Bonded Structures Workshop
Repair Implementation

• Technical Issues for Bonded Structures
  - Critical safety issues
  - Certification considerations
  - Identify needs for engineering guidelines, shared databases, 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
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
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
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
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