The Debris Assessment Team presented its analysis in a formal briefing to the Mission Evaluation Room that relied on PowerPoint slides from Boeing. When engineering analyses and risk assessments are condensed to fit on a standard form or overhead slide, information is inevitably lost. In the process, the priority assigned to information can be easily misrepresented by its placement on a chart and the language that is used. Dr. Edward Tufte of Yale University, an expert in information presentation who also researched communications failures in the Challenger accident, studied how the slides used by the Debris Assessment Team in their briefing to the Mission Evaluation Room misrepresented key information.38

The slide created six levels of hierarchy, signified by the title and the symbols to the left of each line. These levels prioritized information that was already contained in 11 simple sentences. Tufte also notes that the title is confusing. “Review of Test Data Indicates Conservatism” refers not to the predicted tile damage, but to the choice of test models used to predict the damage.

Only at the bottom of the slide do engineers state a key piece of information: that one estimate of the debris that struck Columbia was 640 times larger than the data used to calibrate the model on which engineers based their damage assessments. (Later analysis showed that the debris object was actually 400 times larger). This difference led Tufte to suggest that a more appropriate headline would be “Review of Test Data Indicates Irrelevance of Two Models.”39

The Debris Assessment Team was reviewed along with STS-107 Southwest Research data.  

- Crater overpredicted penetration of tile coating
  - Initial penetration to described by normal velocity
  - Varies with volume/mass of projectile (e.g., 200 ft/sec for 3 cu in)
  - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
  - Test results do show that SOFI can cause significant damage
  - Can cause significant tile damage

The low resolution of PowerPoint slides promotes the use of compressed phrases like “Tile Penetration.” As is the case here, such phrases may well be ambiguous. (The low resolution and large font create 3 typhographic orphans, lonely words dangling on a separate line.)

Shakiness in units of measurement provokes concern. Slides that use hierarchical bullet-outlines here do not handle statistical data and scientific notation gracefully. Perhaps the available font cannot show exponents. If PowerPoint is a corporate-mandated format for all engineering reports, then some competent scientific typography (rather than the PP market-pitch style) is essential. In this slide, the typography is so choppy and clunky that it impedes understanding.

This vague pronoun reference “it” alludes to damage to the protective tiles, which caused the destruction of the Columbia. The slide weakens important material with ambiguous language (sentence fragments, passive voice, multiple meanings of “significant”). The 3 reports were created by engineers for high-level NASA officials who were deciding whether the threat of wing damage required further investigation before the Columbia attempted return. The officials were satisfied that the reports indicated that the Columbia was not in danger, and no attempts to further examine the threat were made. The slides were part of an oral presentation and also were circulated as e-mail attachments.

In this slide the same unit of measure for volume (cubic inches) is shown a different way every time: 3 cu in, 1920 cu in, 3 cu in. Rather than in clear and tidy exponential form 1920 in^3. Perhaps the available font cannot show exponents. This vague pronoun reference “it” alludes to damage to the protective tiles, which caused the destruction of the Columbia. The slide weakens important material with ambiguous language (sentence fragments, passive voice, multiple meanings of “significant”). The 3 reports were created by engineers for high-level NASA officials who were deciding whether the threat of wing damage required further investigation before the Columbia attempted return. The officials were satisfied that the reports indicated that the Columbia was not in danger, and no attempts to further examine the threat were made. The slides were part of an oral presentation and also were circulated as e-mail attachments.

The analysis by Dr. Edward Tufte of the slide from the Debris Assessment Team briefing. [SOFI=Spray-On Foam Insulation]