



Bonded Structures Workshop

Repair Implementation

- **Technical Issues for Bonded Structures**
 - Critical safety issues
 - Certification considerations
 - Identify needs for engineering guidelines, shared data bases, and standardized tests and specifications
 - Certification and training of repair personnel
 - Examples of proven engineering practices
 - What works
 - What doesn't work
 - Provide directions for research and development



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Repair Implementation

- **Accidents occur after breakdown in system**
 - Poor details in bonded structure designs
 - Damage prone, high peel stresses, inspectability
 - Flaws can occur in manufacturing
 - Processing, assembly, inspection
 - Mistakes in repair
 - Repair designs, surface preparation, processing, inspection



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Repair Implementation

- **Designs for Bonded Repairs**
 - Analysis tools
 - Design values/allowables for repair materials
 - Potential for shared OEM databases, base material allowables
 - Standardized engineering guidelines
 - Minimize peel stresses
 - Failsafe features for primary structures
 - Fasteners in bondlines?
 - Limit load capability if bonded repair falls off?
 - Instructions for continued service



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Repair Implementation

- **Repair Material and Process Controls**
 - Raw material qualification-adhesives, substrates
 - Testing
 - Receiving inspection
 - Supplier/user relationships
 - Storage and working lives
 - Standardized materials
 - Availability
 - Surface preparation
 - In-process control
 - Temperature monitoring, vacuum and/or pressure
 - Companion panels, SPC, proof loading
 - Post repair acceptance criteria



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Repair Implementation

- **Considerations for Maintenance of Bonded Structures**
 - Current field procedures used to inspect bonded structures and repairs
 - Visual, NDE, tap, reference standards
 - Robust and repeatable repair processes
 - Need for hand-held NDE equipment to interrogate bondline strength
 - Certification of repair technicians, QA staff, engineering and regulators
 - Two or more tiers for SRMs
 - Qualification for upper SRM tiers
 - Operator experience and expertise