Techniques for Assessing Cost/Risk in Source Selections

A Practical Look at Improving Source Selection Decisions

Ken Kennedy, AAC/FMC
Col. Tom Sanders, AAC/FM
Kristy Golden, AFCAA/FMAE

Overview

- The Source Selection Process
  - General Objective
  - Evaluation Criteria…***of course*** *it's all about cost!*
- Cost's Role in Source Selection – the Introduction of "Cost/Price Risk"
- Valuing Cost/Price Risk
  - PM, Engineering Preferences
  - Cost Community Preference
- Refining the Process

The Source Selection Process

General Objective

Pick the contractor who offers the most cost-effective approach

- Implications:
  - Government understands the offeror's approach and generally accepts his estimating methodology
  - Proposed technologies can be Matured
  - Technical solution is producible
  - Costs are understood with an acceptable level of confidence
  - Uncertainty is adequately understood and addressed
- The objective is NOT necessarily to select the offeror with:
  - The best technical solution
  - The lowest cost
  - The least risk

Hey, who are we kidding? It's all about cost… everything from unrealistic schedules to inaccurate technology maturity claims eventually evidences itself in cost. If we pick the wrong guy… we'll have a very tough time of it!

The Source Selection Process

Government-Contractor Perspectives

- In acquisition, Contractors produce for a living; government outsources for a living
- Differing experience levels
- Incentives drive behavior
- “Managing the taxpayers’ investment”
- “Not a writing contest”
  - Stringent rules on communications
  - Limited interchange create challenges to full understanding

The Source Selection Process

Properly Incentivizing - Challenges

If contractors really believe that Cost-Risk is the #1 evaluation criterion, that could drive bids up.

…but… Government's reputation for awarding to lowest bidder could drive bids down.

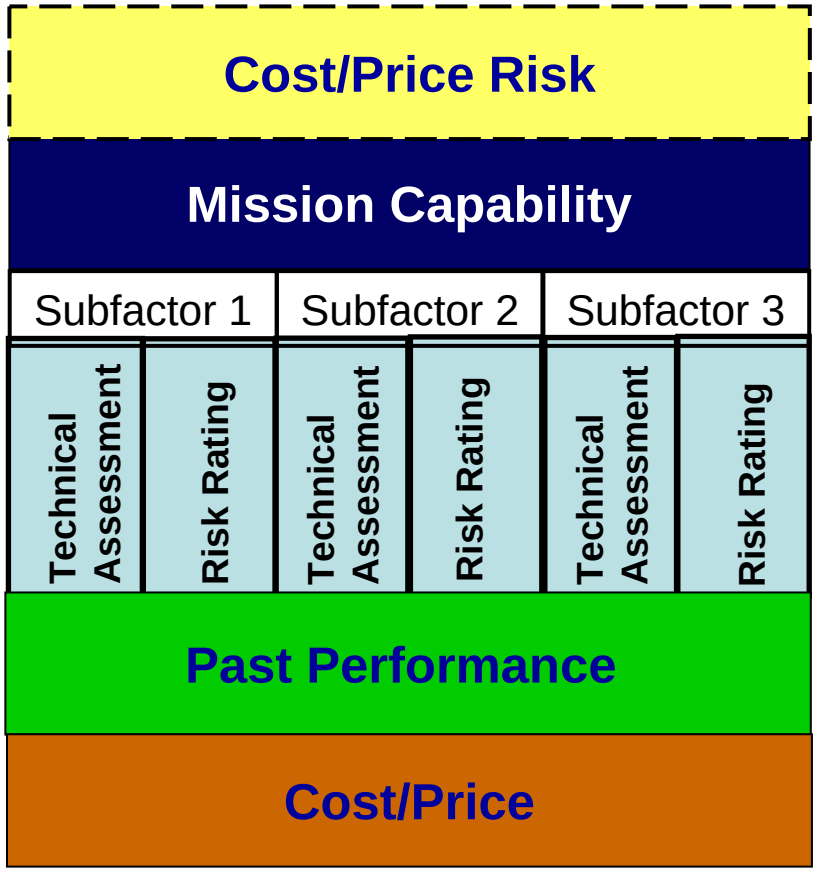
… and… the contractor's ability to propose in trade space could complicate evaluation.

What's certain: Lack of free and open collaboration could lead to misunderstandings, incomplete assessments

Any ambiguity on the source selection team's part will diminish confidence in the probability to select the right contractor…so we'd better be clear.

The Source Selection Process

Evaluation Criteria



Order of Priority

Mission Capability and Cost/Price Risk Ratings are key to the Evaluation

The Source Selection Process

The New Approach to Cost

Old Way:

Government prepares its estimate of “generic” configuration.
The evaluation compares the government estimate to each offeror’s estimate.
Whichever contractor is closest gets the most points.

New Way:

Government prepares a separate estimate for each contractor’s approach.
The evaluation compares each contractor’s approach to the Independent Government Estimate for that contractor’s approach.
The contractor’s approach is rewarded based on how close it is to the IGE.

The Source Selection Process

Recent Eglin Source Selections

- SDB 1 (SDD)
- CRIIS (Risk Reduction)
- SDB 2 (Risk Reduction)
- HTVSR Risk Reduction)

Early in the program there is increased uncertainty and, therefore, a greater need for accurately capturing and quantifying risk.

Cost's Role in Source Selection

An AFMC Best Practice

Since risk is a such a well-known adversary of successful programs… We need to acknowledge and employ risk identification and quantification techniques used elsewhere in DOD acquisition

… **so why not merge the currently-used risk management tools and approaches (risk cube, Active Risk manager (ARM), PoPs, etc.) with the cost discipline's quantification skills!**

Cost's Role in Source Selection

New Source Selection Focus

- Cost/Price Risk # 1 evaluation priority
  - High, medium, or low rating based on percent difference between proposed contractor cost and government estimate of offeror's approach
- Requires clear communication
  - Full data source ID and extract for element basis of estimates (BOEs)
  - Full data source adjustment justification in element BOEs
  - Full discussion of risk and uncertainty in element BOEs

Cost's Role in Source Selection

RFP Language: Section M

4.1 The Cost/Price Risk evaluation assesses the degree to which an offeror's price proposal for all Pre-SDD and SDD Fixed Price Incentive Firm (FPIF) work compares with the Independent Government Cost Estimate (IGCE) for the same items. This IGCE will be the Government's Most Probable Cost (MPC) of each offeror's approach. The government will develop an IGCE for each offeror that represents their unique technical approach using one or more cost estimating methods (i.e. grass roots, analogy, parametric, etc.).

The estimate will also include an analysis of uncertainty based on technical team inputs and contractor proposal data. The analysis results will be compiled using commercial simulation software to identify the range of projected costs with associated confidence levels.

The government will utilize whatever cost analysis techniques it deems appropriate, to include those listed in FAR 15.404-1(c)(2) to calculate their estimate. A cost/price risk rating for each Pre-SDD and SDD price will be assigned based on the following description. The cost/price risk rating, the offeror's price, the IGCE, and relevant comments will be presented to the SSA.

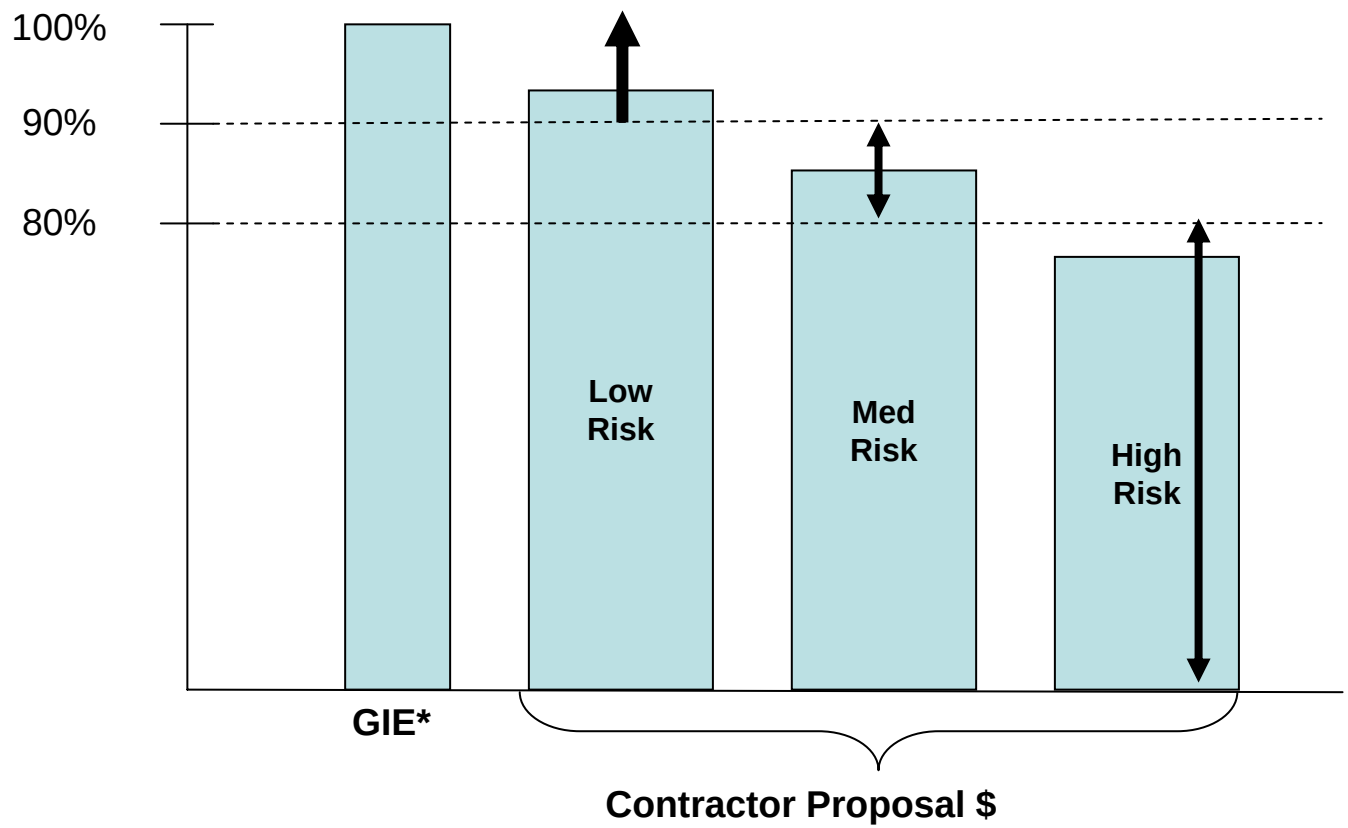
Cost's Role in Source Selection
Air Force FAR Supplement 5315.3

4.4.1.4.1 Most Probable Cost (MPC)

The MPC estimate is the government estimate of the costs to acquire specified goods and/or services. This estimate includes not only those costs that will be included as part of the contract, but may include any other costs that will be incurred by the government in the performance of the acquisition program. For ACAT I programs, the MPC must also include an analysis of the uncertainties inherent in any acquisition, from those related to the cost estimating methods chosen, to those associated with the technical and programmatic assumptions of the program

Valuing Cost/Price Risk

Evaluation Criteria



* Government Independent Estimate of particular contractor's approach. The ral challenge lies in the derivation of the GIE.

Valuing Cost/Price Risk
The Cost Risk Team

- Engineers (Identify risky elements of offeror's approach and craft a technical solution/ mitigation strategy)
  - Liaison between Execution Risk, Mission Capability
  - Must understand big picture
- Cost Estimators (Determine sufficiency of offeror's BOEs and derive GIE)
- Financial Specialists (Insure accountability of cost proposal and consistency in deriving GIE)

Valuing Cost/Price Risk

Alternative Approaches

- Grass-roots Approach
- Discreet Event Approach
- Uncertainty Modeling Approach

Program Management is most comfortable with a process that defines discreet events and attaches “risk dollars” to the uncertainty inherent in a contractor’s approach. A primary problem with this process is that it insists on more perfect knowledge and understanding of the risks and uncertainties in the approach than the contractor – and certainly than the government – could ever know.

So…what DO we know for sure?

Valuing Cost/Price Risk
Estimating Trends

GAO-07-406SP Defense Acquisitions Assessments of Selected Weapon Programs

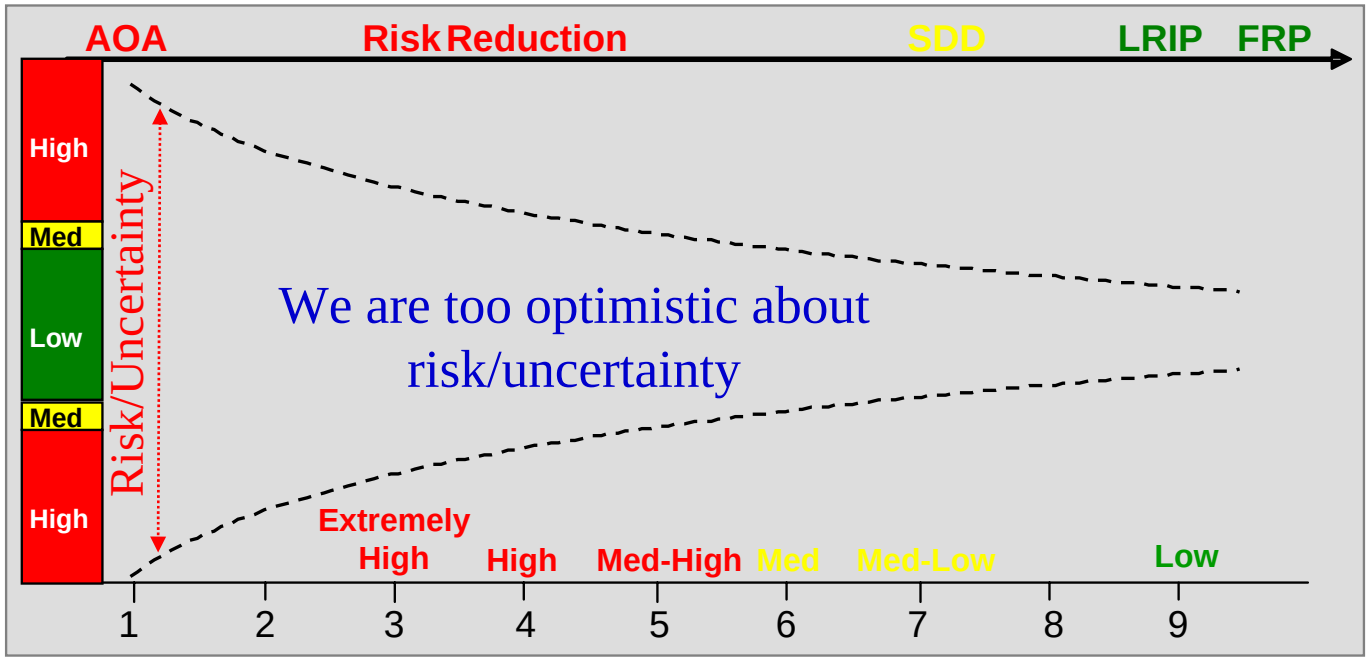
- GAO assessed 62 weapon systems with a total investment of over $950 billion, some two-thirds of the $1.5 trillion DOD plans for weapons acquisition
- "*Fully mature technologies were present in 16 % of the systems at development start*" - the point at which best practices indicate mature levels should be present.
- Programs that began development with *immature technologies (84%) experienced a 32.3 percent cost increase*, whereas
- Those that began with *mature technologies (16%) increased just 2.6 percent*."

This is fairly well-known among seasoned estimators...

Valuing Cost/Price Risk

The Uncertainty Continuum

Range of Missile Program Cost Outcomes



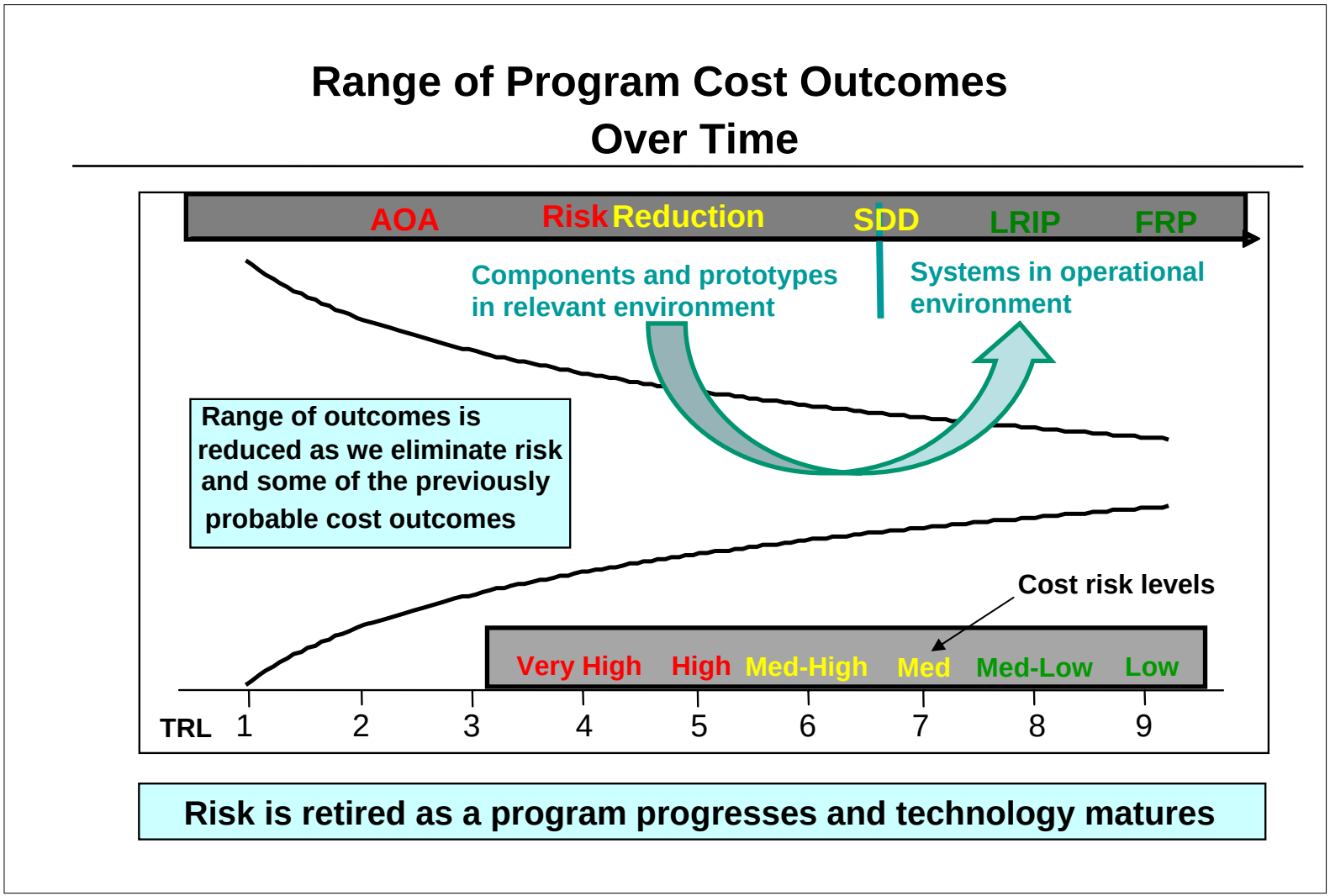
Risk is retired as a program progresses and technology matures

Valuing Cost/Price Risk
"Low Risk" For FRP

- We are not at "Low Risk"
  - Once we are through our pre-SDD risk reduction phase
  - Once we enter SDD
  - Once we start testing prototypes
  - Once we start LRIP
- We are at "Low Risk" only after
  - we have a proven design supported by OT&E findings
  - We have a proven production line
  - ready to enter FRP
- Until then, there are a lot of bad things that can happen, probably will happen, and will have technical, schedule, and, therefore, cost impacts.

Valuing Cost/Price Risk

Risk vs Notional TRLs



Valuing Cost/Price Risk

Grass-roots Approach

- General concept: Government prepares estimate using technical definition provided in proposal
- Proposal acts as CARD
- Government estimators use analogies, parametrics, engineering methodologies
- Government estimating methodologies likely to emulate POE methodologies

Valuing Cost/Price Risk

Discreet Event Approach

- General concept: Identify specific elements of the offeror's approach that are risky
  - In collaboration with Execution Risk, Mission Capability
- Define a strategy to mitigate those risks
- Estimate the cost of implementing that strategy
- Add costs and apply evaluation criteria
- Implies a validation of offeror BOEs

Valuing Cost Risk
Uncertainty Modeling Approach

- General concept: Statistically quantify the uncertainty in an offeror's approach using tailored industry standards and recognizing unique proposal characteristics
  - Guidance from FMC, AFCAA
  - In collaboration with Execution Risk, Mission Capability
- Characterize risk of effort by WBS
- Prepare "Risk-free" GIE, or cleanse risk from offeror's proposed cost
- Run statistical simulations to derive confidence intervals
- Target the 65% confidence level

This should be the preferred solution…

Valuing Cost Risk
AFCAA/AAC Risk Model

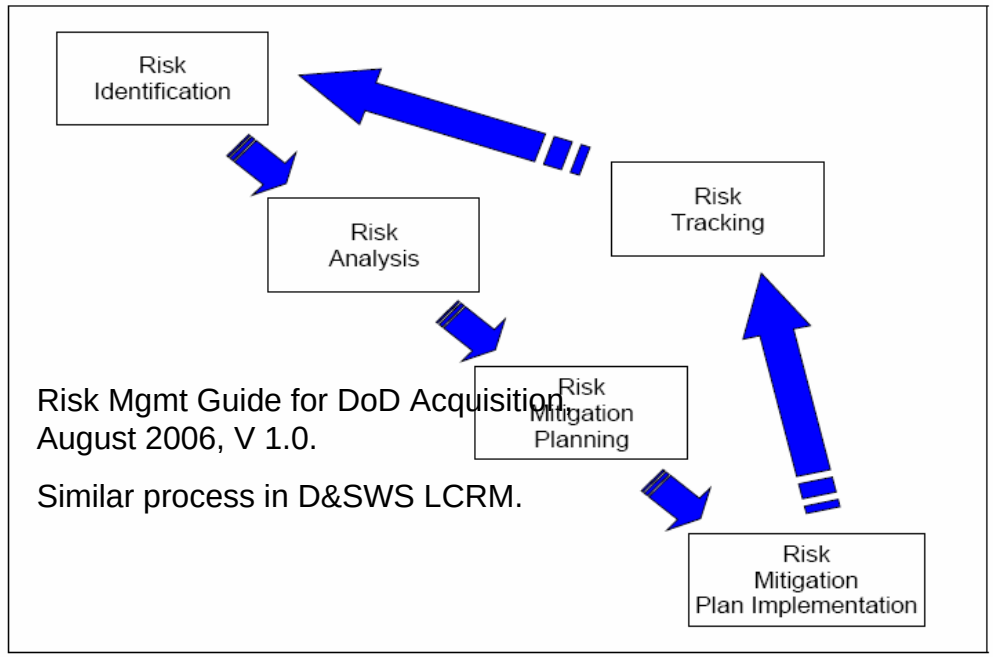
Basic Concepts

- Uses TRLs
- Uses RI3 input for documenting risk assessments
- Point Estimate with Risk Assessment
- Triangular or other distribution
- Correction for Uncertainty Not Captured
- Correction for Skewness
- Risk back-spread based upon standard deviation of risk distribution
- Can be used with @Risk©, Cystall Ball©, etc.
- Produces Cost Confidence curves (S-Curves)

Valuing Cost Risk

RI3 Use For Risk Management

- RI3 leverages existing DoD and AF Risk Management processes
- Questions in nine 'ilities" areas
  - Design Maturity and Stability
  - Scalability & Complexity
  - Integrability
  - Testability
  - Software
  - Reliability
  - Maintainability
  - Human factors
  - People, organization, & skills



Risk Mgmt Guide for DoD Acquisition, August 2006, V 1.0.

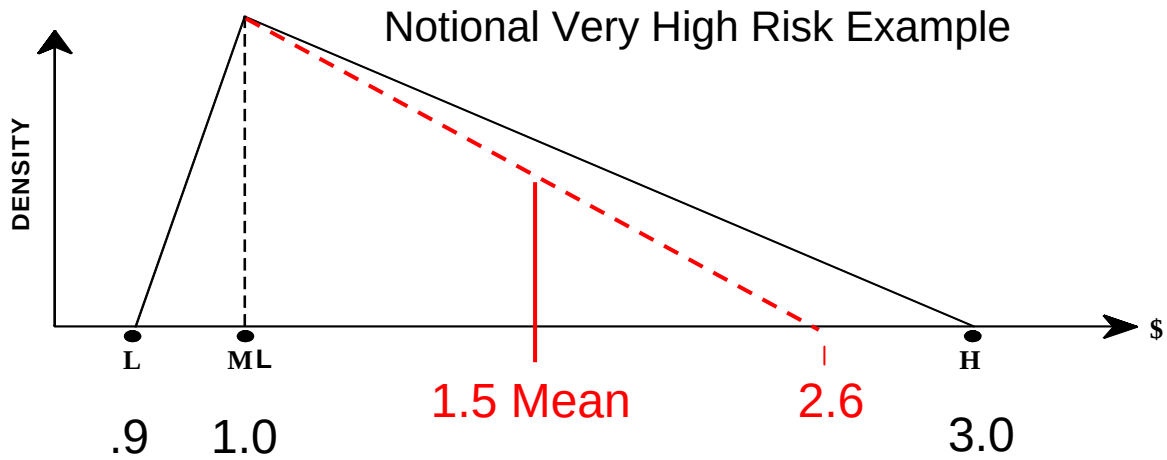
Similar process in D&SWS LCRM.

- **Questions contained in a guidebook and interim tool**
  - **Guidebook explains why each question is important**
  - **Based on repeated problems in past**
  - **Deconflicted from TRA, MRA, SEAM, LHA**

Valuing Cost Risk

Triangular Distribution by Risk Category and TRL

Schedule/Technical Challenge Beyond Source		Absolute Bound	
		Lower	Upper
TRL 9	None	1.0	1.0
TRL 7	Low	0.9	1.1
TRL 5	Medium	0.9	1.5
TRL 4	High	0.9	2.0
	Very High	0.9	3.0

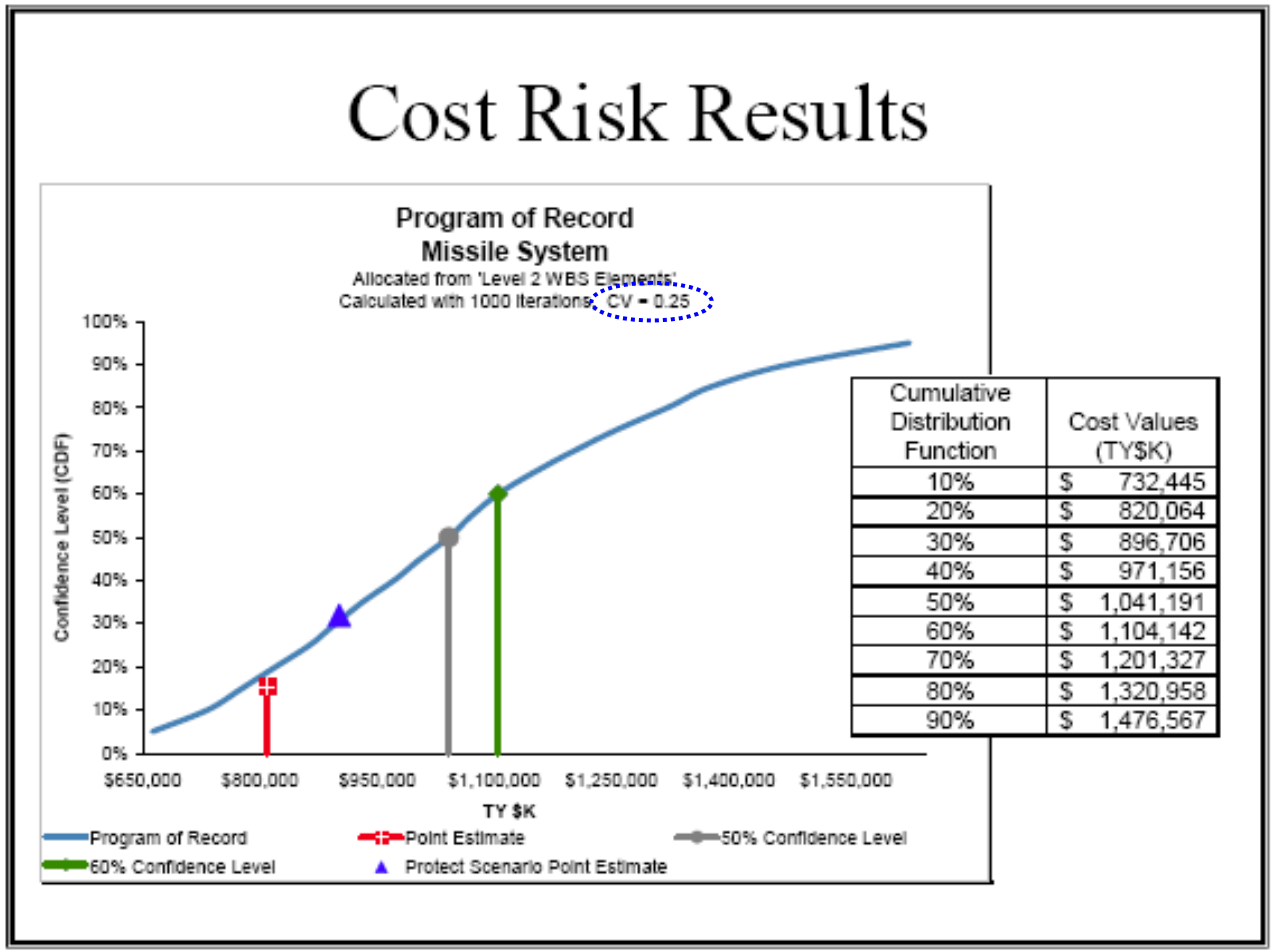


Note: These are the Air Force Cost Risk and Uncertainty default or notional ranges only. If you have empirical data to suggest wider or narrower ranges for your commodity or type of program within a commodity area, use those instead.

For example: if you find that schedule outcomes are 1.5 times the most likely values, compute the upper bound that would give you a triangular distribution with a mean of 1.5.

Valuing Cost Risk

Uncertainty Modeling Approach



Cumulative Distribution Function	Cost Values (TY$K)
10%	$ 732,445
20%	$ 820,064
30%	$ 896,706
40%	$ 971,156
50%	$ 1,041,191
60%	$ 1,104,142
70%	$ 1,201,327
80%	$ 1,320,958
90%	$ 1,476,567

Figure 6-3 Sample Presentation Chart (3 of 4) Cost Risk Results

Valuing Cost Risk
Comparing Techniques

- Clarity
  - Discreet technique more understandable
- Comprehensiveness
  - Grass-roots technique may miss subtleties in the offeror's approach
  - Uncertainty Modeling technique covers all elements of contractor's approach, but…
  - Insists on a credible, "risk-free" GIE
- Analytical Rigor
  - Grass-roots approach requires our best for a significant amount of time
  - Discreet technique more challenging, however…
  - Building the "risk-free" GIE for the modeling technique will be hard

Valuing Cost Risk
Comprehensive Approach

- Collaborate With Mission Capability & Execution Risk
  - Common Understanding Of Contractor's Approach
  - Consistent Identification Of Risk And Areas Of Uncertainty
- Identify Risk Associated With the Offeror's Approach
  - Features Of The Offeror's Approach That Drive Cost
    - Risks
    - Uncertainties/Deficiencies
  - Improper Estimating Methodologies/Admin Errors
- Quantify Risk Associated With the Offeror's Approach And Adjust Offeror's Proposed Cost
  - Estimating Methodology Varies by WBS
  - Result - Government Independent Estimate
- Cross-check – AFCAA/AAC Risk Estimating Methodology
- Apply Evaluation Criteria

Refining the Process

- We must do better to understand the offeror's approach and subsequent cost proposal
  - Where is the risk?
  - Improve communication without giving unfair advantage
- We need to make these source selections less painful
  - Increase internal reconciliation
  - Need Clear lines of authority
- Need to increase the rigor in deriving cost risk assessments