Standardizing Assumptions in Multi-Team Study Situations

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May 1, 2012
The Problem

• NASA Program Offices engage several different Concurrent Engineering (CE) teams to conduct related mission studies for a larger common purpose.

• Program Offices must combine the different CE team results into one cohesive roadmap, technology survey or portfolio report:
  - Conclusions and recommendations dependent on a comparative assessment of the missions studied by the different CE teams.
  - Each CE team has developed their own methods for studies.

• The resulting products are not usually directly comparable.
The Approach

- Develop a standard cross-team set of assumptions
  - Will make the Program Office’s job of comparing easier and less open to error
  - Must protect center proprietary models or other competition sensitive information

- As an initial test case we developed a set of standard assumptions between IDC and Team X for a set of X-ray and Gravity Wave studies
Study Key Assumptions

- Mass Margin – 53% of CBE
- Power and other margins – follow Center best practices
- Cost Reserves – 30% of Phases A-E (w/o L/V)
- WBS per 7120.5D
- In-house builds
- All Technology is at TRL 6
  - Teams will note where technology is not currently at TRL 6 and does not have a funded path to TRL 6 in time for this mission as a risk

- NLS II Launch vehicles only
• Sparing, design units, and parts class determined by mission class

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<th></th>
<th>Low $ Bin</th>
<th>Med $ Bin</th>
<th>High $ Bin</th>
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<tbody>
<tr>
<td><strong>Redundancy</strong></td>
<td>&lt;$600M</td>
<td>$600M-$1.2B</td>
<td>$1.2B-$2B</td>
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<td>Weak selective redundancy, mostly single string. Only Class B parts, no Class S parts.</td>
<td>Strong selective redundancy. Only Class B parts, no Class S parts.</td>
<td>Fully redundant for all credible failures. Mostly Class B parts, may have some Class S parts.</td>
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<td><strong>Model Philosophy (EDU’s, ETU’s, Qual Units)</strong></td>
<td>No or minimal reliance on EDU’s and ETU’s. Typically no Qual Units, all Protoflight Qual.</td>
<td>Minimal use of ETU’s. Qual Units only where unavoidable, elsewhere Protoflight.</td>
<td>Near-ubiquitous use of EDU’s and ETU’s. Qual Units where required.</td>
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<tr>
<td><strong>Sparing Philosophy</strong></td>
<td>Only long lead mission critical components.</td>
<td>Only long lead components.</td>
<td>Almost all components.</td>
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How Will This Benefit CEWG?

• **Establishes the first cut on common initial assumptions**
  - A wider discussion of these assumptions is needed to ensure acceptance and usability in other CE teams
  - Additional assumptions will be needed in future multi-center studies but should build from and add to this initial set

• **Demonstrates the value of multi-team communication to NASA Programs and enables greater collaboration where not competition sensitive**

• **The “Baseball Card”**
  - Standardizing assumptions and aligning WBS’s are the first steps making the CE teams more translatable for NASA
  - The next big area of alignment is in key parameter outputs
  - A set of standard design parameters should be defined and reported by all CE teams as study output – the study “Baseball Card”