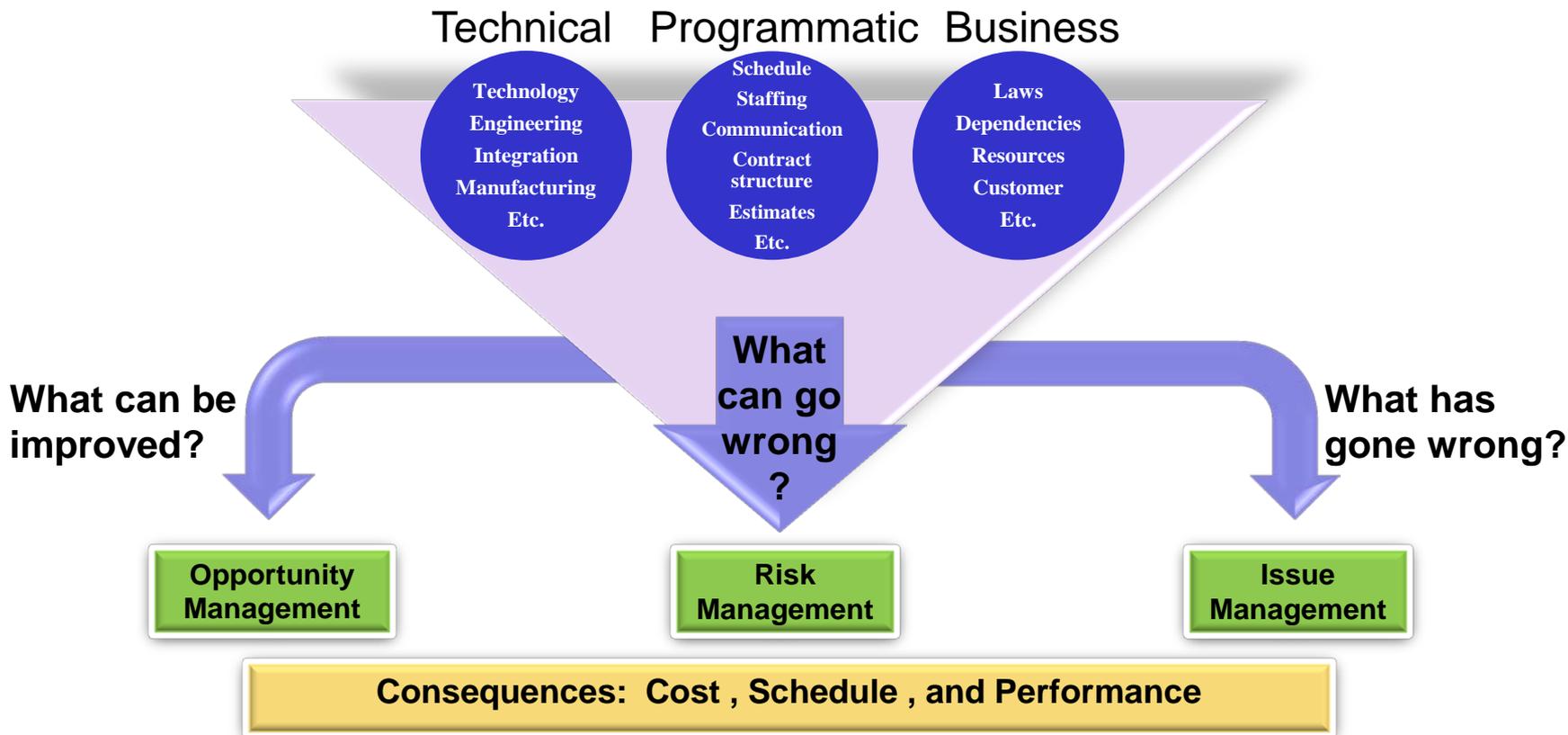


Integration Across Multiple Systems





Risk, Issue and Opportunity Relationship



New Guide provides guidance on managing not only risks, but issues and opportunities as well



Issue Management

- **Issue Management**

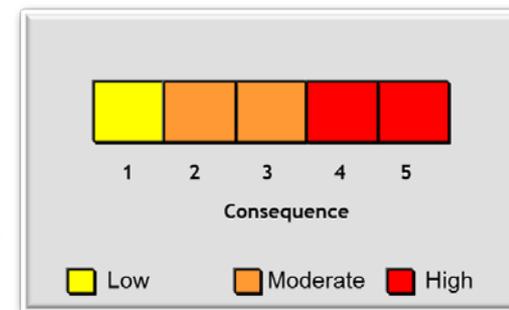
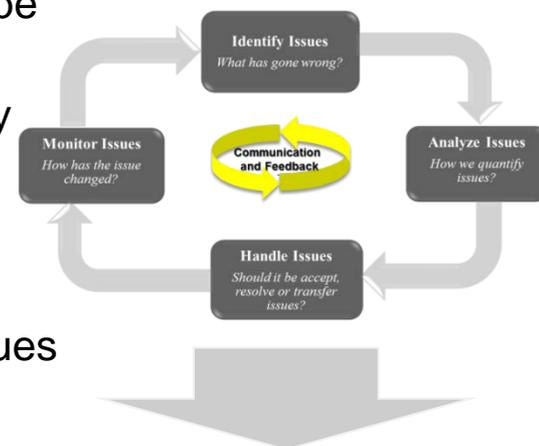
- Management of current problems (realized risks) that should be addressed with action plans, resourced and resolved
- Identifies issues that have occurred and assesses the severity and urgency of its possible impact on the program

- **Fundamental to Program Management**

- PMs and chief engineers develop a Plan of Action and Milestones (POA&M) to address and manage all program issues
- Addressed during regular battle rhythm of program activities
- 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

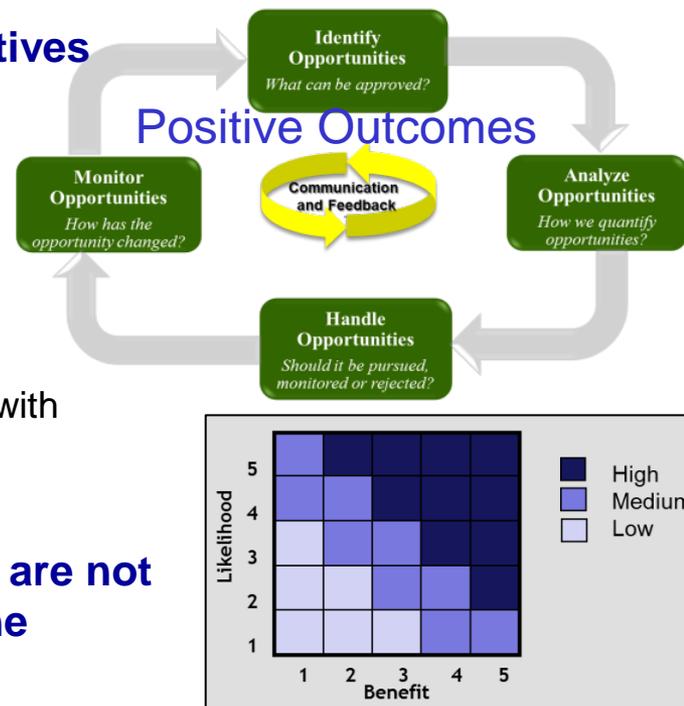


Rigorous Issue Management shifts management from reactive to proactive



Opportunity Management

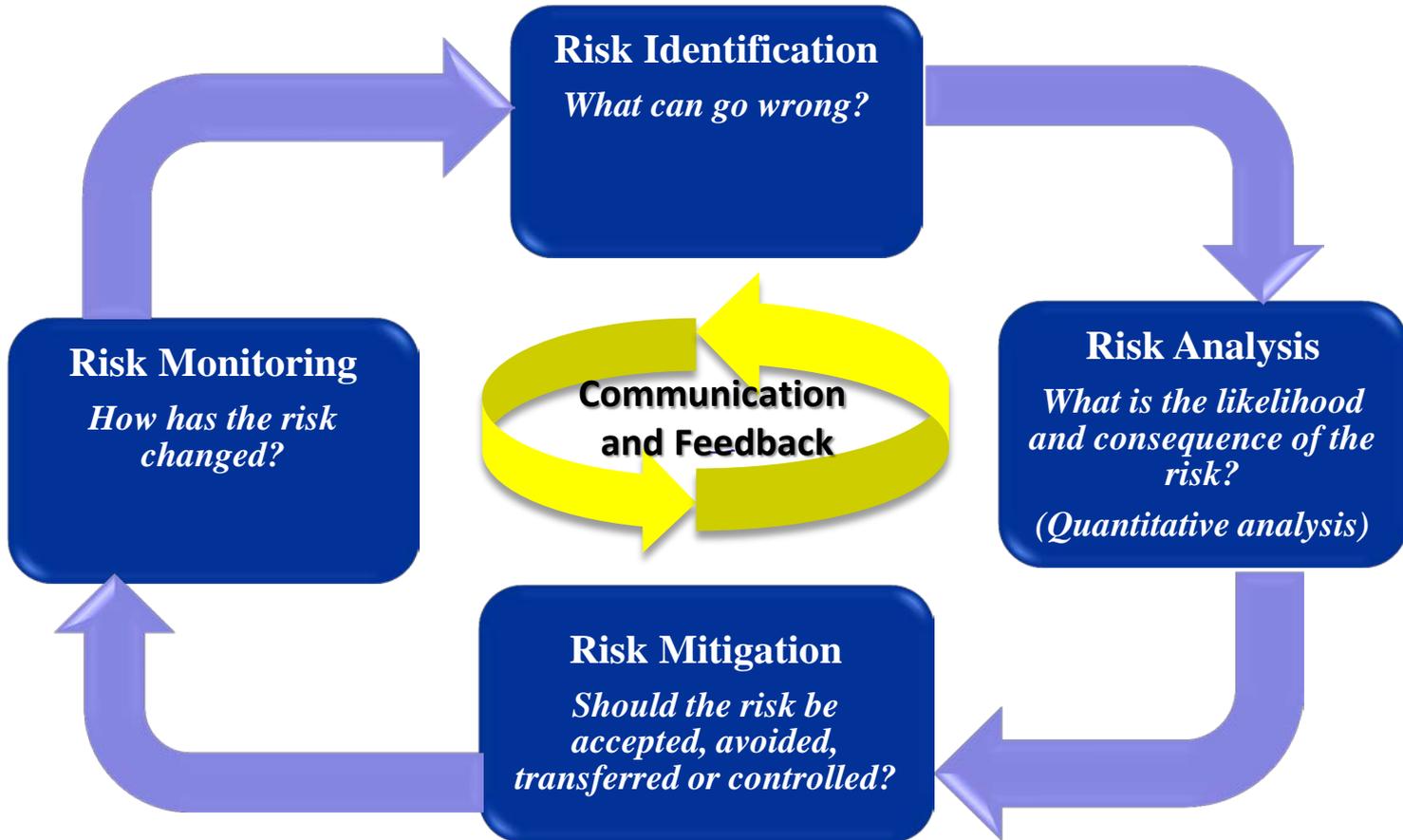
- **Opportunity Management (OM)** is a process used to identify, analyze, plan, implement and track initiatives that can yield improvements in the program's cost, schedule, and/or performance baseline through the reallocation of internal or external resources
- **Better Buying Power 2.0:** “Our goal should be to identify opportunities to do better and to manage toward that goal.”
- **OM enables achieving BBP 2.0 “should” cost objectives**
- **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 objectives, and contract extensions
 - Balance the cost and likelihood of achieving the opportunity with the benefit of what the opportunity brings
 - Implement handling activities to achieve the opportunity
- **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**



Fundamentals of Risk Management





Integration of Risk Management with other Program Management Tools



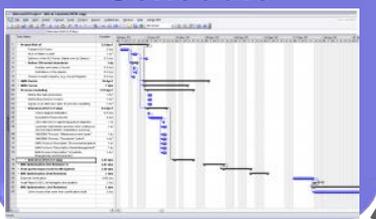
Must have linkage and traceability between IMP and IMS

- Roadmap for entire program

Integrated Master Plan

IMP Code	IR - SA - AC
A	(PE) Vendor Selection Process Completed
A.01	(SA) Vendor Selection Criteria Defined
A.01.02	(AC) University operations defined
A.01.03	(AC) Partnering Capabilities Defined
A.01.04	(AC) Operational Capabilities Defined
A.01.05	
A.02	
A.02.01	
A.02.02	
A.03	
A.03.01	
A.03.02	
A.03.03	
B	
B.01	
B.02	
B.03.01	
B.03.02	
B.03.03	
C	

Integrated Master Schedule



14-point Schedule Health Check

Metric	Score and Reason
Logic	0.3% (7/2757 tasks) have a missing schedule relationship
Leads	0% (0/2757 tasks) have lead time
Lags	0.4% (11/2757 tasks) have lag time
Relationship Types	2.6% (72/2757 tasks) have an improper schedule relationship
Hard Constraints	0.4% (12/2757 tasks) have hard constraints
High Float	6.4% (178/2757 tasks) have excessive float
Negative Float	2.3% (68/2757 tasks) have negative float
High Duration	18.6% (512/2757 tasks) have excessive duration
Invalid Forecast/Actual Dates	0.8% (85/10425 tasks) have invalid dates
Resources	83.1% (2567/2757 tasks) have improper resources assigned
Mixed Tasks	32.9% (1425/10425 tasks) have missed their finish dates
Critical Path Test	0 day(s) of float
Critical Path Length Index (CPLI)	1 CPLI
Baseline Execution Index (BEI)	1.01 BEI, 0% (2/7584 tasks) prior to the status date were not completed

Risk Register should have:

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

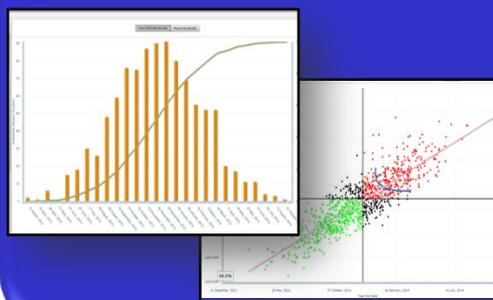
Risk Register

ID	Task Name	Start Date	End Date	Risk Type	Current Status	Severity	Impact	Probability	Score	Owner	Start Date	End Date						
1001	Task 1	2014-01-01	2014-03-31	High	Open	High	High	High	High	John Doe	2014-01-01	2014-03-31	2014-01-01	2014-03-31	2014-01-01	2014-03-31	2014-01-01	2014-03-31
1002	Task 2	2014-02-01	2014-04-30	Medium	Open	Medium	Medium	Medium	Medium	Jane Smith	2014-02-01	2014-04-30	2014-02-01	2014-04-30	2014-02-01	2014-04-30	2014-02-01	2014-04-30
1003	Task 3	2014-03-01	2014-05-31	Low	Open	Low	Low	Low	Low	Bob Johnson	2014-03-01	2014-05-31	2014-03-01	2014-05-31	2014-03-01	2014-05-31	2014-03-01	2014-05-31
1004	Task 4	2014-04-01	2014-06-30	High	Open	High	High	High	High	Alice Brown	2014-04-01	2014-06-30	2014-04-01	2014-06-30	2014-04-01	2014-06-30	2014-04-01	2014-06-30
1005	Task 5	2014-05-01	2014-07-31	Medium	Open	Medium	Medium	Medium	Medium	Charlie Davis	2014-05-01	2014-07-31	2014-05-01	2014-07-31	2014-05-01	2014-07-31	2014-05-01	2014-07-31
1006	Task 6	2014-06-01	2014-08-31	Low	Open	Low	Low	Low	Low	Diana Prince	2014-06-01	2014-08-31	2014-06-01	2014-08-31	2014-06-01	2014-08-31	2014-06-01	2014-08-31
1007	Task 7	2014-07-01	2014-09-30	High	Open	High	High	High	High	Ethan Hunt	2014-07-01	2014-09-30	2014-07-01	2014-09-30	2014-07-01	2014-09-30	2014-07-01	2014-09-30
1008	Task 8	2014-08-01	2014-10-31	Medium	Open	Medium	Medium	Medium	Medium	Fiona Glenanne	2014-08-01	2014-10-31	2014-08-01	2014-10-31	2014-08-01	2014-10-31	2014-08-01	2014-10-31
1009	Task 9	2014-09-01	2014-11-30	Low	Open	Low	Low	Low	Low	George Clooney	2014-09-01	2014-11-30	2014-09-01	2014-11-30	2014-09-01	2014-11-30	2014-09-01	2014-11-30
1010	Task 10	2014-10-01	2014-12-31	High	Open	High	High	High	High	Halle Berry	2014-10-01	2014-12-31	2014-10-01	2014-12-31	2014-10-01	2014-12-31	2014-10-01	2014-12-31

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

EVM – allows integration of risk assessment with resourced schedule



Better SE Planning - Schedule Improvements



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:

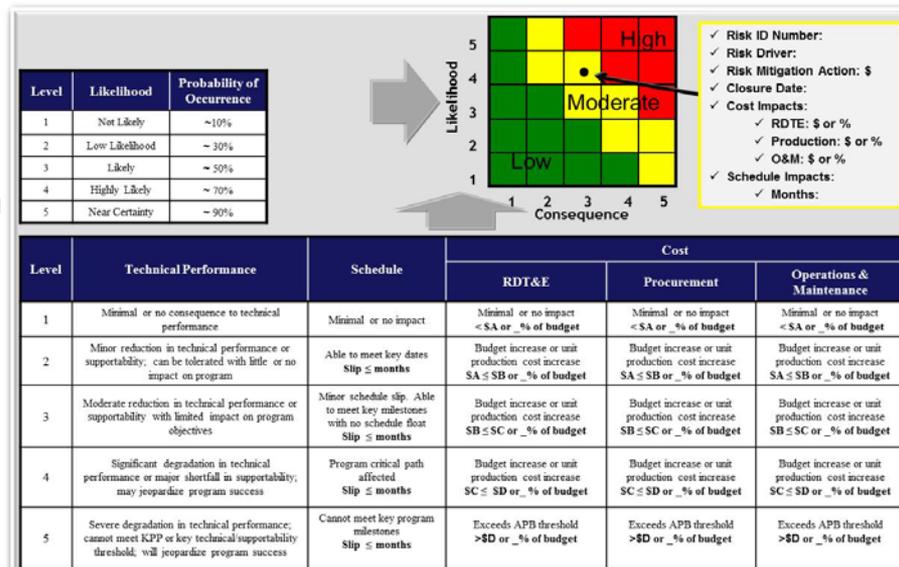
- Deficiencies in Schedule Planning
- Incomplete **Integrated Master Schedules**
- Missing Artifacts Prevents Performing **Schedule Risk Analysis**



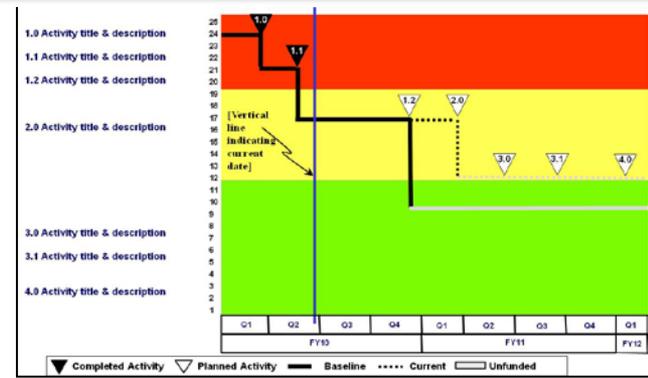
Quantifying Risks

What we have seen:

- 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
- 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
 - The guide provides additional guidance to identify the RDT&E, procurement, and O&S costs



Activity ID	Activity Title	Start Date	End Date	Baseline	Current	Unfunded
1.0	Activity title & description					
1.1	Activity title & description					
1.2	Activity title & description					
2.0	Activity title & description					
3.0	Activity title & description					
3.1	Activity title & description					
4.0	Activity title & description					



How the Guide addresses 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



Better SE Planning - Integration Risks

Putting the pieces together

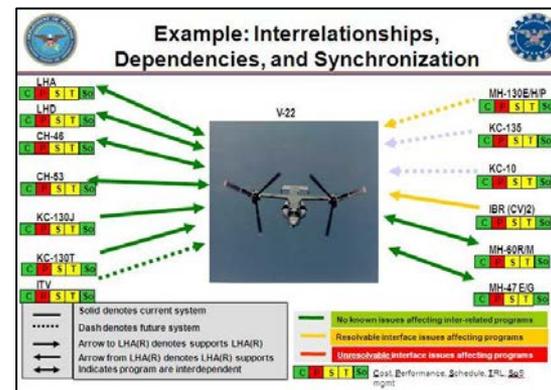
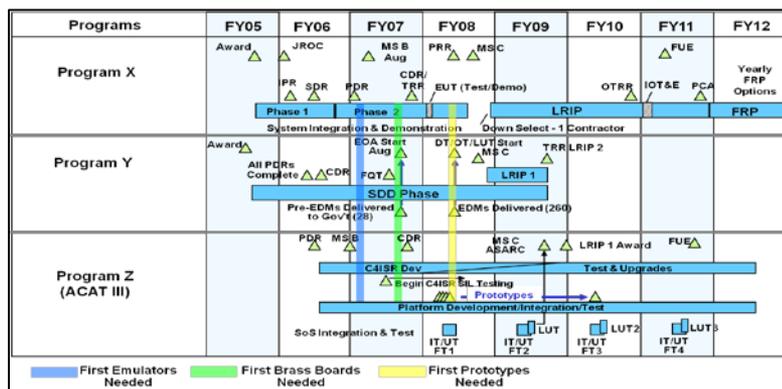


What we are seeing - common integration threads:

- 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





Leading Indicators



**National Defense Industrial Association
Systems Engineering Division**

In conjunction with

**Office of Under Secretary of Defense
Acquisition, Technology & Logistics
Systems & Software Engineering
Deputy Director, Assessments & Support**

**Report on
Systemic Root Cause Analysis
Of Program Failures**

December 2008



15-10-008



Systems Engineering Leading Indicators (1)

Leading Indicator	Insight Provided
Requirements Trends	Rate of maturity of the system definition against the plan. Additionally, characterizes the stability and completeness of the system requirements that could potentially impact design, production, operational utility, or support.
System Definition Change Backlog Trend	
Interface Trends	
Requirements Validation Trends	
Requirements Verification Trends	

NDIA System Development: Performance Measurements
March 2011



Systems Engineering Leading Indicators (3)

Leading Indicator	Insight Provided
Technical Measurement Trends	Progress towards meeting the Measures of Effectiveness (MOEs) / Performance (MOPs) / Key Performance Parameters (KPPs) and Technical Performance Measures (TPMs). Lack of timely closure is an indicator of
Systems Engineering Staffing & Skills Trends	
Process Compliance Trends	
Facility and Equipment Availability Trends	

NDIA System Development: Performance Measurements
March 2011



Systems Engineering Leading Indicators (4)

Leading Indicator	Insight Provided
Defect/Error Trends	Progress towards the creation of a product or the delivery of a service that meets the quality expectations of its recipient. Understanding the proportion of defects being found and opportunities for finding defects at each stage of the development process of a product or the execution of a service.
System Affordability Trends	
Architecture Trends	
Schedule and Cost Pressure	

NDIA System Development: Performance Measurements
March 2011



Systems Engineering Leading Indicators

- Requirements Trends
- Systems Definition Change Backlog Trend
- Interface Trends
- Requirements Validation Trends
- Requirements Verification Trends
- Work Product Approval Trends
- Review Action Closure Trends
- Risk Exposure Trends
- Risk Treatment Trends
- Technology Maturity Trends
- Technical Measurement Trends
- Systems Engineering Staffing & Skills Trends
- Process Compliance Trends
- Facility and Equipment Availability Trends
- Defect/Error Trends
- System Affordability Trends
- Architecture Trends
- Schedule and Cost Pressure

NDIA System Development: Performance Measurements
March 2011

(Version 1.0)



Systems Engineering Leading Indicators (2)

Leading Indicator	Insight Provided
Work Product Approval Trends	Adequacy of internal processes for the work being performed and also the adequacy of the document review process, both internal and external to the organization. High reject count would suggest poor quality work or a poor document review process each of which could have adverse cost, schedule and customer satisfaction impact.
Review Action Closure Trends	Responsiveness of the organization in closing post-review actions. Adverse trends could forecast potential technical, cost and schedule baseline issues.
Risk Exposure Trends	Effectiveness of risk management process in managing / mitigating technical, cost & schedule risks. An effective risk handling process will lower risk exposure trends.
Risk Treatment Trends	Effectiveness of the SE organization in implementing risk mitigation activities. If the SE organization is not retiring risk in a timely manner, additional resources can be allocated before additional problems are created.
Technology Maturity Trends	Risk associated with incorporation of new technology or failure to refresh dated technology. Adoption of immature technology could introduce significant risk during development while failure to refresh dated technology could have operational effectiveness/customer satisfaction impact.

NDIA System Development: Performance Measurements
March 2011

(Version 1.0)

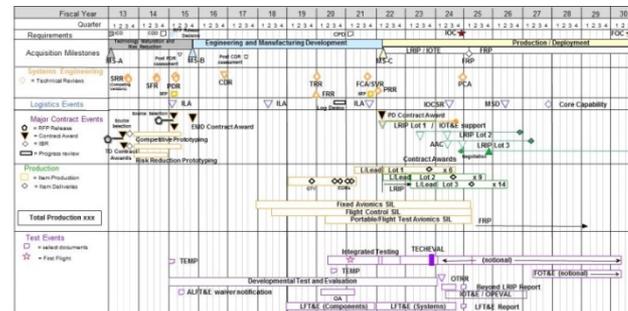
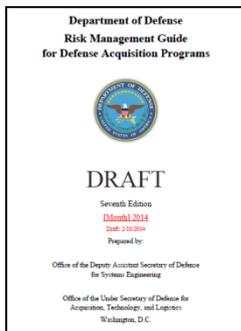
Reference: NDIA Report on "Systemic Root Cause Analysis of Program Failures" December, 2008



Infusing Risk, Issue and Opportunity Management Across the DoD Enterprise



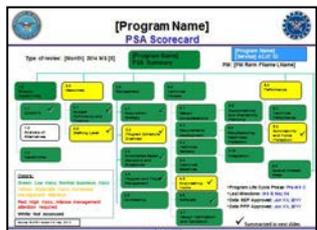
2014 Risk, Issue, & Opportunity Guide (draft)



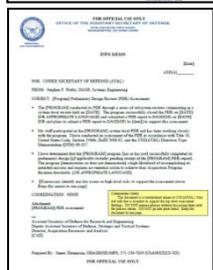
How DASD(SE) will implement it

What we are doing to infuse it across the enterprise

Program Support Assessments



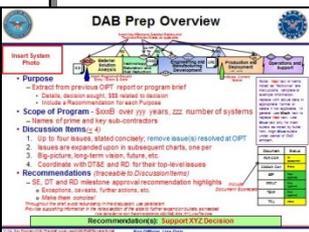
PDR/CDR Assessments



DASD(SE) Annual Report to Congress



OIPT/ DAB prep



Interim DoDI 5000.02



SEP Outline 2014



Defense Acquisition Guidebook 2014





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Systems Engineering: Critical to Defense Acquisition



Innovation, Speed, Agility
<http://www.acq.osd.mil/se>