Bonded Structures Workshop
Repair Implementation—Summary

Design for Bonded Repairs

- Software to optimize repair layups
- Develop a fracture mechanics approach to analysis of bonded original structures and repairs
- A simple PC based analysis tool to design and substantiate repairs
- A4EI and BJAM type analyses—need to look at non-uniform shear stresses in bondlines
- Looking forward to CACRC operators’ analysis tool and MIL HDBK-17 OEM analysis tool
- Shared OEM base and repair material databases would help airlines and MROs, but don’t hold your breath
- Bondline strength and durability analyses are needed
Repair Material and Process Control

- Standardized repair materials would alleviate the availability problem
- Material suppliers are not interested in furnishing small lots
  - Obtaining small lots from second tier suppliers can be problematic due to lack of warehouse/shipping controls
- Repair environment needs to be controlled
- Good surface preparation paramount
- Moisture elimination for thin face sheet sandwich, but for thick laminates not possible
- Companion coupons can be proof of cure, but do not guarantee bondline integrity
- Processes need to be robust and repeatable
  - Cure temperature ranges can be opened up, e.g. F18E/F
    - Cold spots within heat blankets
Considerations for Research and Development for Bonded Structures

➢ Bondline strength and durability prediction capability needed
➢ Multi-tiered SRMs
  • Qualification for upper tiers
  • Operator experience, facilities and expertise

Certification and qualification of complete repair system

➢ Repair technicians, QA staff, engineering and regulators
➢ Repair materials
➢ Repair process
  • Environment
  • Surface preparation
➢ In-process controls

Failsafe considerations for bonded primary structural repairs

➢ Fasteners in bondline not recommended
➢ Limit load requirement in the event the repair falls off-conservative, but less risk
  • US Navy-on carrier repairs
➢ Confidence from service experience will allow bonded repairs for damaged components with less than limit load strength
  • AOG repairs