



Earning Value From Risk

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Agenda

Overview Earned Value

Overview Risk Management

Investment Strategy

Summary

Presentation Objective

Relate risk management and earned value concepts to a practical strategy of investment

Definitions

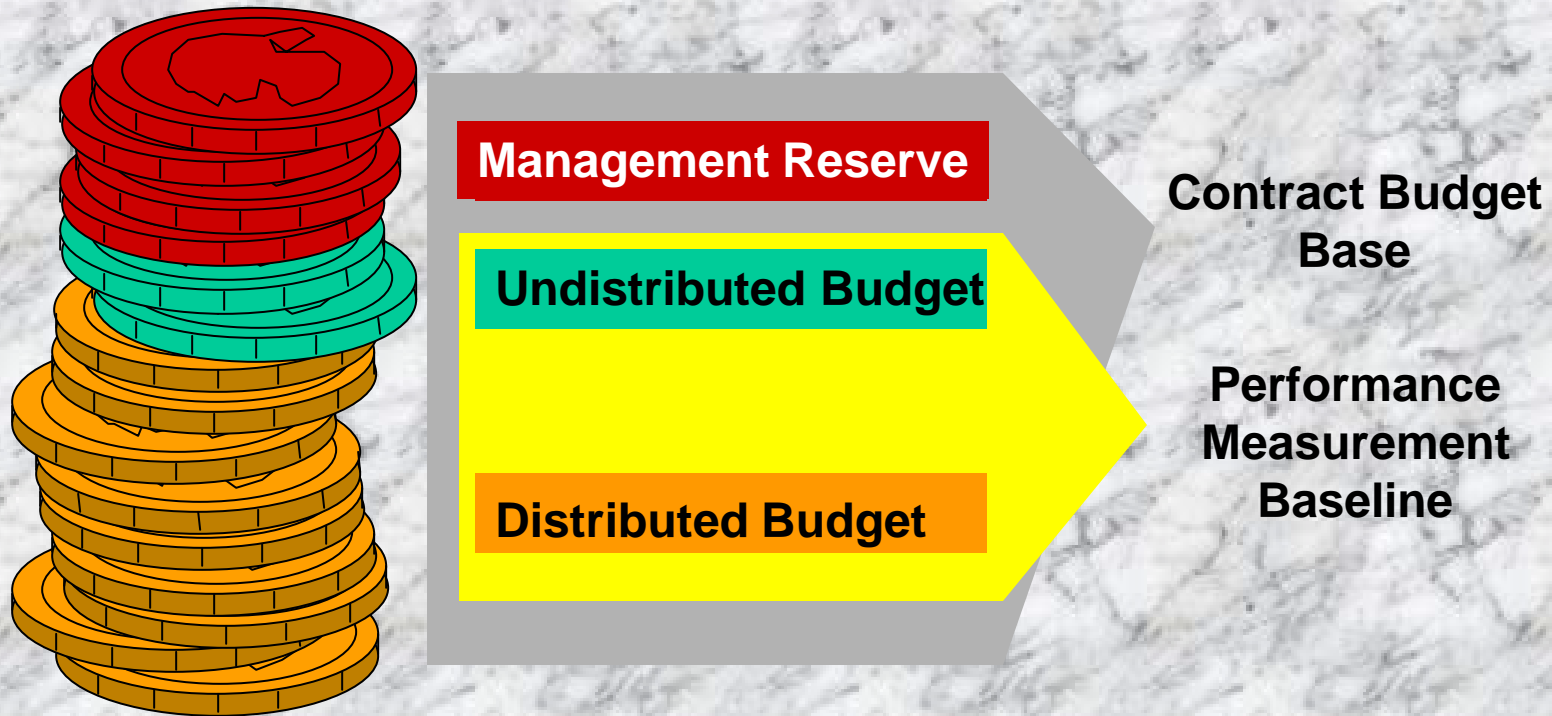
Earned value is a management technique that relates resource planning to schedules and to technical performance requirements.

Earned value management (EVM) uses earned value as the tool for integrating cost, schedule, and technical performance management, and risk management.

Source: DSMC www.dsmc.dsm.mil/educdept/evmdept.htm

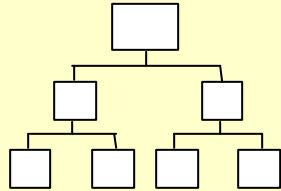
Performance Measurement Baseline

... to achieve a realistic, executable contract plan,
called the Performance Measurement Baseline (PMB).

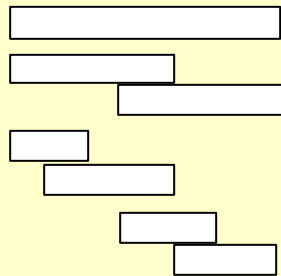


ESTABLISH THE BASELINE

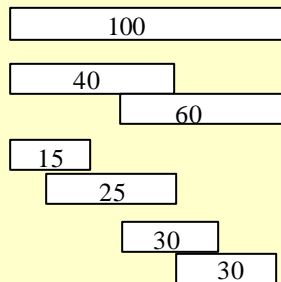
1. DEFINE THE WORK



2. SCHEDULE THE WORK



3. ALLOCATE BUDGETS



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CONTRACT BUDGET BASE

Mgmt Reserve

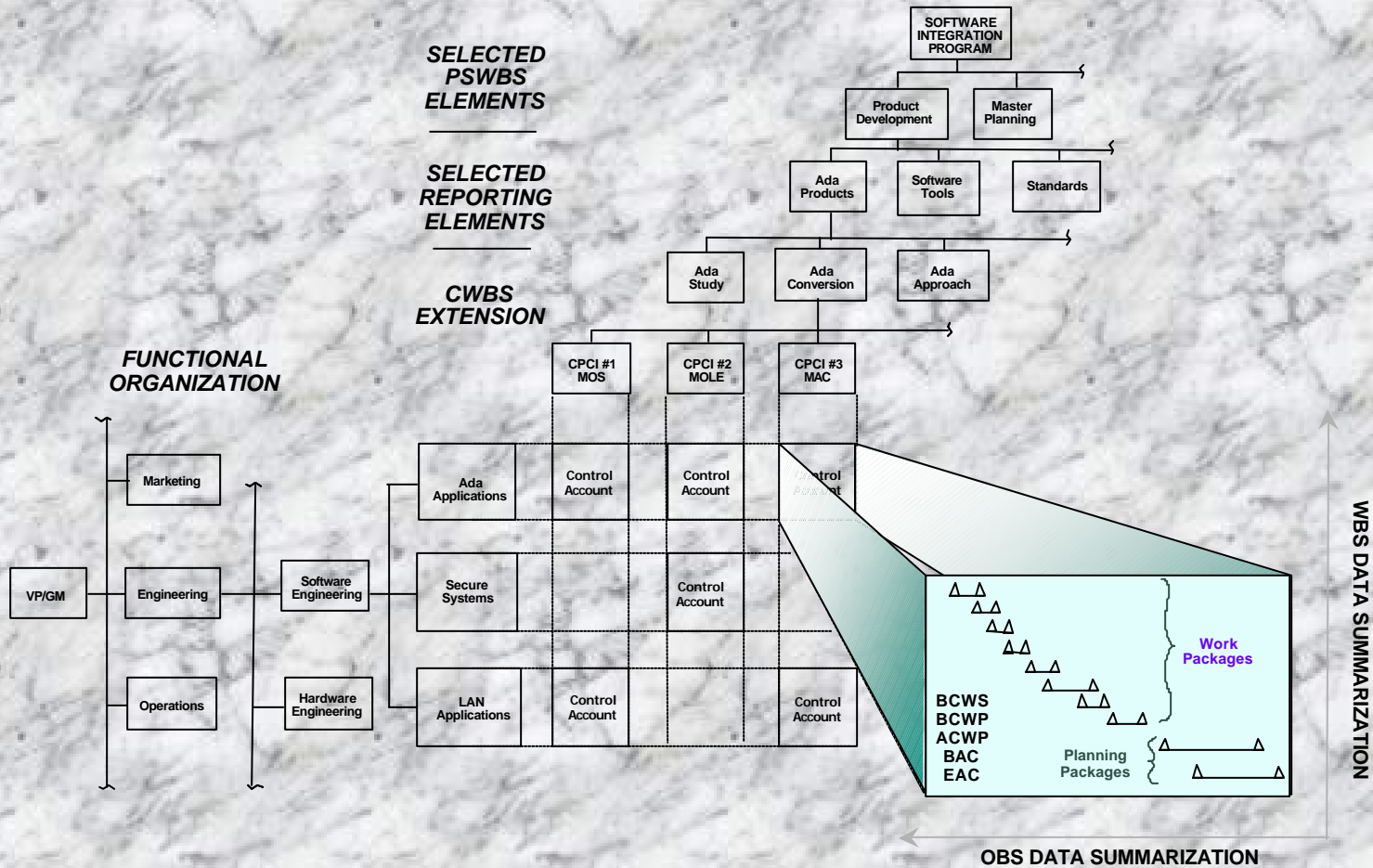
Performance Measurement Baseline

TIME

Earned Value Terminology

<i>Data Element</i>	<i>Term</i>	<i>Acronym</i>
Scheduled Work	Budgeted Cost for Work Scheduled	BCWS
Earned Value	Budgeted Cost for Work Performed	BCWP
Actuals	Actual Cost of Work Performed	ACWP
Authorized Work	Budget At Completion	BAC
Forecasted Cost	Estimate At Completion	EAC
Work Variance	Schedule Variance	SV
Cost Variance	Cost Variance	CV
Completion Variance	Variance At Completion	VAC

WBS/Organization Integration



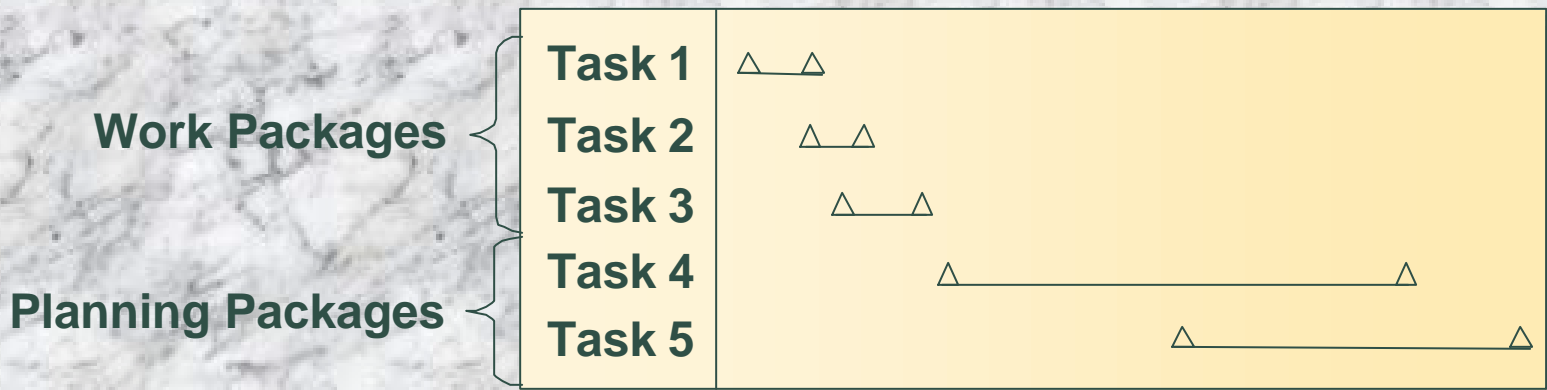
Control Account Elements

Work Packages

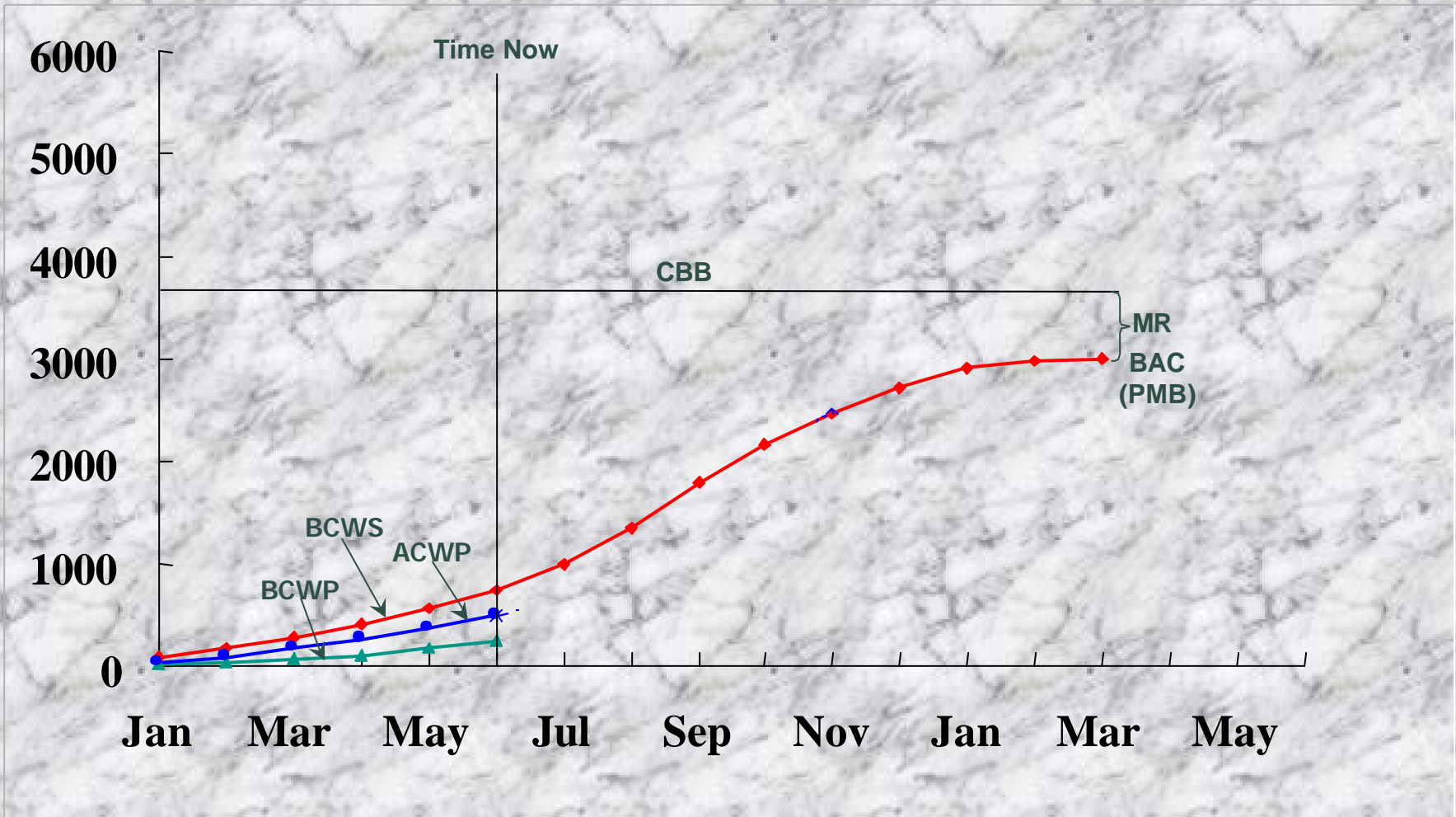
Detailed, short-span tasks, or material items, required to accomplish the CA objectives, typically in the near term

Planning Packages

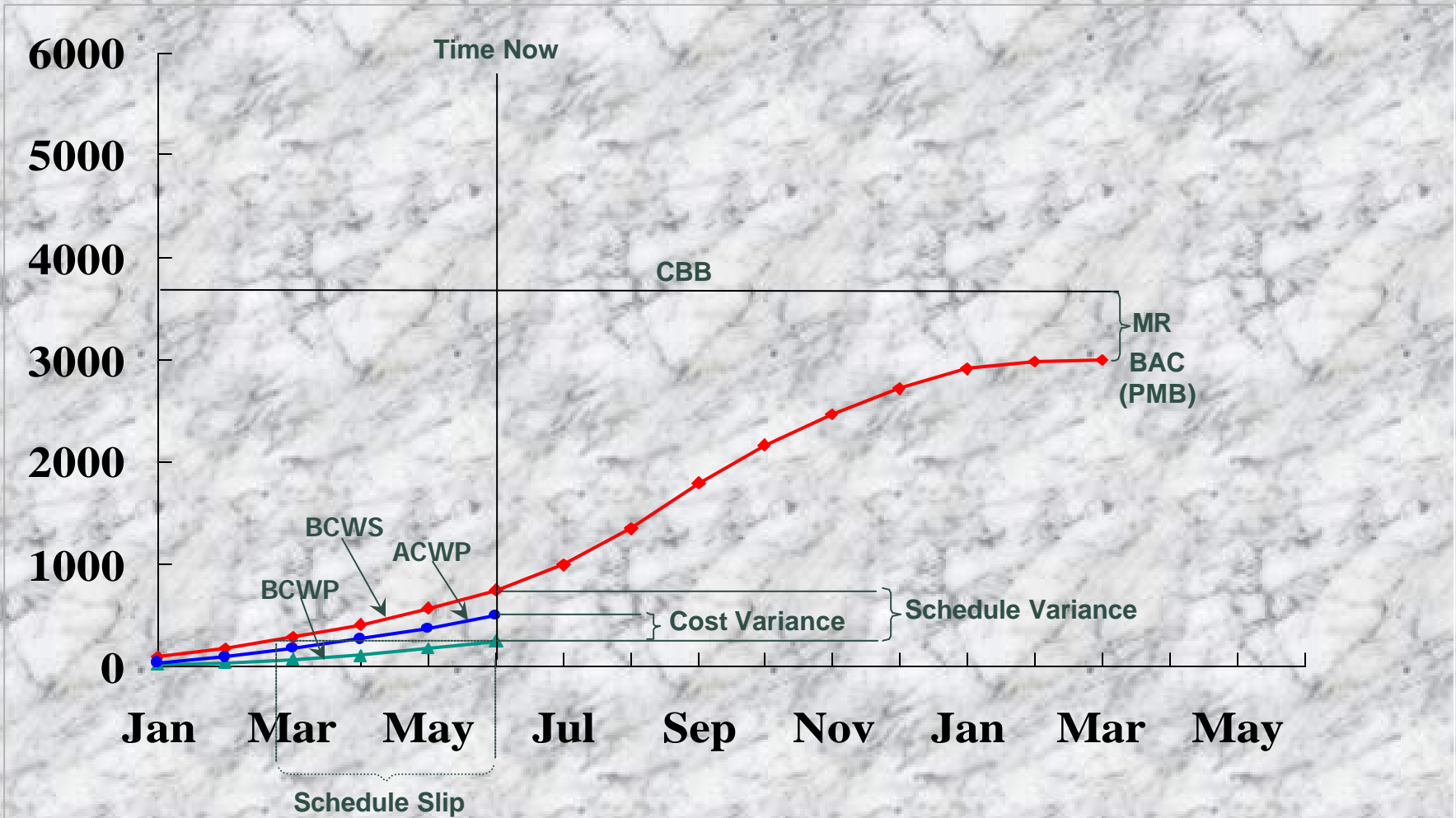
Future work that has not been detail planned as work packages. They are always scheduled to occur in the future.



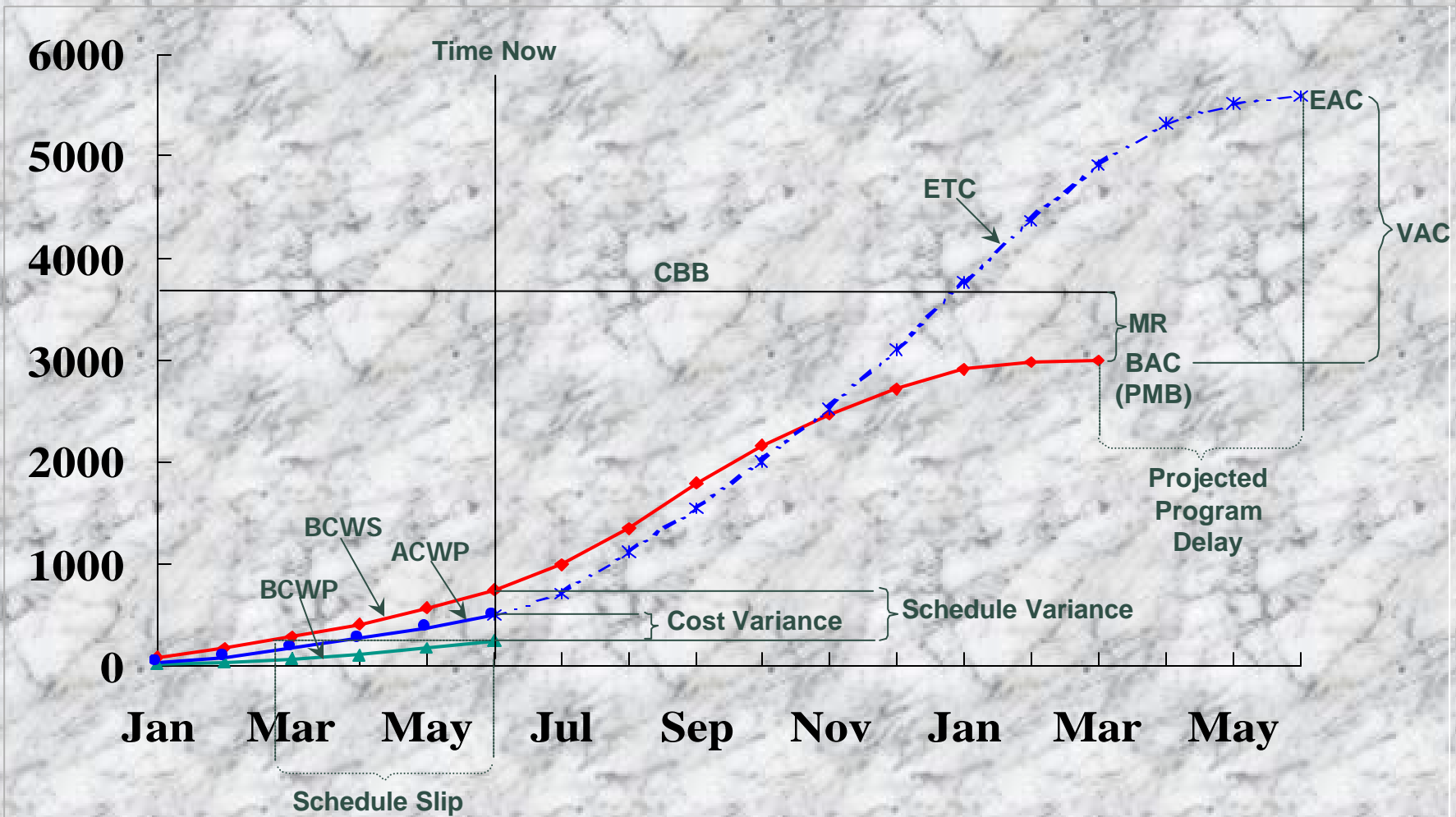
Earned Value Data Elements



Earned Value Data Elements



Earned Value Data Elements



Data Analysis Relationships

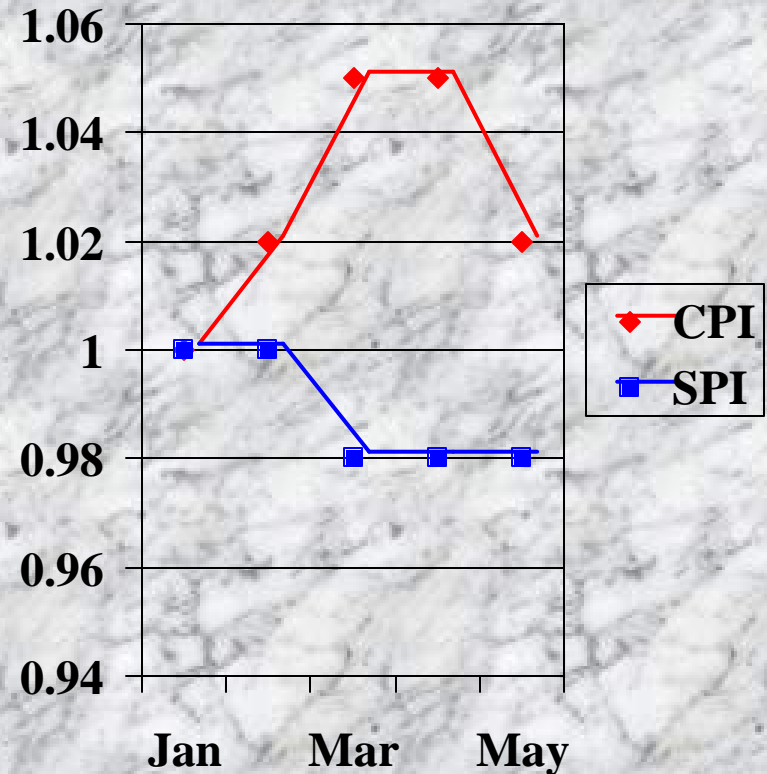
Term	Symbol	Formula	Checklist Actions
Percent Complete	% Done	$\frac{BCWP}{BAC}$	Ratio of work accomplished in terms of the total amount of work to do.
Cost Performance Index or Performance Factor	CPI or PF	$\frac{BCWP}{ACWP}$	Ratio of work accomplished against money spent (Efficiency Rating: Work Done for Resources Expended)
To Complete Performance Index or Verification Factor	TCPI or VF	$\frac{BAC - BCWP}{EAC - ACWP}$	Ratio of work remaining against money remaining (Efficiency which must be achieved to complete the remaining work with the expected remaining money)
Schedule Performance Index	SPI	$\frac{BCWP}{BCWS}$	Ratio of work accomplished against what should have been done (Efficiency Rating: Work done as compared to what should have been done)
Estimate At Completion	EAC	ETC + ACWP	Calculation of the estimate to complete plus the money spent
Estimate To Complete	ETC	$\frac{BAC - BCWP}{CPI}$	Calculation of the budgeted work remaining against the performance factor

Risk Indicators (example)

EVM provides several metrics that can “flag” potential problems (risks) either as trends or thresholds.

CPI: Good = ≥ 1.0

SPI: Good = ≥ 1.0



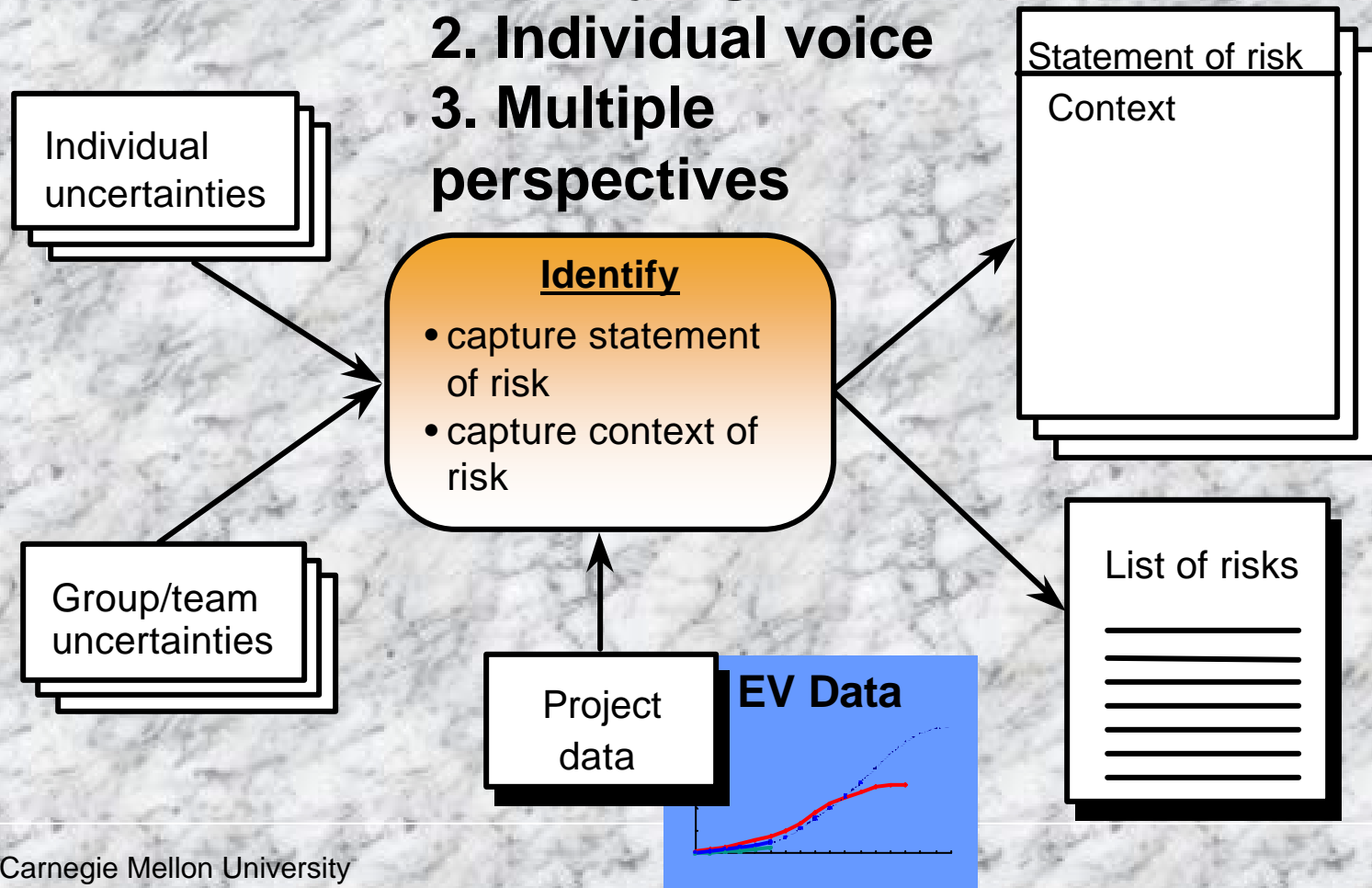
A Risk Management Process



Identification Activities Overview

PRINCIPLES

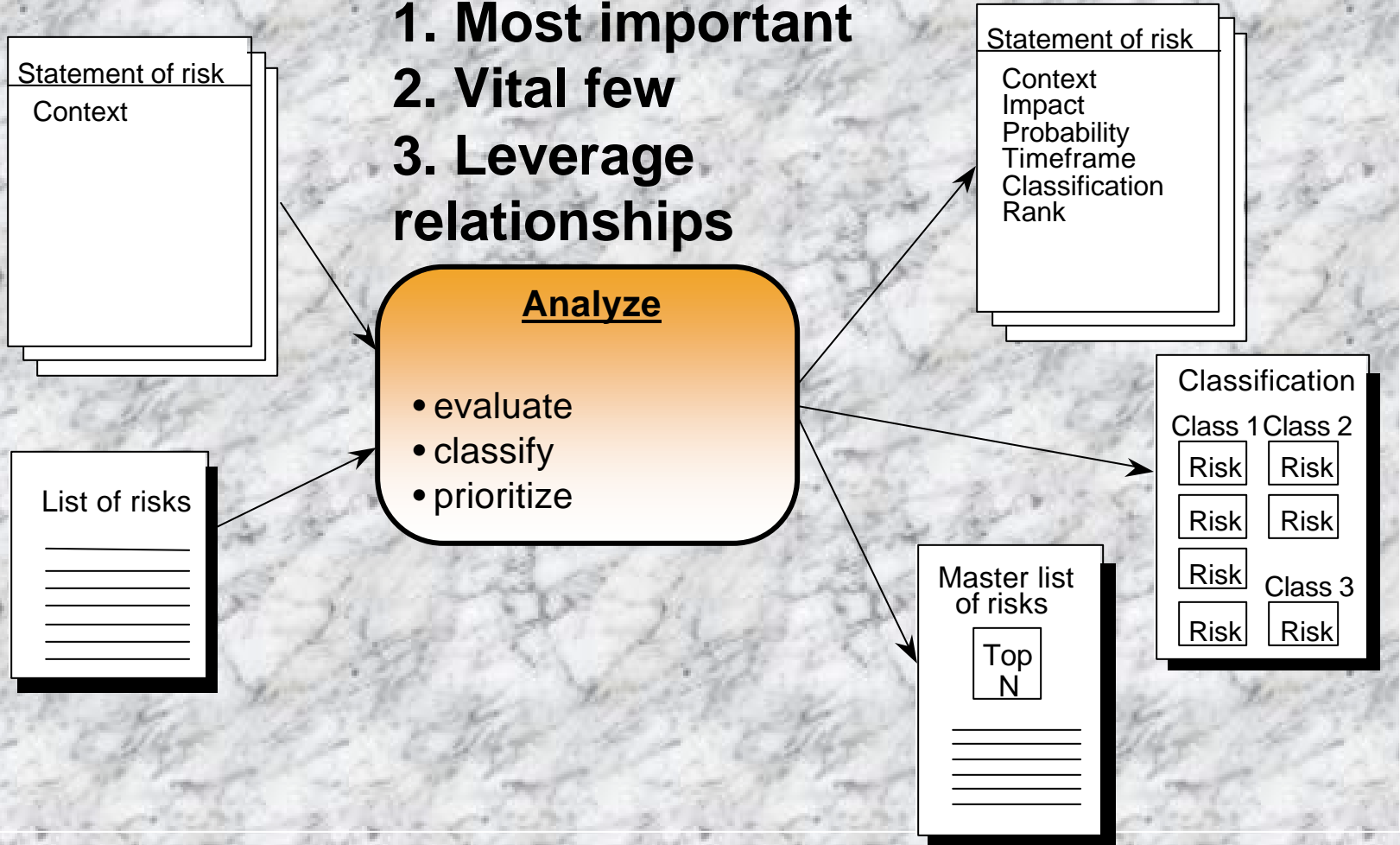
1. Non-judgmental
2. Individual voice
3. Multiple perspectives



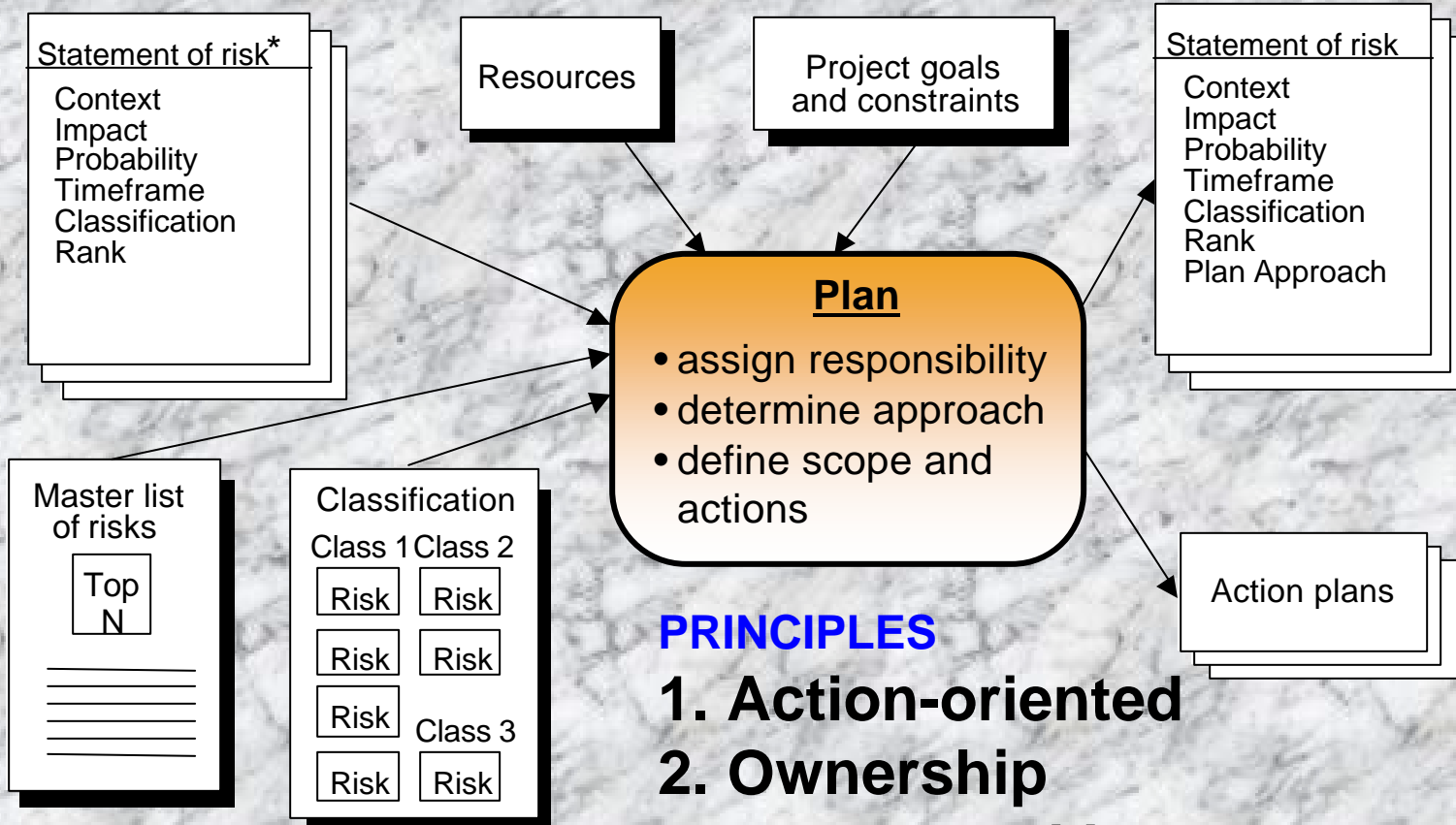
Analysis Activities Overview

PRINCIPLES

1. Most important
2. Vital few
3. Leverage relationships



Planning Activities Overview



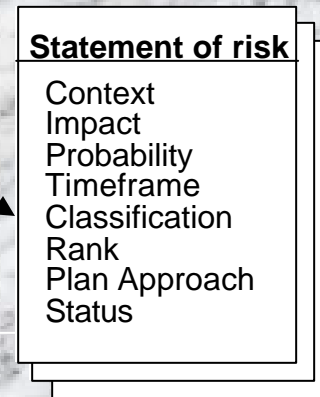
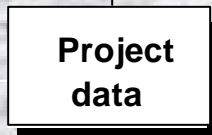
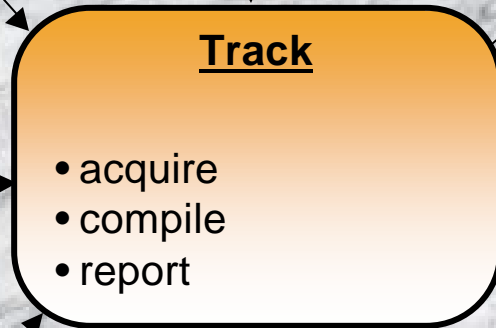
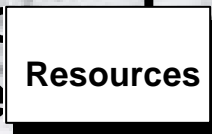
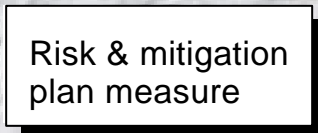
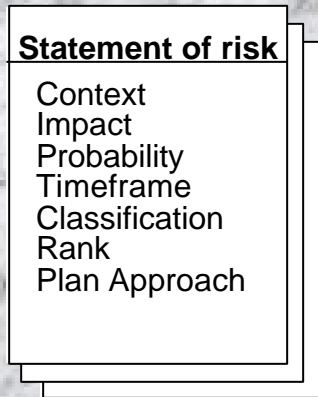
PRINCIPLES

1. Action-oriented
2. Ownership
3. Accountability

Tracking Activities Overview

PRINCIPLES

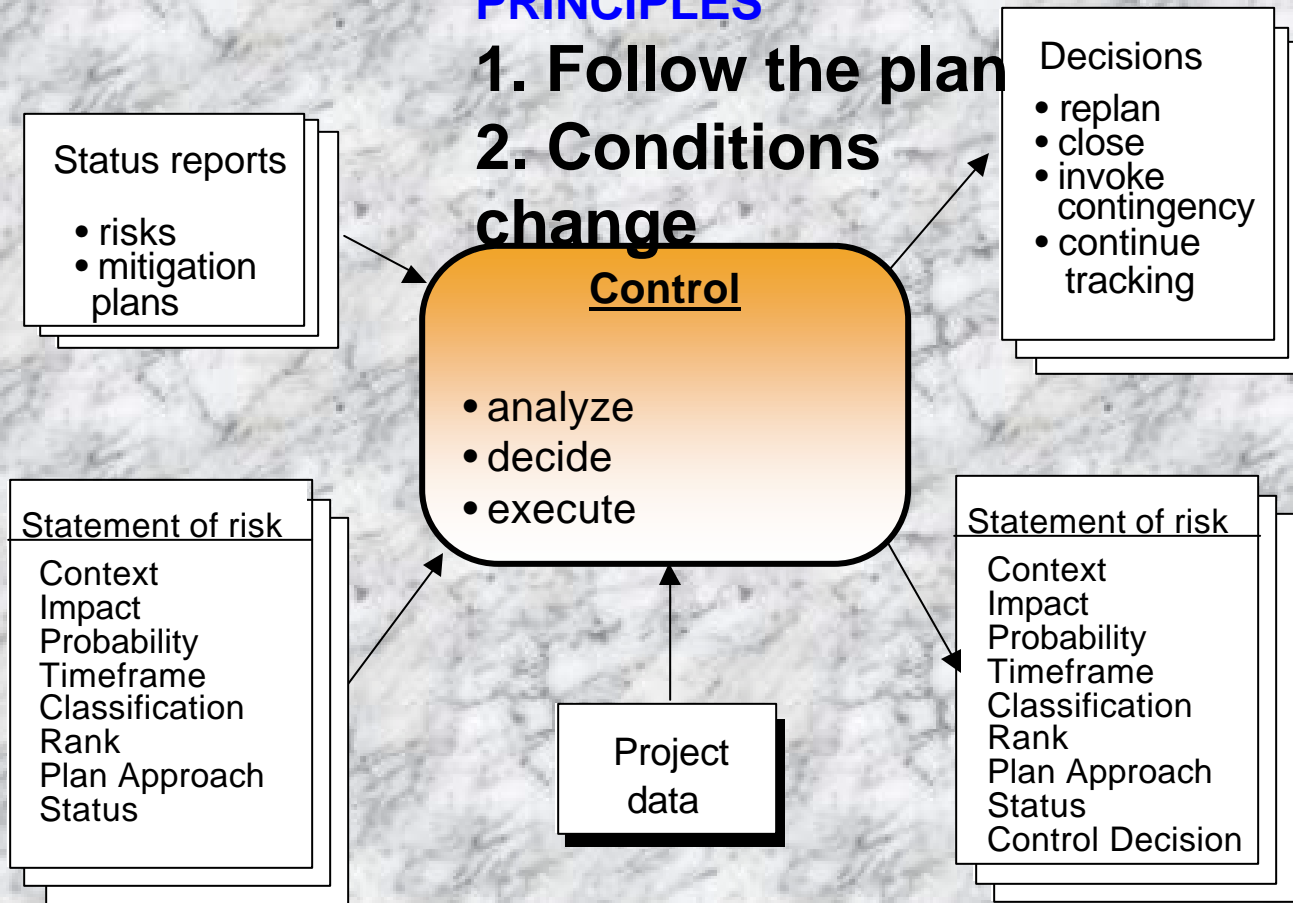
1. Risk-driven measures
2. Know your audience
3. Know what success looks like



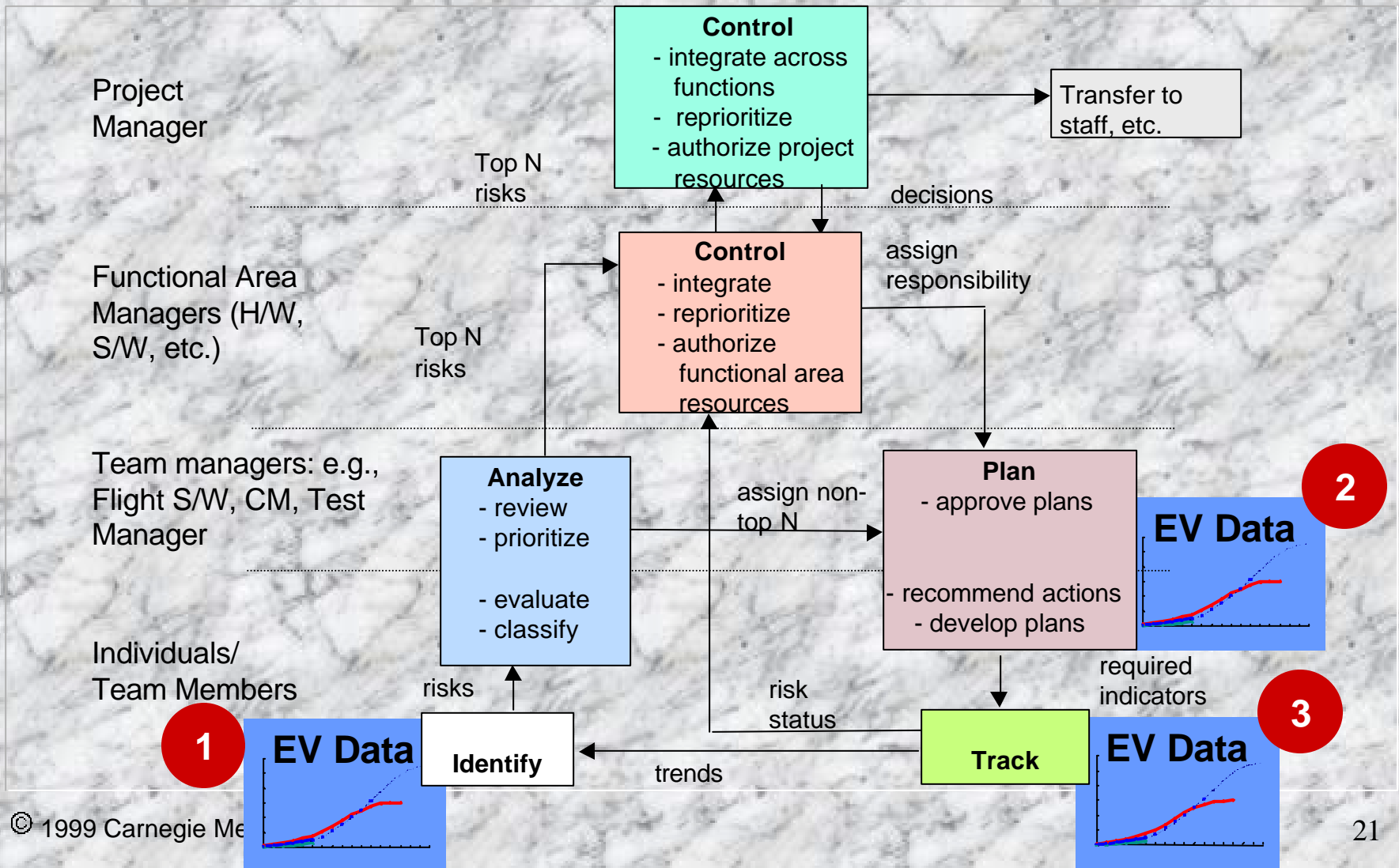
Control Activities Overview

PRINCIPLES

1. Follow the plan
2. Conditions change



Risk Management Framework Ex:

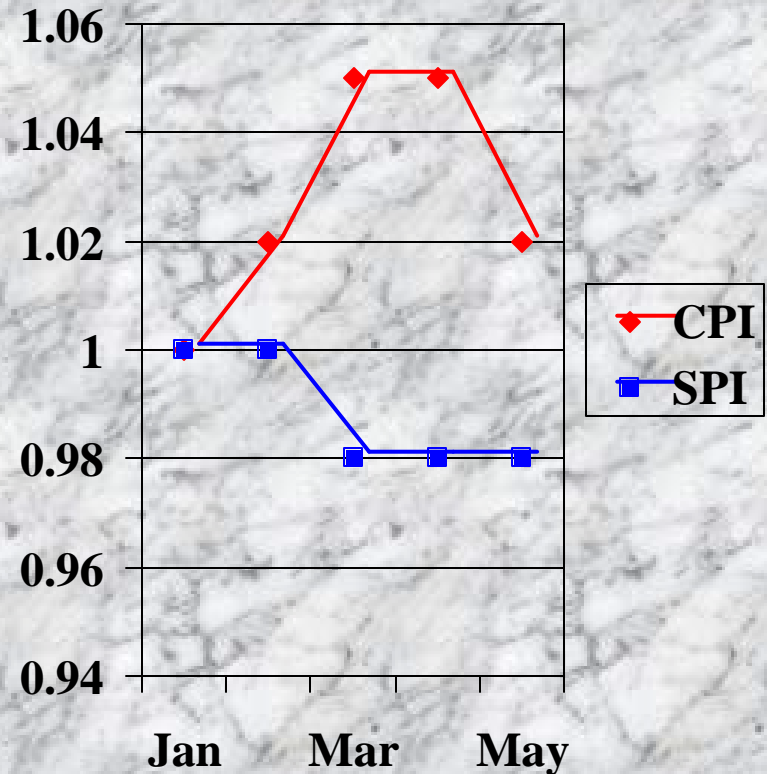


Risk Indicators (example)

EVM provides several metrics that can “flag” potential problems (risks) either as trends or thresholds.

CPI: Good = ≥ 1.0

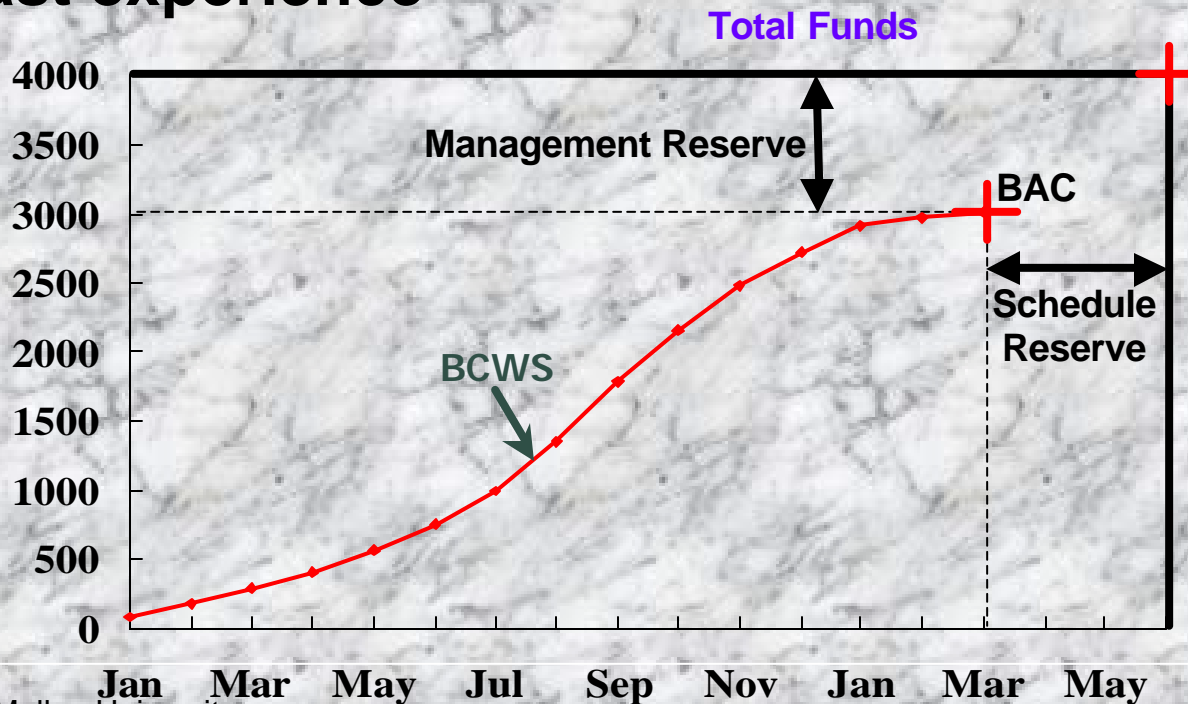
SPI: Good = ≥ 1.0



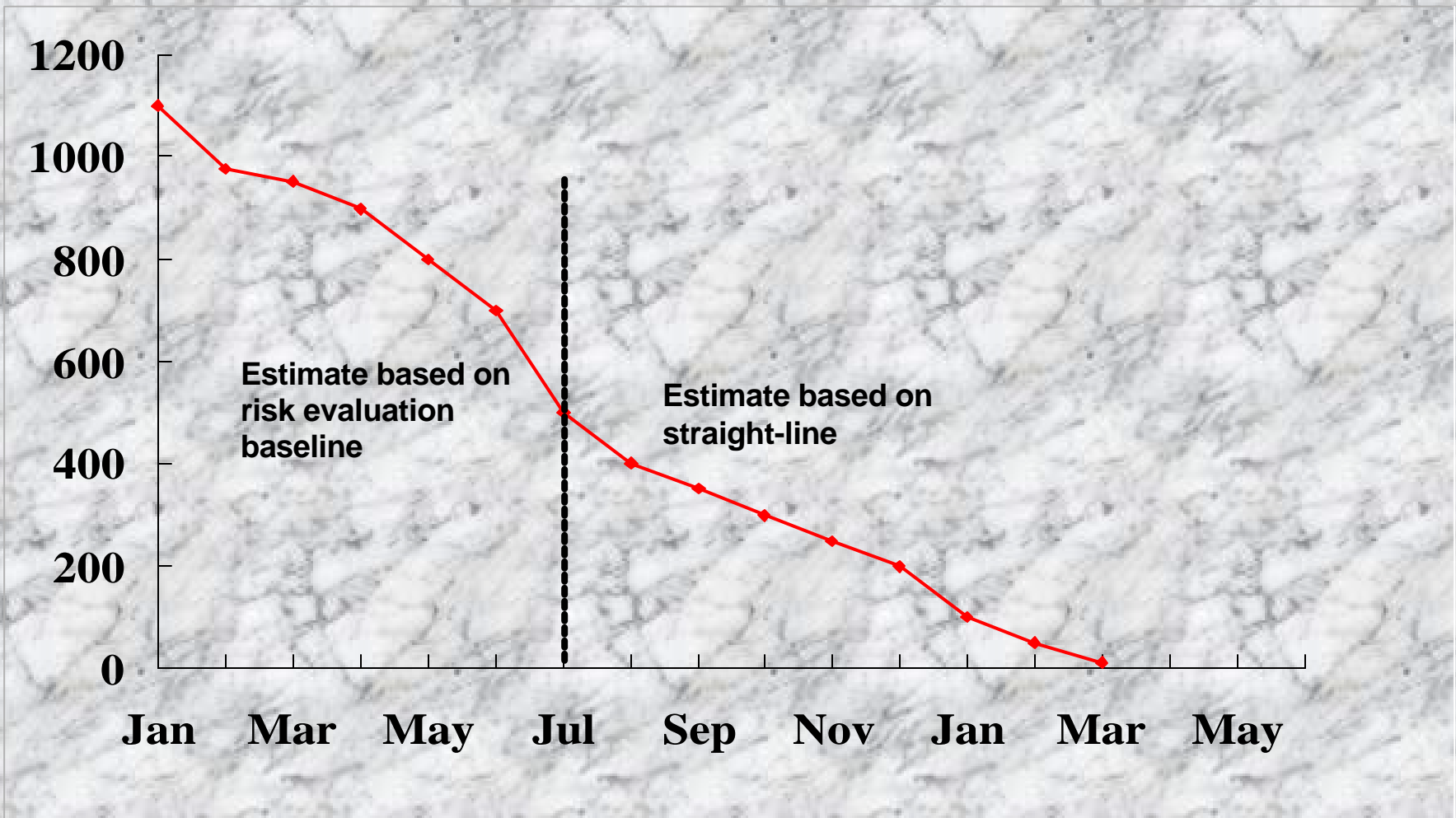
Management Reserve

Calculate total project management reserve required based on

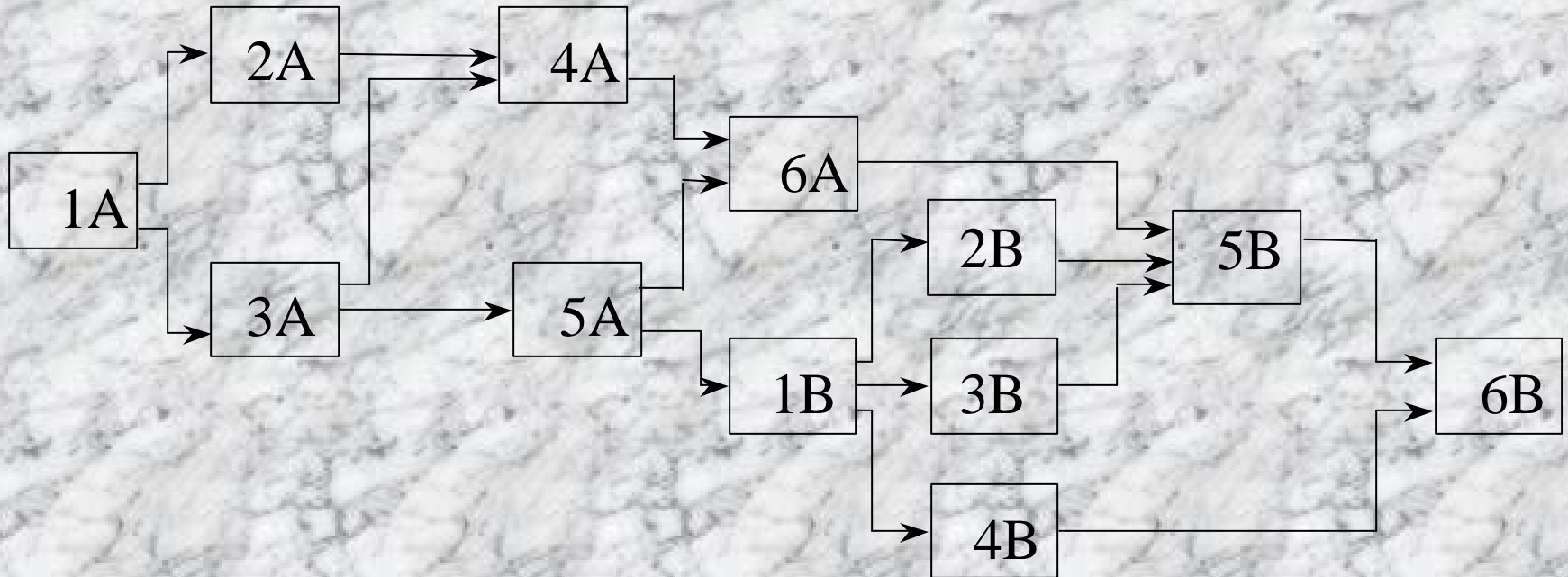
- statistical modeling
- past experience



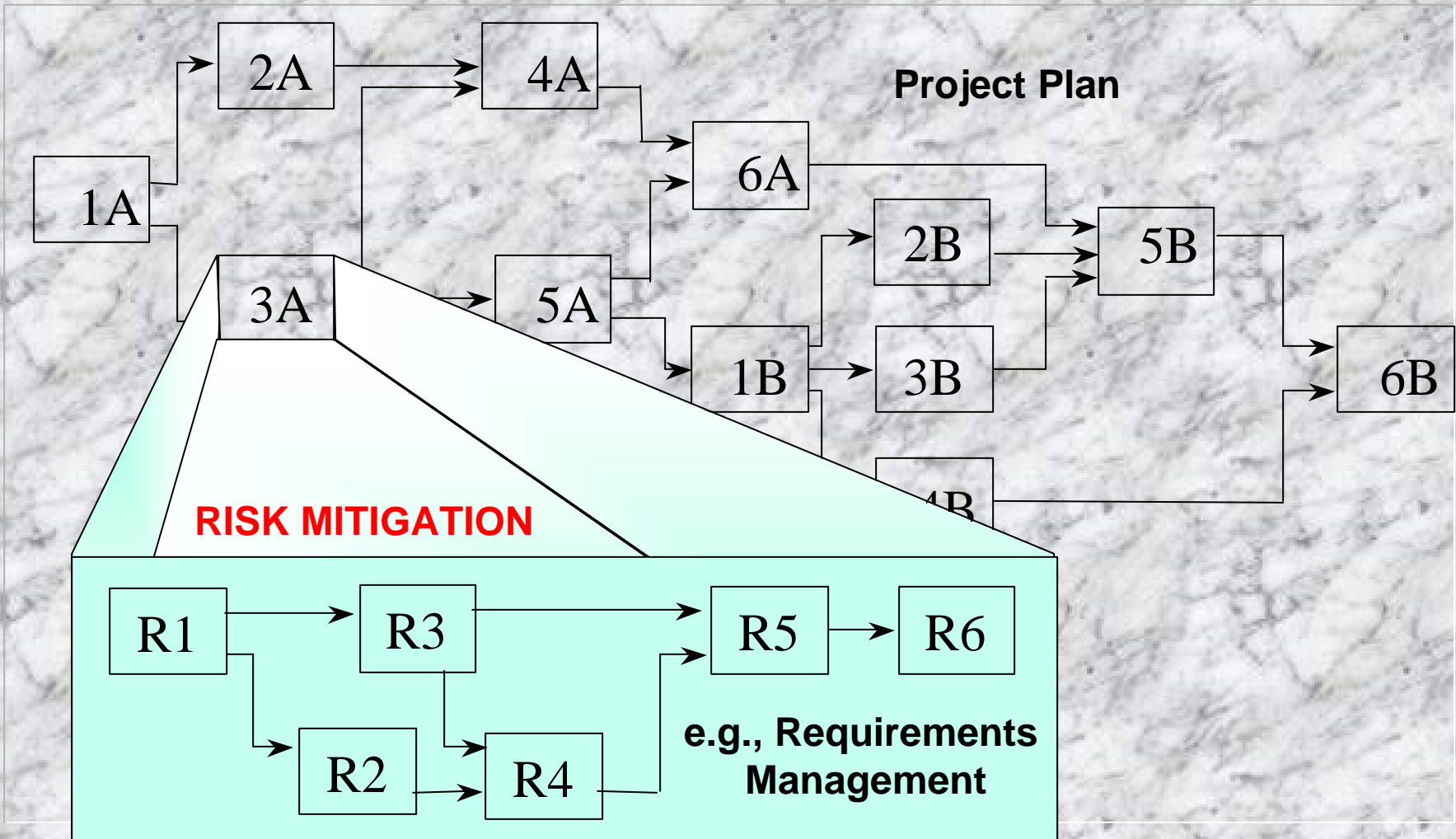
Management Reserve Investment Strategy



Project Plan

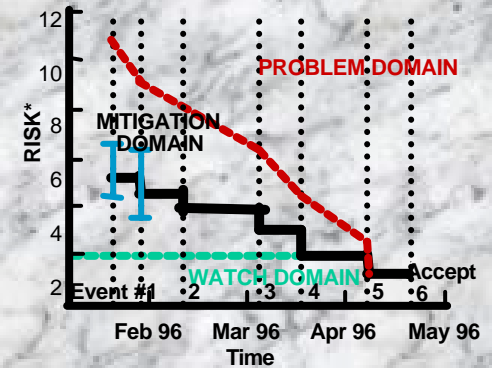


Risk Mitigation Strategy Tasks



Risk Mitigation Strategy

- 1.0 Reprioritize the baselined requirements and reorganize the builds to implement the high-priority requirements first. The likelihood of their changing will be factored into the prioritization process.
- 2.0 Estimate the impact to the schedule for builds and requirements based on the projected completion of the TBD requirements. Verify (as much as possible) that the new schedule accounts for the anticipated changes.
- 3.0 Complete the requirements document for TBD requirements 38-42 and submit a change request.
- 4.0 Complete the requirements document for TBD requirement 73 and submit a change request.
- 5.0 Complete the requirements document for TBD requirement 104 and submit a change request.
- 6.0 Complete the requirements document for TBD requirements 143-149 and submit a change request.



ID	Task Name	Duration	February				March				April				May			
			2/4	2/11	2/18	2/25	3/3	3/10	3/17	3/24	3/31	4/7	4/14	4/21	4/28	5/5	5/12	5/19
1	Reprioritize baseline requireme	10 days	[Task 1 bar]															
2	Estimate Schedule	10 days					[Task 2 bar]											
3	TBD Requirements 38-42	30 days	[Task 3 bar]				[Task 3 bar]											
4	TBD Requirement 73	25 days					[Task 4 bar]											
5	TBD Requirement 104	20 days									[Task 5 bar]							
6	TBD Requirement 143-149	10 days													[Task 6 bar]			

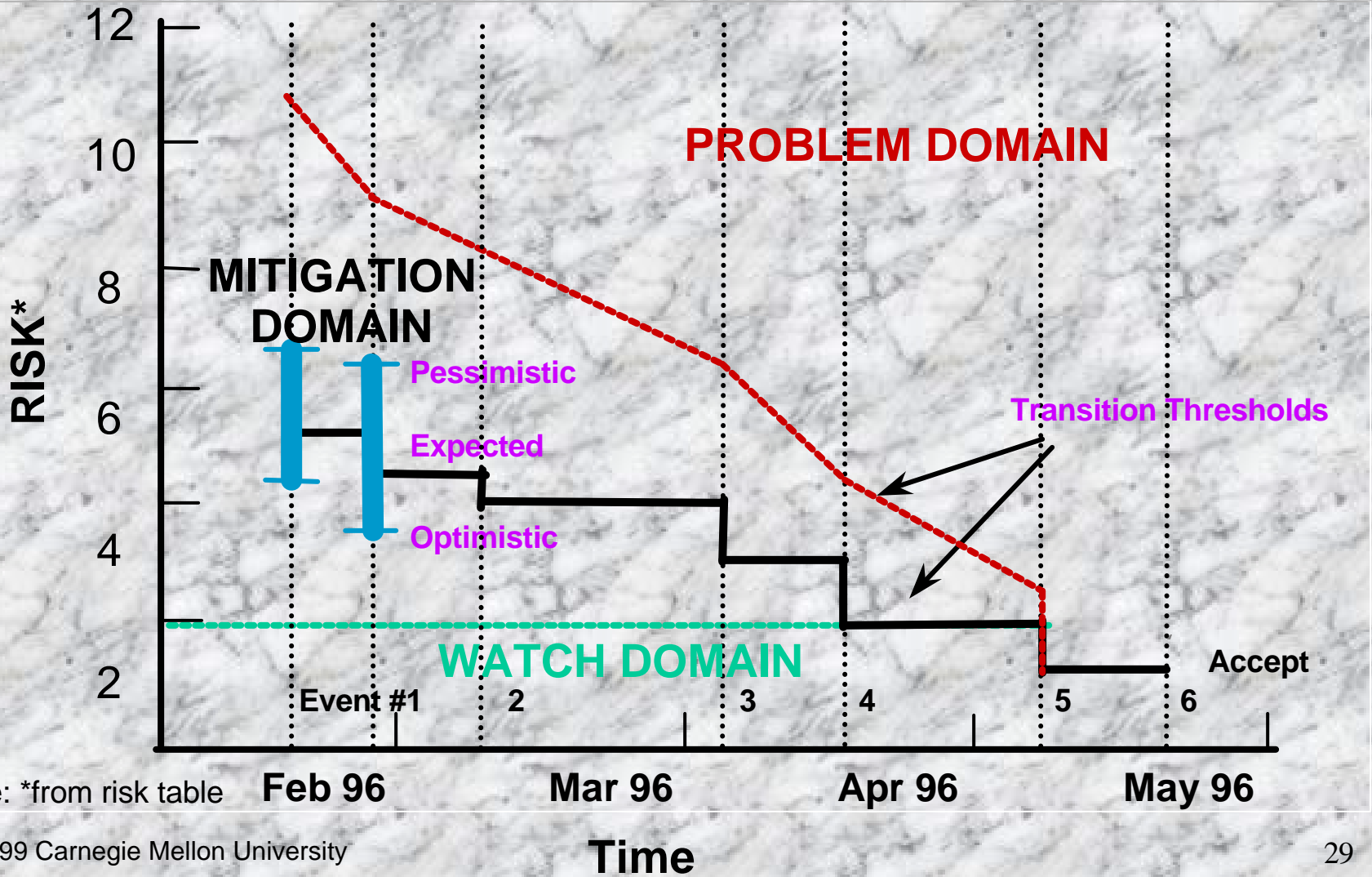
Risk Criteria Table

Attribute: Probability		
Level	Value	Criteria
5	Near certainty	Everything points to this becoming a problem, always has
4	Very likely	High chance of this becoming a problem
3	Likely (50/50)	There is an even chance this may turn into a problem
2	Unlikely	Risk like this may turn into a problem once in awhile
1	Improbable	Not much chance this will become problem

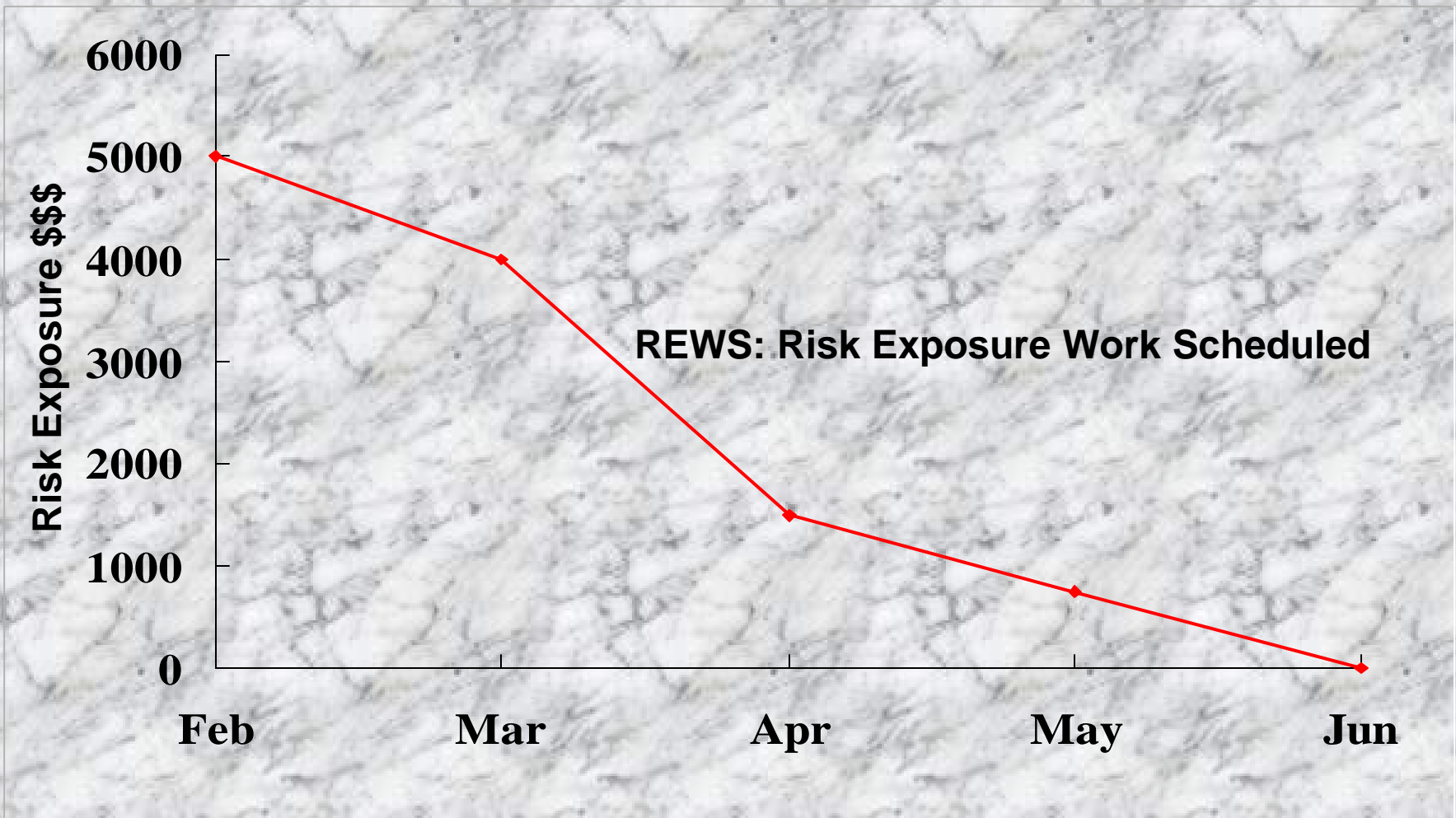
Probability	5	2	3	6	9	12
	4	2	3	5	8	11
	3	1	2	4	7	10
	2	1	2	3	5	8
	1	1	1	2	3	5
		1	2	3	4	5
		Impact				

Attribute: Impact				
Level	Value	Technical Criteria	Cost Criteria	Schedule Criteria
5	Catastrophic	Can't control the vehicle OR Can't perform the mission	> \$10 Million	Slip to level I milestones
4	Critical	Loss of mission, but asset recoverable in time	\$ 10 M ≤ X < \$ 5 Million	Slip to level II milestones
3	Moderate	Mission degraded below nominal specified	\$ 5 M ≤ X < \$ 1 Million	Slip to level III milestones
2	Marginal	Mission performance margins reduced	\$ 1 M ≤ X < \$ 100 K	Loss of more than one month schedule margin
1	Negligible	Minimum to no impact	Minimum to no impact	Minimum to no impact

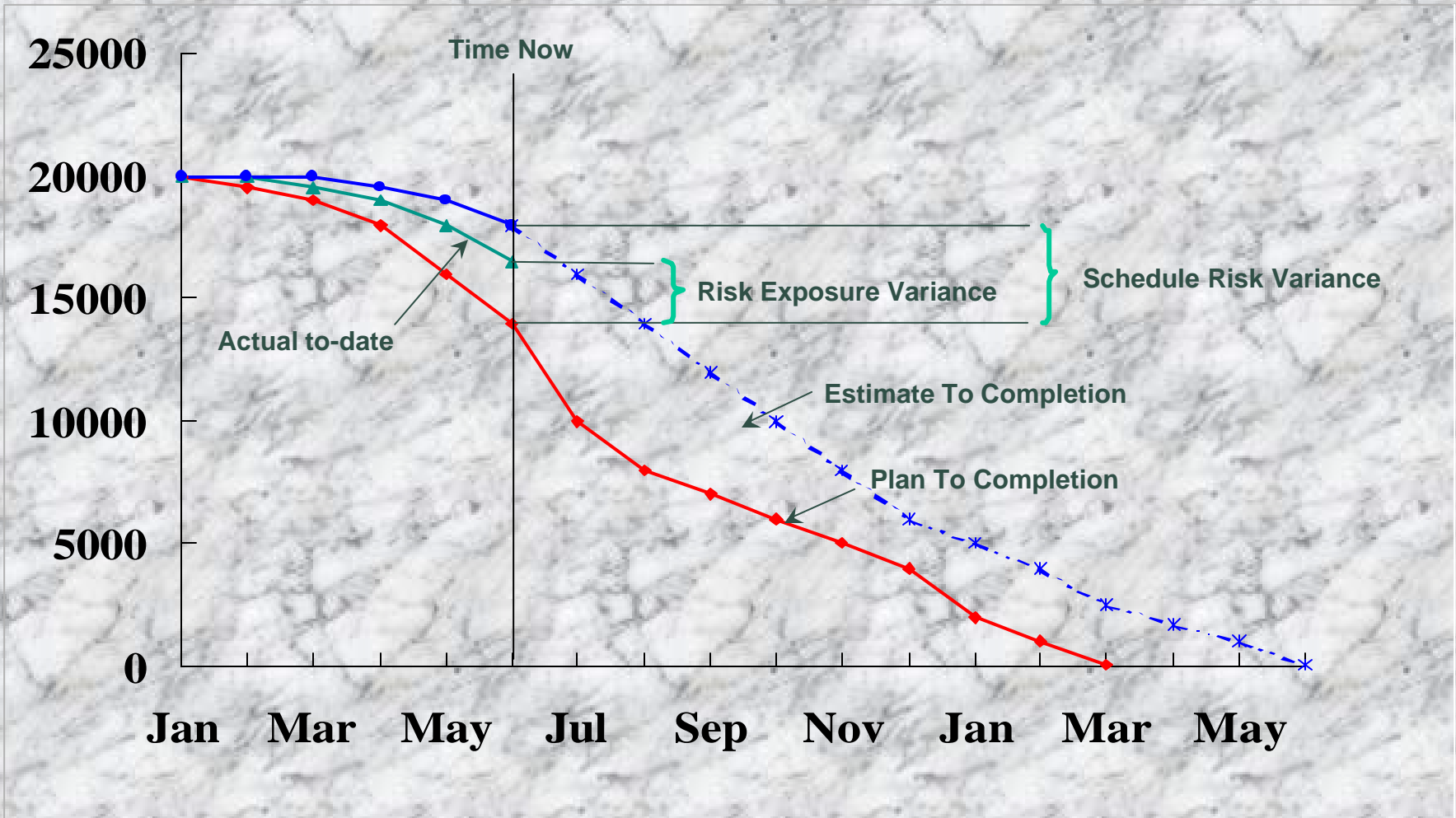
Risk Metrics

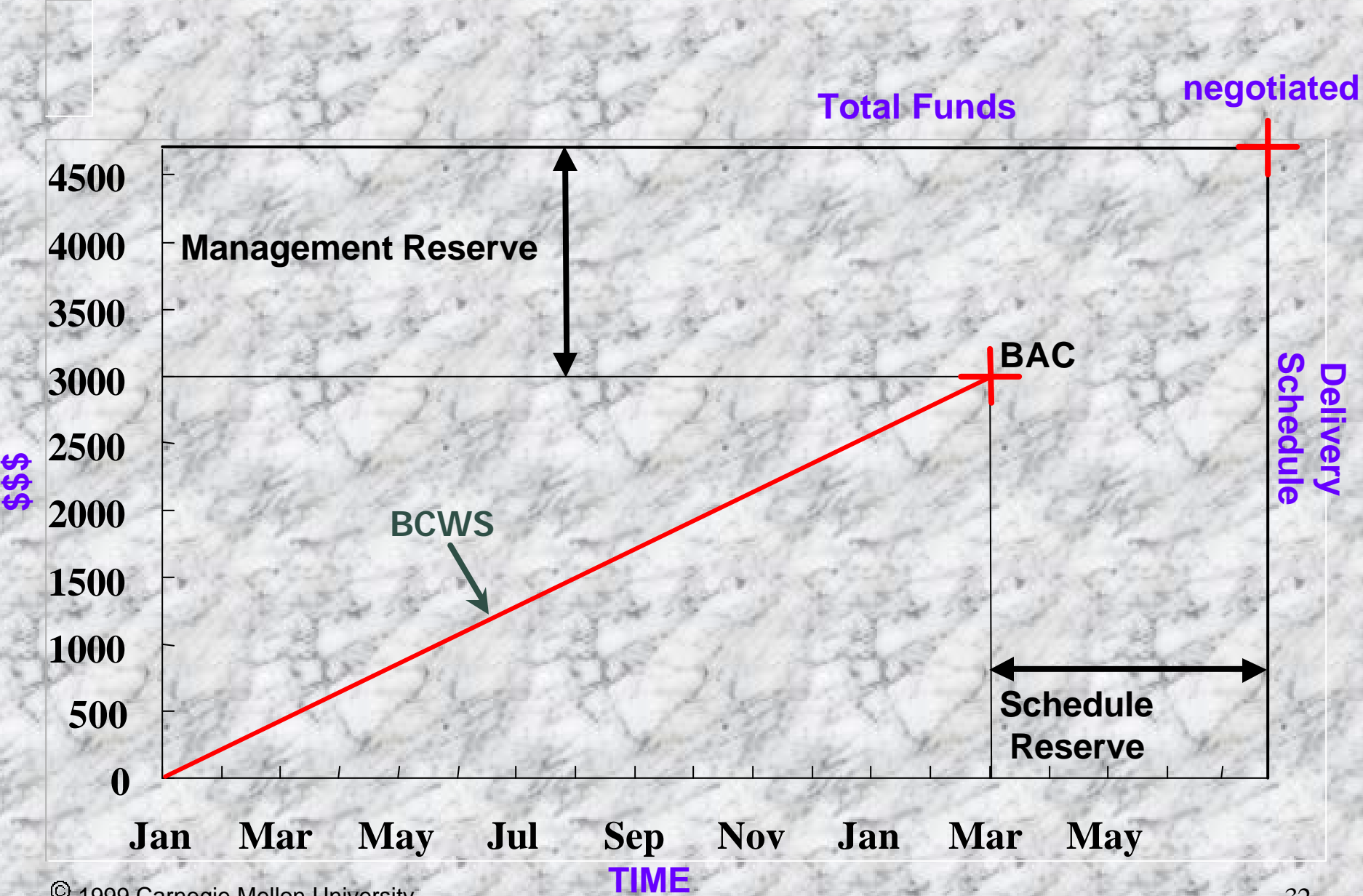


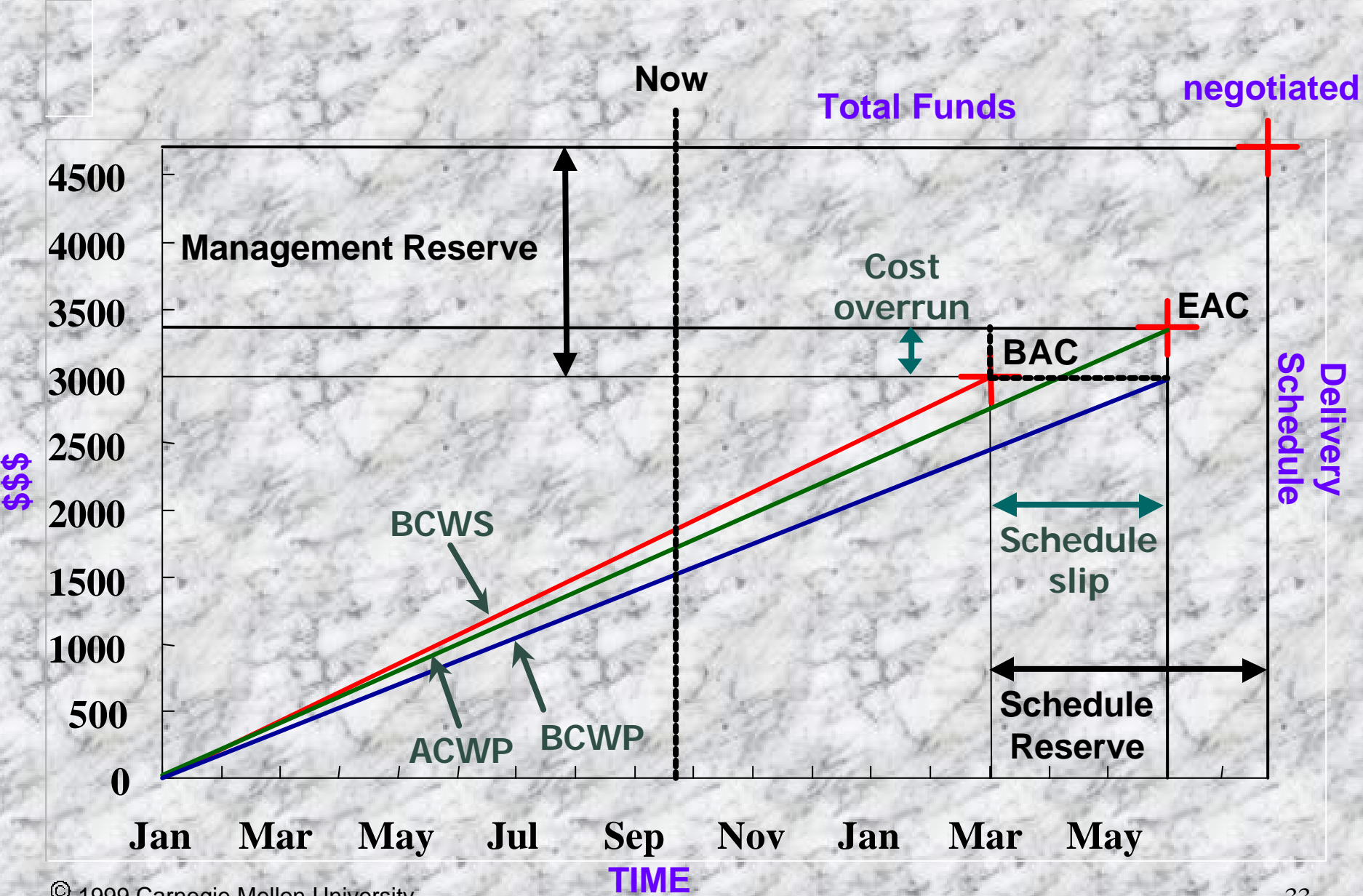
Risk-Earned Value



Risk Exposure “Buy-Down”







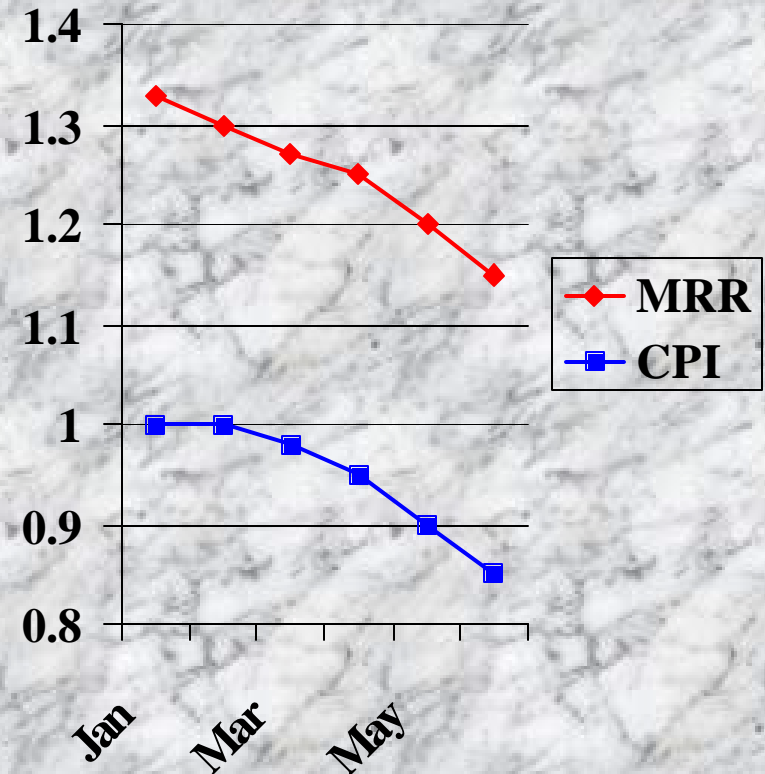
Management Reserve Ratio (MMR)

$$MR = TFA - BAC$$

$$MRR = \frac{TFA}{EAC} = \frac{TFA}{BAC} * CPI$$

Ratio of total funds available against total estimated funds expended at completion

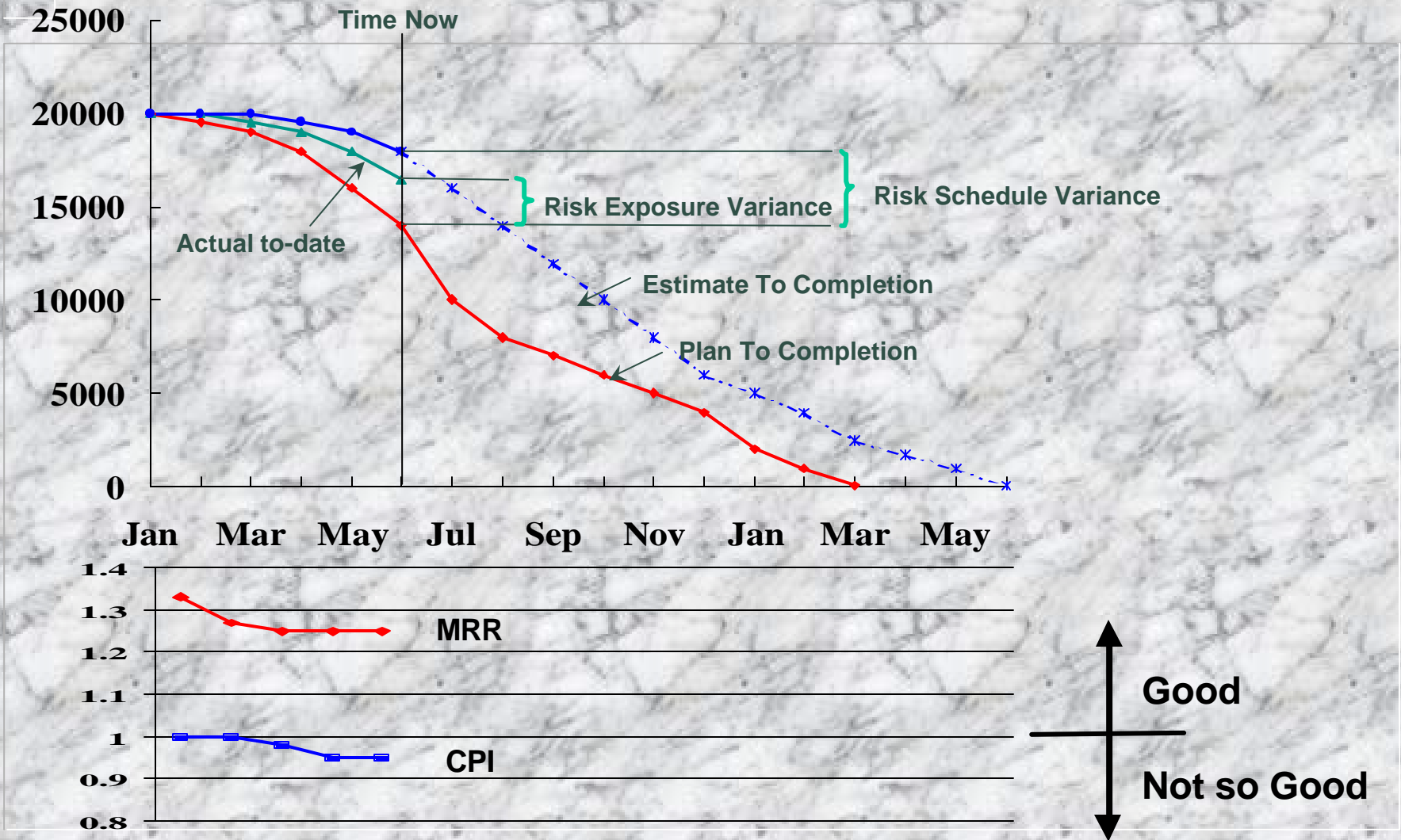
MRR: Management Reserve Ratio
TFA: Total Funds Available



Risk Data Analysis Relationships

Term	Symbol	Formula	Checklist Actions
Risk Exposure Performance Index	REPI	$\frac{ARWP}{REWP}$	Ratio of work accomplished against money spent (Efficiency Rating: Work Done for Resources Expended)
Risk Schedule Performance Index	RSPI	$\frac{REWS}{REWP}$	Ratio of work accomplished against what should have been done (Efficiency Rating: Work done as compared to what should have been done)
Management Reserve Ratio	MRR	$= \frac{TFA}{EAC}$ $= \frac{TFA}{BAC} * CPI$	Ratio of total funds available against total estimated funds expended at completion or total funds available against the budgeted cost at completion multiplied by the cost performance index

Risk Exposure Tracking



Summary

Earned Value methods used

- **to indicate risks**
- **plan allocation of management reserve**
- **track risk exposure “buydown”**
- **track “buydown” investment**

Use for “critical” risks

Account for actions that reduce risk

Fixing risks is cheaper than fixing problems