Discussion of Challenges: **Static Strength**  
Mike Cann and Angie Kostopoulos

- XX.613 basis (linked to M&P controls)
- Many STC Applicants want to treat composites like metals.
- Their first approach is to submit material supplier data sheet *allowables* to show compliance to 2x.613
- Some Applicants believe that if another company has qualified materials that they do not have to qualify the materials or have possession of the other company’s data.
- Material/process Variability and environmental effects are much more significant issues in composites than metals.
- Test Proposals MUST consider additional factors and have strong rationale for each factor used.
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**Design detail challenges for composites**

- Does an Applicant fully understand the processes (such as process specifications/inspection types/etc) used to manufacture the baseline structure? (Point Design/Subcomponent/Full Scale testing)

- Static test overload factors for Hybrid structure that includes both composite materials and metals for primary structure

- Is there anything unique about the point design level (such as contour) that would be hard to analyze or replicate in either modeling or testing?
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What ‘sizes’ critical composite structural details?

• For composites compression and shear strength are significantly affected by damage and is critical for many structures.
• The reduction in compression and shear and result in local instabilities and stress concentrations.
• Tensile strength behavior of composites is similar to metallic structure. Like metals, composite materials often exhibit a “strength versus toughness trade-off”.
• Applicants need to keep these points in mind when modifying the structure. Most applicants dealing with composite structure are not familiar with composites and still want to treat them like metals.
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- **Allowable damage and manufacturing defects**
  - Test articles should include intentional damage that is allowable for the life of the aircraft at critical locations.
  - The method of imparting the damage is also important so that the ‘damage’ is representative of what could actually occur in the field.
  - These often require coordination with the FAA.

- **Substantiation by test versus analysis supported by test evidence**
  - Many applicants that substantiate their structure based only on tests have to account for the variability of the material manufacturing damage and repairs. This approach may make it difficult to support variations, future modifications or design changes, and field issues.
  - Analysis supported by tests requires careful integration of the testing and analysis. This method supports variations and field issues.
  - Most applicants feel that coupon testing is all they need to do and then proceed with analysis. They also feel that open hole compression or tension coupon tests address any failure mode in their test article.