Integrated Cost Risk and Cluster Analyses

SBIRS SPO Visit

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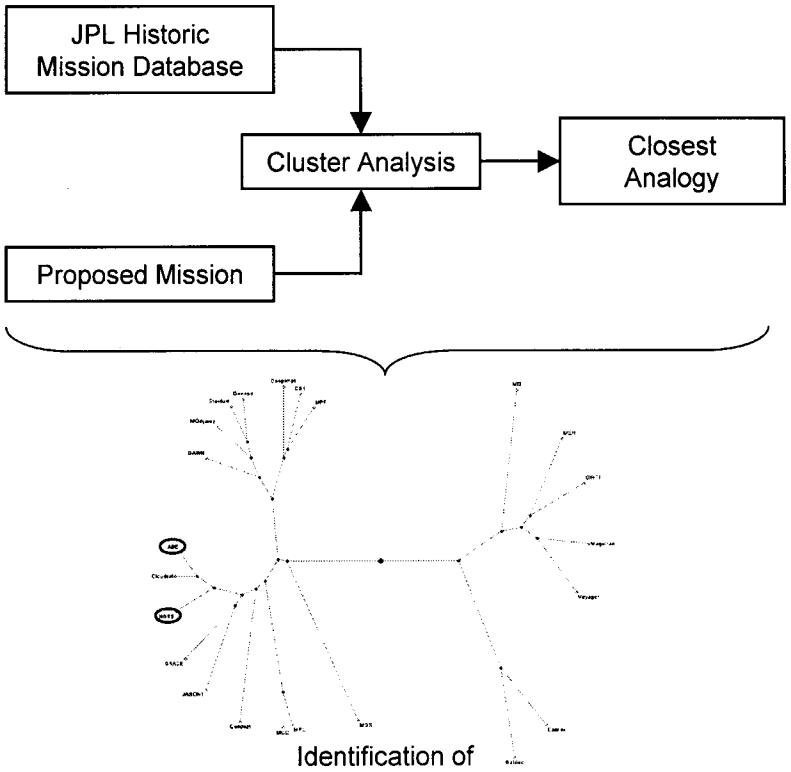
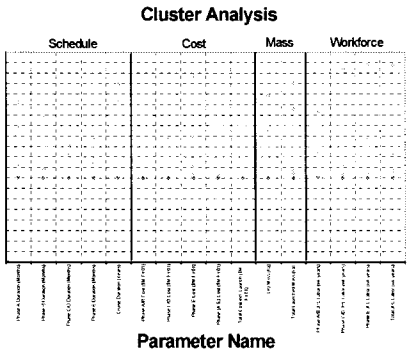
5 December 2002

Introduction

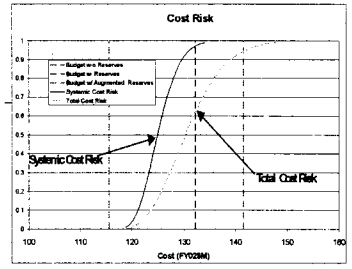
- Incorporate cluster analysis information to quantify total cost risk.
  - Identification of closest analogy should be based on proposal values or similarity to current vintage of estimate.
  - Quantitative analysis is focused on history of actual values for analogy mission.



Identification of Cluster for a Proposed Mission and Closest Analogy



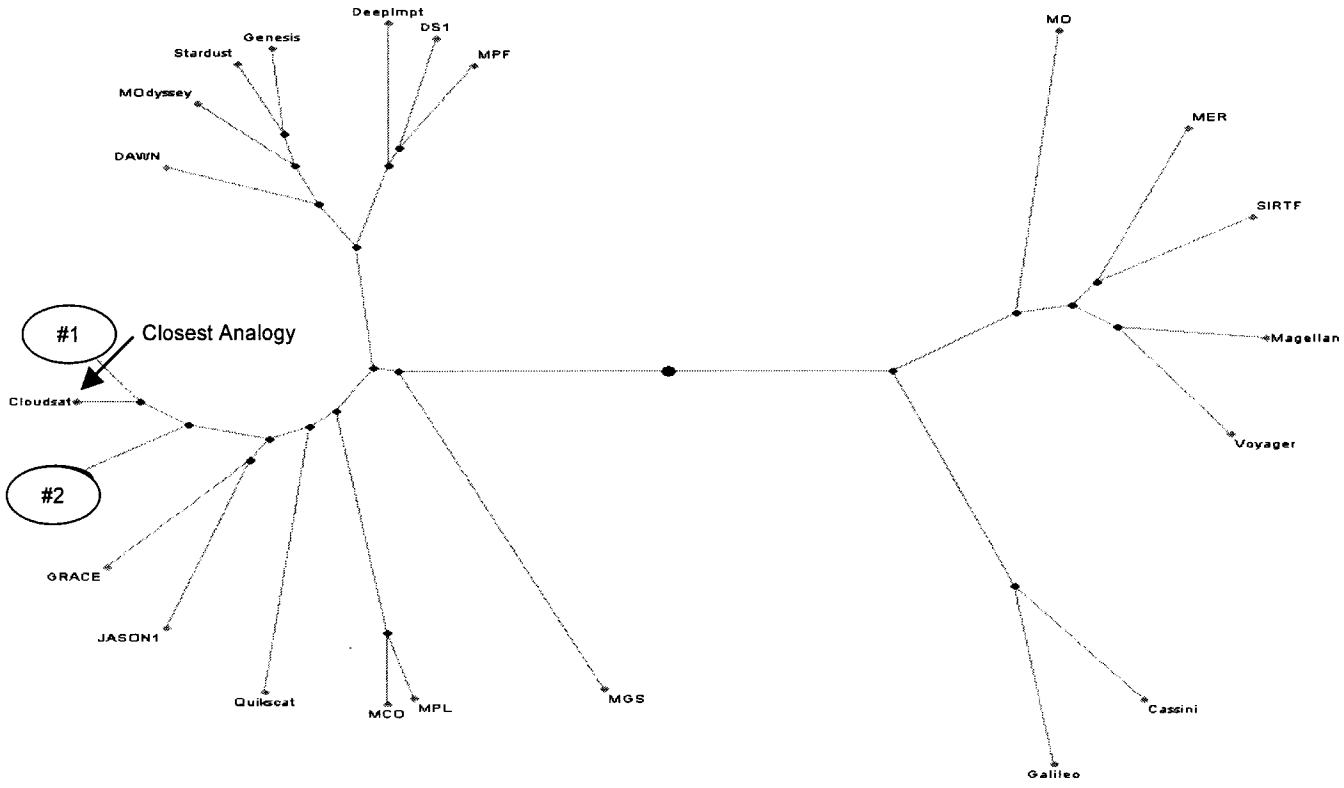
Quantitative Analysis Highlighting Proposed Mission & Closest Analogy



Systemic and Total Cost-Risk Comparison Using External Cost Fraction

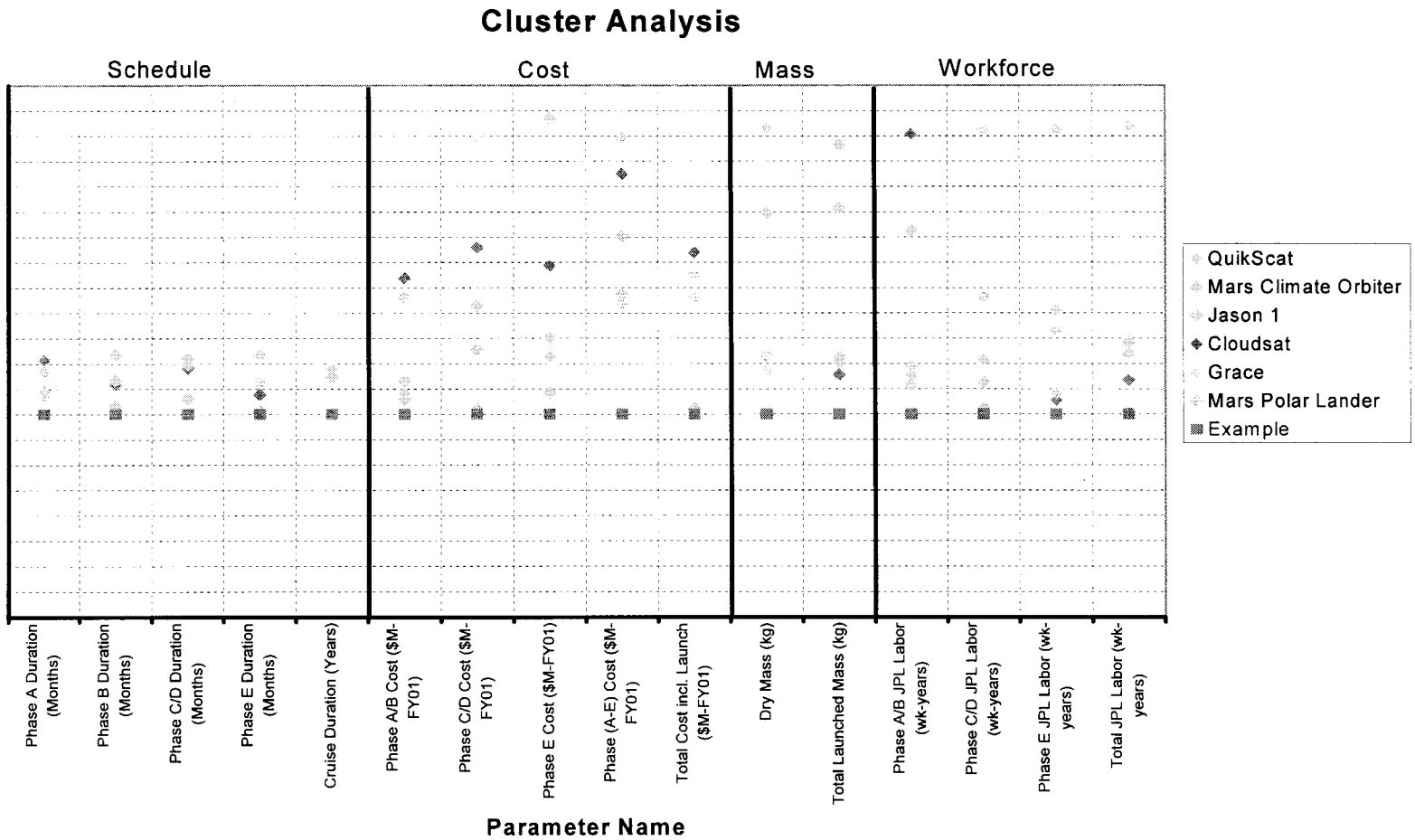
Cluster Analysis

- Identify Cluster for a Proposed Mission and Closest Analogy
- Currently Based Upon 4 Categories of 16 Descriptive Parameters
  - Schedule
  - Cost
  - Mass
  - Workforce
- Can Expand Parameters to Add Technical Data as Data Become Available. Maintain vintage dates of estimates.



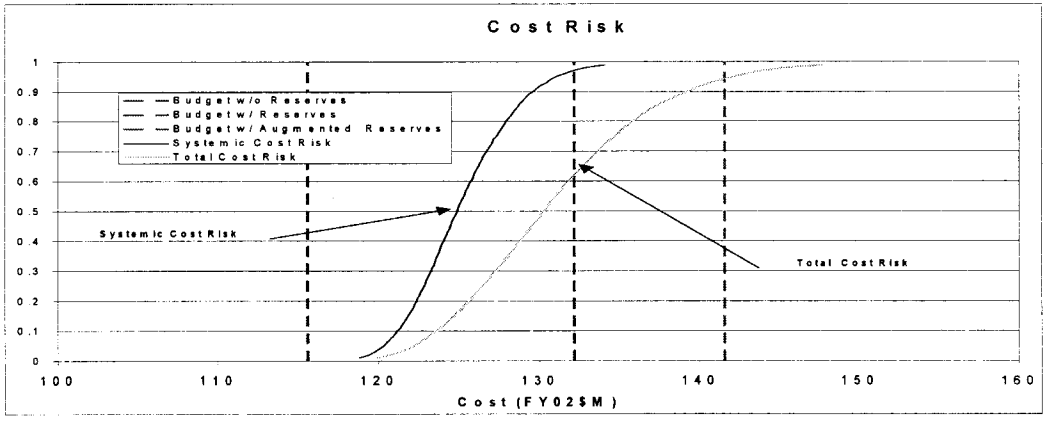
Quantitative Analysis

- Cluster Quantitative Analysis Focused on Analogy Mission
  - Displays Ratios of Current Actual Values to Estimates of Values at Commitment (or at Step 2 Proposal Selection).



Cost-Risk Using External Cost Fraction

- Cost Risk
  - Establish Systemic Cost-Risk Using 99th Percentile Elicitation and Monte Carlo Simulation
  - Augment Cost Risk Analysis Using Project Data Illustrating Cost Growth and Reserves Expenditure
    - Decompose Cost Growth Into 2 Components
      - Systemic: Under Control of the Project(Contractor)
      - External: Outside the Control of the Project(Contractor), e.g., HQ Directed Change of Launch Date
    - Systemic Cost Risk Adjusted by External Cost Risk Fractions for Each WBS Element Significantly Impacted By External Factors and Also Ranked As an Important WBS Element Cost Risk Driver
      - Adjustment = (Total Growth / Systemic Growth)
      - =1+ (External Growth / Systemic Growth)
      - Adjustment Factors Estimated from Analogy Mission Experience



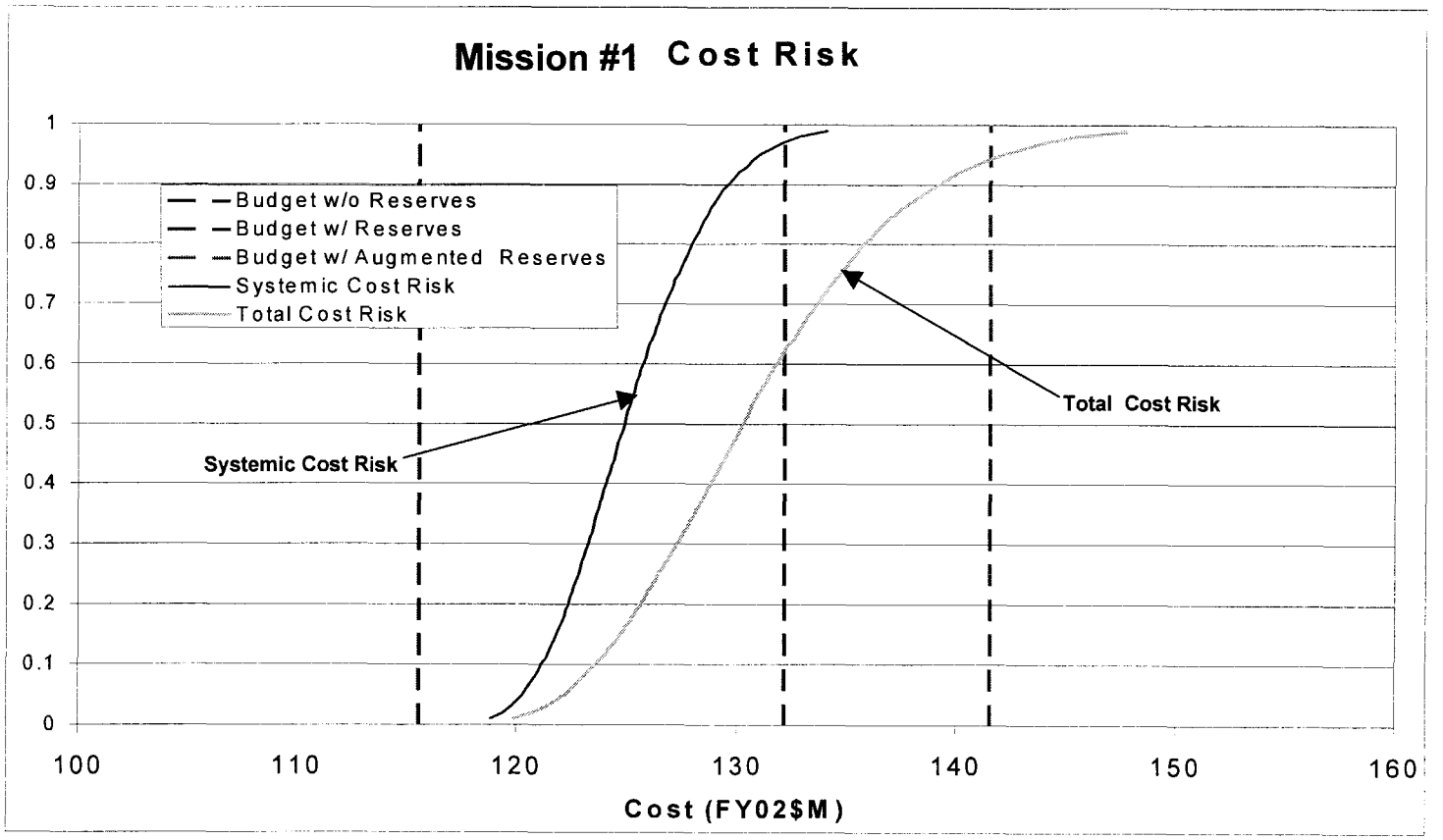
Example

- Mission #1 Cost Risk Ranking

WBS Element	Budget (FY'02$M)	Pessimistic Cost	Importance
1.0 Project Management	$4.050	$4.455	**7**
2.0 Project Systems Engineering	$5.250	$6.038	**14**
3.0 Mission Assurance	$3.630	$4.719	**18**
4.0 Science	$11.160	$15.066	**61**
5.0 Payload System	$47.100	$59.000	**192**
6.0 Observatory	$32.800	$39.300	**110**
7.0 Mission Operations System	$11.570	$15.620	**64**

Example

- Mission #1: Adjustment = 1+(6.0/3.9)
  - (HQ + JPL Changes on Ball) / (Ball Rate Changes + Ball Overruns)
  - Estimated from Cloudsat changes to Ball contract
  - Applied to WBS Element 6.0



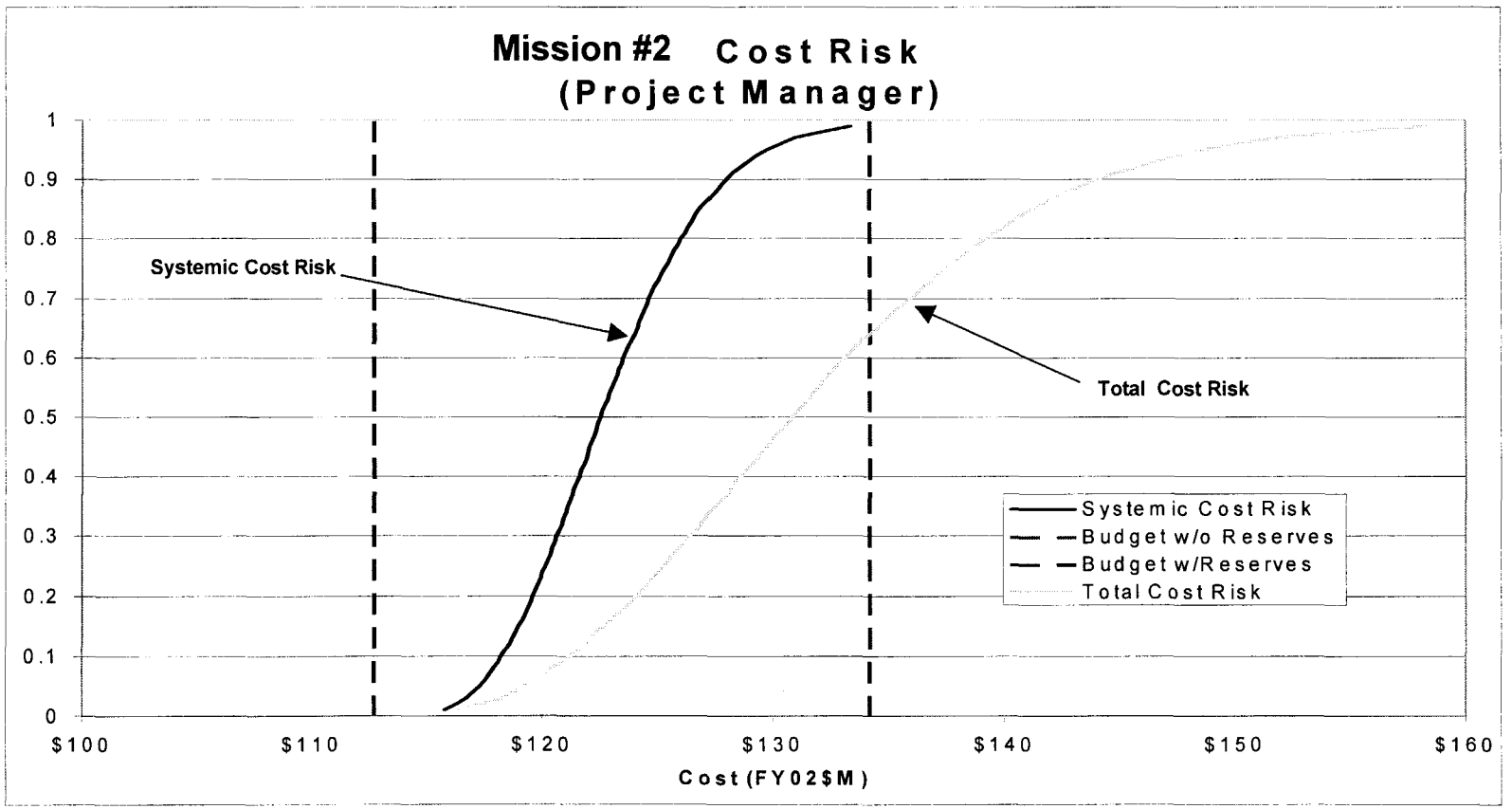
Example

- Mission #2 Cost Risk Ranking

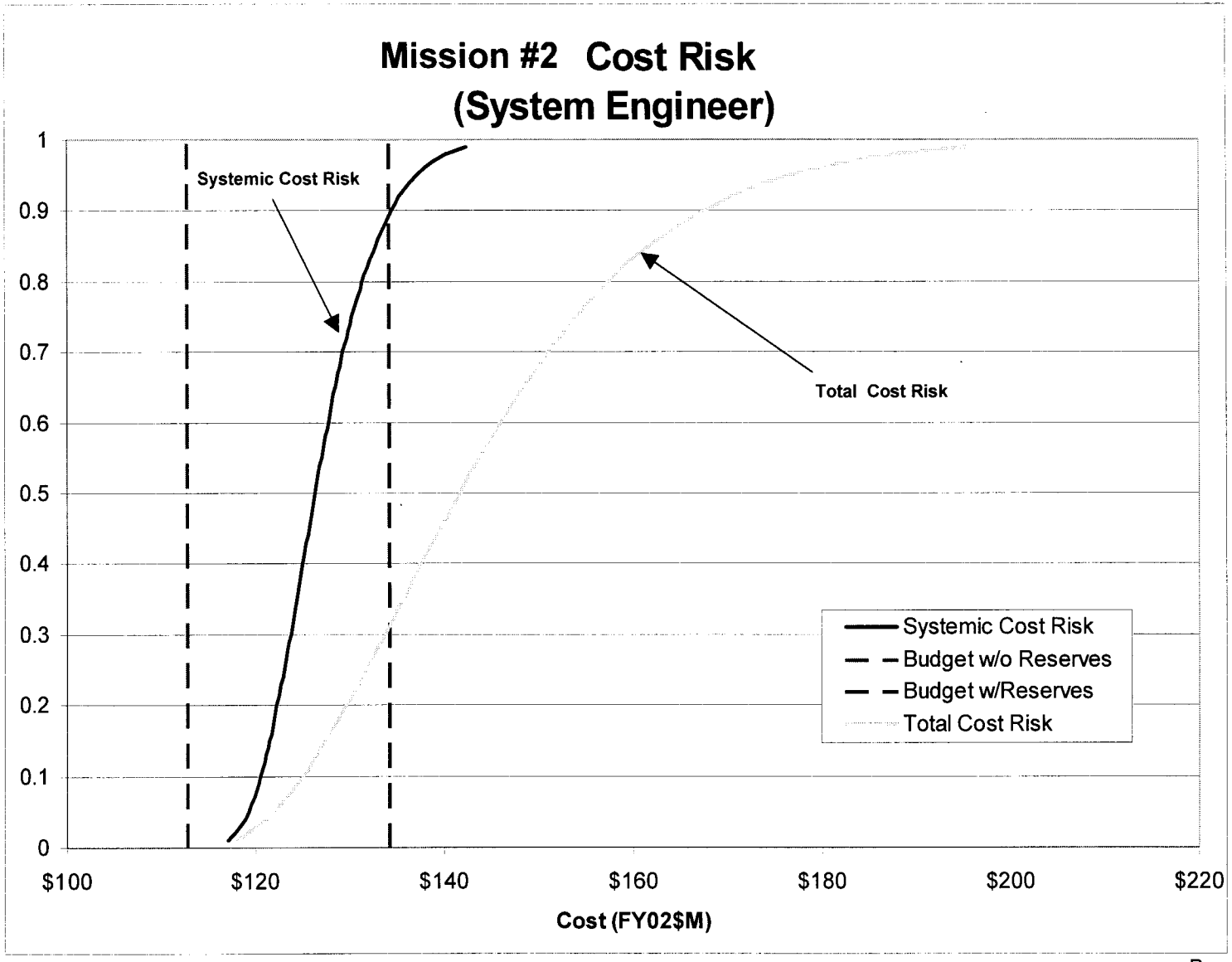
WBS Element	Budget (FY'02$M)	Pessimistic Cost	Importance
1.0 Project Management	$4.099	$6.149	**31**
2.0 Project Systems Engineering	$2.378	$4.042	**25**
3.0 Mission Assurance	$4.533	$4.986	**8**
4.0 Science & EPO	$6.853	$7.538	**12**
5.0 Payload System	$41.121	$53.457	**198**
6.0 Flight System	$35.584	$46.260	**170**
7.0 Mission Operations System	$18.102	$20.817	**46**

Example

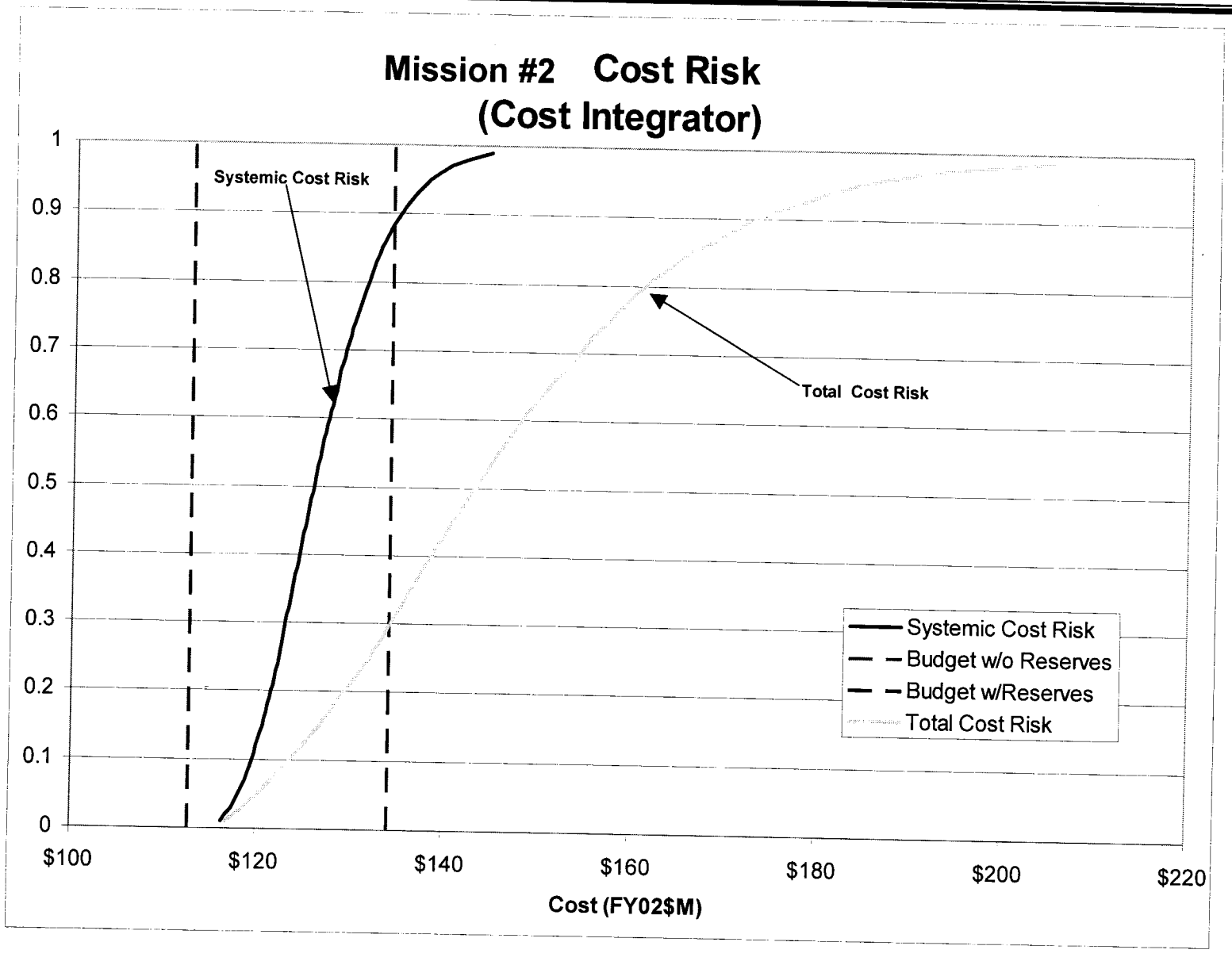
- Mission #2: Adjustment = 1+(6.0/3.9)
  - (HQ + JPL Changes on Ball) / (Ball Rate Changes + Ball Overruns)
  - Estimated from Cloudsat changes to Ball contract
  - Applied to WBS Element 6.0



Example


Mission #2 Cost Risk
(System Engineer)
Systemic Cost Risk
Total Cost Risk
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
$100
$120
$140
$160
$180
$200
$220
Cost (FY02$M)
Systemic Cost Risk
Budget w/o Reserves
Budget w/Reserves
Total Cost Risk

Example


Mission #2 Cost Risk
(Cost Integrator)
Systemic Cost Risk
Total Cost Risk
Systemic Cost Risk
Budget w/o Reserves
Budget w/Reserves
Total Cost Risk
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
$100
$120
$140
$160
$180
$200
$220
Cost (FY02$M)