MIL-HDBK-17 USE FOR FCS

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MIL-HDBK-17 BACKGROUND

- Developed largely by traditional civil fixed-wing aircraft, some input from rotorcraft and Army/Navy thick-section personnel
- Building Block Approach – For different applications, recommendations for lamina/laminate level and some structure-sensitive tests predominantly for aircraft.
- Timely input on Army applications is appropriate but needs involvement from those application areas

NEEDS SUMMARY

Manned Ground Vehicles	- hybrid materials g fatigue - ballistic damage
Unmanned Ground Vehicles	- hybrid materials, - storage
Munitions	- storage + MMC (most)
Gunbarrels	- fatigue - durability - interface/ hybrid material issues + materials
UAVs	- storage
Rotorcraft	- fatigue

\+ currently covered
g general discussion included
\- needed

SPECIFIC NEEDS

- Building Block
  - Specific information for a variety of aircraft including rotorcraft provided.
  - Volunteer for UAVs
  - More needed on general information – how to make building block decisions
- Test Matrices
  - Test matrices are somewhat general assuming mechanical property criteria and sampling
- Confidence (Sampling)
  - Reduced Sampling B-basis
    - 18 specimens from 3 batches
    - Manufacturing risk?
- Documentation
  - Fiber forms
  - Processes
    - Reasonably well-covered
    - Not quite to material spec level

SPECIFIC NEEDS

- Test Methods
  - Preference for test methods from standards organizations
  - Must be publicly available
  - Descriptions and advantages/disadvantages
- Statistical Analysis
  - Methodology in general well-established for a broad range of data needs
  - Strict hierarchy of distributions and reliance on ANOVA are not friendly to small sample sizes and are under consideration. These makes comparison of data sets difficult.
- Data
  - Largely carbon/epoxy uni- and fabric prepreg database
  - Other materials as well – repair, RTM, thermoplastics, etc.
  - Export control issues outstanding

SPECIFIC NEEDS

- Design & Analysis
  - General discussion of basic micromechanics and laminate analysis
  - Rules of thumb for lay-up, etc
  - Can be applied to other areas but more specific information is needed
- Environments
  - Assumed temperature range of -67°F – ~200 °F
  - Conditioning – as-fabricated and wet (85%RH) plus fluid exposure – hydraulic fluid, de-icing fluid, etc.
  - Specific conditions for other applications need to be considered
- Processes
  - Autoclave cure of prepreg
  - Fabrics
  - Filament winding
  - Braided preforms
  - RTM, VARTM
  - Thick sections
  - Hybrid materials including CIRTM

SPECIFIC NEEDS

- Alternate Materials
  - General guidelines for addressing alternative materials and processes ranging from change in prepreg line to change in process, fiber, or matrix material
  - Specifics dependent on building block type decisions
    - What properties are critical?
    - What level of confidence is needed?
- Durability/Damage Tolerance
  - Current information entirely focused on FAA requirements
  - Fatigue is covered in general terms
- Repair
  - Repair materials included in data
  - Interaction with Civil Aircraft Composite Repair Committee
  - Adhesives need to be addressed
  - Repair of hybrid/multifunctional materials and structures needs to be addressed

CONCLUSIONS

- Many Army applications are reaching a point where a consistent approach to material properties and design is possible and potentially cost-saving.
- Input and involvement in the MIL-HDBK-17 can support such a consistent approach
- Drafts under development on
  - Military Bridges – Ramki Iyer, TARDEC
  - RTM – Tom Cassin, MSC
- Vehicles – FY04 Task for FCS

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