

# Discrete Statistical Scenario-Based (DSSB) Cost-Risk Utility (Utilizing ACEIT)

for

ACEIT User's Workshop

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David R. Graham

Decision Support Associates

Redondo Beach, CA

[dgmogul1@verizon.net](mailto:dgmogul1@verizon.net)

703-489-6048

# Outline

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- 5X5 Risk Matrix Rating Scales
- Qualitative-to-Quantitative Algorithm
- DSSB Excel Interface
- Mechanics
  - Endpoint Interpretation, Correlations & Simulation Iterations
  - Risk Point Estimate (RPE) Calculation
  - Cost Consequence Range Identification
  - Likelihood of Occurrence Ranges
  - Phased Cost Consequences
- Total S-Curve Result
- Demo of DSSB Cost-Risk Utility

# 5x5 Risk Matrix Rating Scales

## Definitions From Program's Risk Management IPT

- Level Likelihood of Occurrence
  - 1 Not Likely (5% - 20%)
  - 2 Low Likelihood (21% - 40%)
  - 3 Likely (41% - 60%)
  - 4 Highly likely (61% - 80%)
  - 5 Near certainty (81% - 99%)
- Cost Consequence Rating (see notes 1,2 &3)
  - 5 Critical (23% - 28%)
  - 4 Serious (15%- 20%)
  - 3 Moderate (10% - 15%)
  - 2 Minor (5% - 10%)
  - 1 Negligible (1% - 5%)
  - OPP (opportunities) Potential cost savings (added to matrix)

Consequence	5	2	1	1	1	1
	4	0	0	0	1	2
	3	0	0	0	0	0
	2	1	3	3	7	2
	1	0	1	0	0	0
OPP	0	1	3	0	0	0
		1	2	3	4	5
		Likelihood				

Total Risks =	30
High =	9
Medium =	12
Low =	5
Opportunities =	4

- 1) Percent of last approved cost estimate
- 2) Alternative 1: Percent additional resources taken as percent of WBS elements (i.e., S/C, P/L, etc.) affected
- 3) Alternative 2: Percent additional resources taken as a function of burn rate per schedule slip on WBS element(s) affected

**NOTE: Number of risks in above example are notional**

# Qualitative-to-Quantitative Cost Risk Algorithm

## General Process Overview

### Identify Discrete Risks

Risk #1  
 Risk #2  
 Risk #3  
 ...

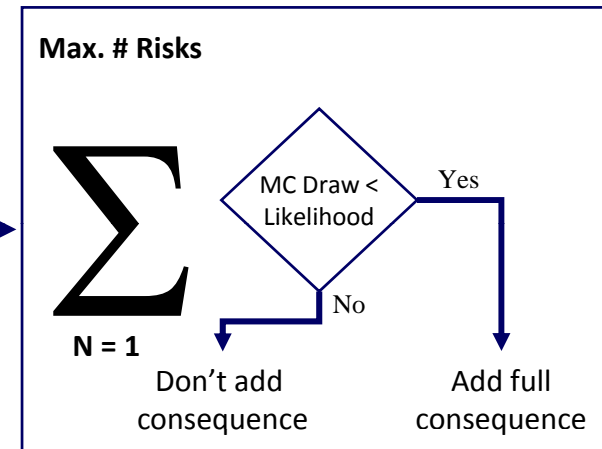
### Estimate Consequence

WBS, Months delay, Phase of Delay  
 WBS % Increase in NRE, RE or both  
 Convert both to \$

### Estimate Likelihood

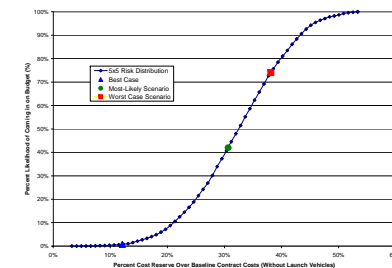
Remote, Unlikely, Likely, Very Likely, Near Certainty

	1	2	3	4	5
5	M	H	H	H	H
4	L	M	H	H	H
3	L	M	M	H	H
2	L	L	M	M	H
1	L	L	L	L	M
	1	2	3	4	5



Run appropriate # of iterations

### Develop Cumulative Distribution





# Mechanics: Endpoint Interpretation, Correlations & Simulation Iterations

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- Set the 'interpretation' of the endpoints for both the cost consequences and the likelihoods
- Set the correlation between cost, likelihoods and risk events
- Set the number of iterations in the simulation

	Cost	Likelihood	Event
Low Interpretation	15	0	
High Interpretation	85	100	
Correlation Between Items	0%	0%	0%
Iterations	5000		

# Mechanics: Risk Point Estimate (RPE) Calculation

Cost Consequence Rating	<u>Low Cost Factors</u>	<u>ML Cost Factors</u>	<u>High Cost Factors</u>
5 Critical (23% - 28%)	0.230	0.250	0.280
4 Serious (15%- 20%)	0.150	0.175	0.200
3 Moderate (10% - 15%)	0.100	0.125	0.150
2 Minor (5% - 10%)	0.050	0.075	0.100
1 Negligible (1% - 5%)	0.010	0.025	0.050
OPP (opportunities) Potential cost savings (added to matrix)			

If the cost consequence is characterized as “critical”:

**Fabrication & Production**  
**5 (Critical)**

	<b>GrahamDR:</b> ASIC H/W+Test+ SEPM
Cost Consequences (NOTE: RPE=Risk Point Estimate)	
WBS Cost (Mean; BY10\$)	24.0
RPE at 5 (CRIT)=0.25*WBS	6.0
RPE at 4 (SERIOUS)=0.175*WBS)	4.2
RPE at 3 (MOD)=0.125*WBS)	3.0
RPE at 2 (MINOR)=0.075*WBS)	1.8
RPE at 1 (NEGLIG)=0.025*WBS)	0.6

Then the consequence is calculated as  $0.25 * 24.0 = 6$  for a Risk Point Estimate (RPE =  $0.25 * \text{WBS Cost of } 24.0$ )

# Mechanics: Cost Consequence Range Identification

## Fabrication & Production 5 (Critical)

<u>Low Cost Factors</u>	<u>ML Cost Factors</u>	<u>High Cost Factors</u>
0.230	0.250	0.280
0.150	0.175	0.200
0.100	0.125	0.150
0.050	0.075	0.100
0.010	0.025	0.050

### RANGES FOR COST CONSEQUENCES

<u>Low = Low/ML</u>	<u>RPE = RPE/RPE</u>	<u>Hi = Hi/ML</u>
92	100	112
86	100	114
80	100	120
67	100	133
40	100	200

Ranges are entered into the DSSB Excel interface as a % of the ML

Cost Consequence		
Low (% of RPE)	Most Likely (% of RPE)	High (% of RPE)
92	100	112



# Mechanics: Likelihood of Occurrence Ranges

Fabrication & Production  
**4 (Hi Likely)**

<u>LIKELIHOOD OF OCCURRENCE (%)</u>			
<u>RATING</u>	<u>LOW</u>	<u>RPE</u>	<u>HIGH</u>
1 (Not Likely)	5.0%	12.5%	20.0%
2 (Low)	21.0%	30.0%	40.0%
3 (Likely)	41.0%	50.0%	60.0%
<b>4 (Hi Likely)</b>	<b>61.0%</b>	<b>70.0%</b>	<b>80.0%</b>
5 (Near Cert)	81.0%	90.0%	99.0%

Likelihood of Occurrence		
Low (value)	Likely (value)	High (value)
<b>61</b>	<b>70</b>	<b>80</b>

# Mechanics: Phased Cost Consequences

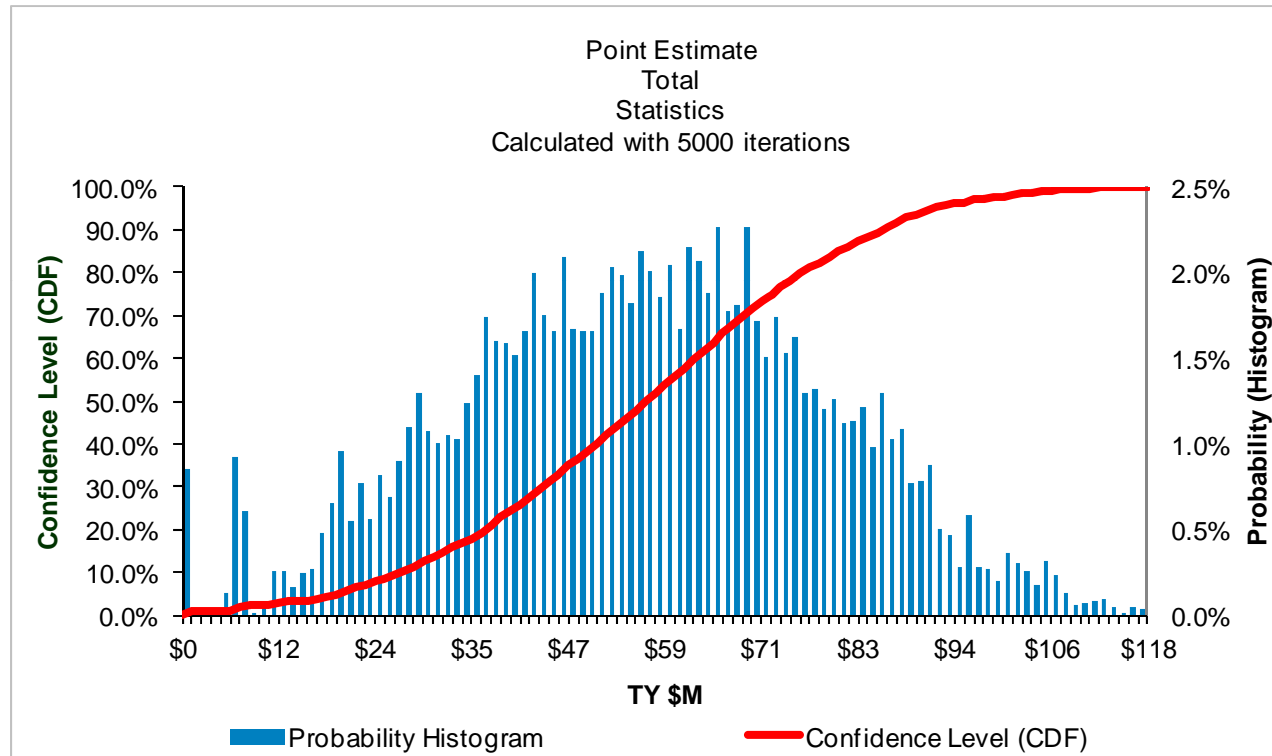
## Fabrication & Production 5 (Critical)

Cost Consequences (NOTE: RPE=Risk Point Estimate)	
WBS Cost (Mean; BY10\$)	24.0
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RPE at 2 (MINOR)=0.075*WBS)	1.8
RPE at 1 (NEGLIG)=0.025*WBS)	0.6

0.75 <----FACTORS FOR SPLITTING ML COST OVER DIFFERENT YEARS---->											
0.4      0.025      0.1      0.25      0.33      0.5      0.34											
Most Likely Cost Consequence, BY 2008 \$M											
Total	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0

2016 & 2017  
0.5\*6.0 = 3.0

# RPE PDF & S-Curve



Note: 99.9% Confidence Level case is the Sum of all RPEs (i.e., effectively simulates likelihoods for each risk cost consequence at 100%);  
At 60% CL, likelihoods for each risk cost consequence is not 100%, so the total risk cost consequence is less than the sum

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# Demo of DSSB Cost-Risk Utility