



# Commercial Aircraft Composite Repair Committee (CACRC) ATA/IATA/SAE

Committee information  
Tim Harris, Secretary



# Mission Statement.

- To reduce the cost of maintaining Composite Structures, through standardization of Materials, Technique and Training

# Organization

- Executive committee
- Main Committee
- Task Groups

# Executive committee

- Six Airline or MRO's members
  - ◆ Chair and co-chair are from this group
    - ☞ Chair - Jan Popp
    - ☞ Co-Chair -
- Six OEM Members
- Secretary
- Liaisons – regulatory or other invitees

# Membership Type

- Supplier
  - ◆ Supplier to the industry
- User
  - ◆ Airlines and OEM's
- Liaison
  - ◆ Consultants, regulatory and others
- Voting

# Main Committee - the voting body

- All who would like to participate
- Members – Votes count, the goal is consensus
- Suppliers – included in the ballots, however advisory only requirement
- Liaisons - included in the ballots, however advisory input only

# Task Groups

- Working groups that produce documents
- Currently 6 active task groups
- 3 Inactive

# Repair Technique Task Group

- Develop standard repair process documents from current best practices, does not conduct research

- ◆ Current Chair - Francois Museux

- ☞ Contact information - [francois.museux@airbus.com](mailto:francois.museux@airbus.com)

- ◆ Published Document

- ☞ ARP5319 Impregnation of Dry Fabric and Ply Lay-Up
  - ☞ ARP5143 Vacuum Bagging of Thermosetting Composite Repairs
  - ☞ AIR5431 Repair Tooling
  - ☞ ARP4916 Masking and Cleaning of Epoxy and Polyester Matrix Thermosetting Composite Materials
  - ☞ ARP4977 Drying of Thermosetting Composite Materials
  - ☞ ARP5144 Heat Application for Thermosetting Resin Curing
  - ☞ ARP5256 Mixing Resins, Adhesives and Potting Compounds



# Repair Technique Task Group

- ◆ Published Document continued
  - ☞ ARP4991A Core Restoration of Thermosetting Composite Components
- ◆ Documents in work
  - ☞ AIR5367 Machining of Epoxy and Polyester Matrix Thermosetting Composite Structures
  - ☞ ARP5701 Lay-up of Pre-preg Composite Materials
  - ☞ ARP5143A Vacuum Bagging of Thermosetting Composite Repairs
  - ☞ ARP5144A Heat Application for Thermosetting Resin Curing
  - ☞ ARP5256A Mixing Resins, Adhesives and Potting Compounds
  - ☞ AIR5702 Storage and Handling of Epoxy Thermosetting Composite Materials

# Analytical Design Group

- Develop a standard repair design and analysis document, guidance only
  - ◆ Current Chair – Tim Harris
    - ☞ [Timothy.j.harris@boeing.com](mailto:Timothy.j.harris@boeing.com)
  - ◆ Document in work
    - ☞ Develop a guide of generally accepted stress analysis methods used for the design and evaluation of composite repairs for approval submission

# Repair Materials

- Develop repair material specifications in support of commercial airplane bonder repairs
  - ◆ Current Chair - Dr. Ana Rodriguez-Bellido
    - ☞ Contact information – [ana.rodriquez@airbus.com](mailto:ana.rodriquez@airbus.com)
  - ◆ Completed Specifications
    - ☞ AMS 2980 Technical Specification: Carbon Fiber Fabric and Epoxy Resin Wet Lay-Up Repair Material 1 through 6
    - ☞ AMS 3970 Carbon fabric prepreg repair material with a non-structural fiberglass Parts 0 through 6

# Repair Materials

## ◆ Specifications in work

- ☞ AMS XXXX Glass Fiber Fabric Repair Prepreg, 120 °C (250 °F) Vacuum Curing Parts 0 through 6
- ☞ AMS 2950 Paste Adhesive for Core Restoration Parts 0 through 2
- ☞ AMS XXXX carbon unidirectional tape/epoxy prepreg repair material

# Inspection Task Groups

- Develop Composite NDT calibration standards, and conducts inspection detection round robins in conjunction with Sandia national labs.
  - ◆ Current Chair Dr Dennis Roach
    - ☞ Contact information - [dproach@sandia.gov](mailto:dproach@sandia.gov)
  - ◆ Published documents
    - ☞ ARP5089 Composite Repair Ndt/Ndi Handbook
    - ☞ ARP5605A Solid Composite Laminate NDI Reference Standards
    - ☞ ARP5606A Composite Honeycomb NDI Reference Standards

# Inspection Task Groups

## ■ Inspection Projects

### ◆ NDI Assessment: Honeycomb Structures

- ☞ Experiments completed in 2009
- ☞ DOT report in progress

### ◆ NDI Assessment: Solid Laminate Structures

- ☞ Experiment development completed including protocols
- ☞ Experiment implementation with airlines (conventional NDI) to be complete in 2012
- ☞ Experiment implementation to assess advanced NDI methods is underway

### ◆ Composite Impact Study

- ☞ Relate damage threat & structural integrity to capabilities of NDI to detect hidden impact damage in laminates

# Inspection Task Groups

- Inspection Projects - Continued
  - ◆ Composite Porosity
    - ☞ NDI quantification of various porosity levels
    - ☞ Structural response – fatigue, residual strength, strain limits
  - ◆ Composite Heat, UV, and Fluid Ingress Damage
    - ☞ Relate array of NDI options with strength measurements
  - ◆ Miscellaneous Ongoing and Planned Studies
    - ☞ Detection and quantification of weak bonds
    - ☞ Affect of porosity, repairs & other impediments on NDI
    - ☞ General assessment of advanced NDI for composites
    - ☞ As required to support main tasks & other task groups
  - ◆ Documents in Work
    - ☞ ARP 5089A Composite Repair NDI Handbook

# Inspection Task Groups

- ◆ Necessary Resources to achieve the goals?
  - ☞ Continued support from airlines and OEMs through in-kind participation in ITG activities
  - ☞ Participation from NDI vendors in validation experiments
  - ☞ Continued joint working agreements (projects) with university, airline, and OEM partners



# Training Task Groups

- Develop standard curricula for non-NDT inspectors, technicians and engineers.
  - ◆ Current Chair – Tim Harris
    - ☞ Contact information: [timothy.j.harris@boeing.com](mailto:timothy.j.harris@boeing.com)
  - ◆ Published Documents
    - ☞ AIR4844B Composites and Metal Bonding Glossary
    - ☞ AIR4938 Composite and Bonded Structure Technician/Specialist: Training Document
    - ☞ AIR5278 Composite and Bonded Structure Engineers: Training Document
    - ☞ AIR5279 Composite and Bonded Structure Inspector: Training Document
    - ☞ AIR5719 Teaching Points for an Awareness Class on "Critical Issues in Composite Maintenance and Repair"

# Training Task Groups

## ◆ Documents in work

- AIR4844C Composites and Metal Bonding Glossary
- AIR4938A Composite and Bonded Structure Technician/Specialist: Training Document
- AIR5278A Composite and Bonded Structure Engineers: Training Document
- AIR5279A Composite and Bonded Structure Inspector: Training Document
- AIR5719A Teaching Points for an Awareness Class on "Critical Issues in Composite Maintenance and Repair"

# Airworthiness Task Groups

- Develop documents that provide key characteristics for the overhaul of production components.
  - ◆ Current Chair – Todd Herrington
    - ☞ Contact information:
      - [todd.m.herrington@delta.com](mailto:todd.m.herrington@delta.com)

## Document in work

- ☞ CACRC10AA Guidelines for Repair Process Evaluation of Aluminum Bonded Structure

# Design Task Groups

- Developed design guide for repairable supportable composite structures - inactive
  - ◆ Current Chair – Eric Chesmar
    - ☞ Contact information -  
Eric.Chesmar@united.com
  - ◆ Published Document
    - ☞ AE-27 Design of Durable, Repairable, and Maintainable Aircraft Composites
  - ◆ The task group also presents their findings to OEM's in seminar format upon request

# Life cycle model

Life cycle model – developed a method to conduct cost-benefit analysis of changes to structures – inactive

- ◆ Current Chair Eric Chesmar

- ☞ Contact information – [Eric.Chesmar@united.com](mailto:Eric.Chesmar@united.com)

- ◆ Published Document

- ☞ AIR5416 Maintenance Life Cycle Cost Model

# Inspection and Repair Conditions Task Groups

- ◆ This task surveyed the world wide operator fleet to determine the initial priorities of the committee . Inactive
  - ☞ A report of the finding was presented to the committee in the early 1990's

# Contact

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