



# Progress Report of the

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

Presented at :

EACMT 59<sup>th</sup> General Meeting

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**History:** The CACRC is an airline maintenance committee, formed in 1991 as a combination of ATA, IATA and SAE committees, with a common charter.

**Charter:**

***"To develop and improve maintenance, inspection and repair of commercial aircraft composite structure and components"***

**Ultimate goal:**

- x Lower maintenance cost of existing composite structures, via standardization among OEMs and airlines.
- x Minimize life cycle cost of future designs.

## **Philosophy:**

- x **Create/establish standard solutions to the most common airline problems.**
- x **Use task groups of industry experts to discuss the existing solutions and write specifications.**

## **Scope:**

- x **Address areas that impact airlines most frequently.**
- x **Consensus documents – Disapproving votes to be resolved**
  1. **Where consensus is not reached, all options are listed**
  2. **Not a research organization - best practices are selected**

# Organization of CACRC

## Entities:

- x **Airline Operators**
- x **Aircraft Original Equipment Manufacturers**
- x **FAA, EASA / JAA, repair stations, vendors, material suppliers, training institutes, academia, any other interested parties**
- x **SAE as secretariat and publisher of standards**

## Meetings:

- x **Main Committee: twice per year  
(alternating between Europe / N. America)**
- x **Executive Committee: before and after Main Committee**
- x **Task Groups (TGs): 2 or 3 working meetings per year**

# Membership of CACRC

**USER MEMBER:** A commercial air transport operator, a manufacturer of an aerospace vehicle subsystem or part, or a government organization. Only User Members Vote on documents.

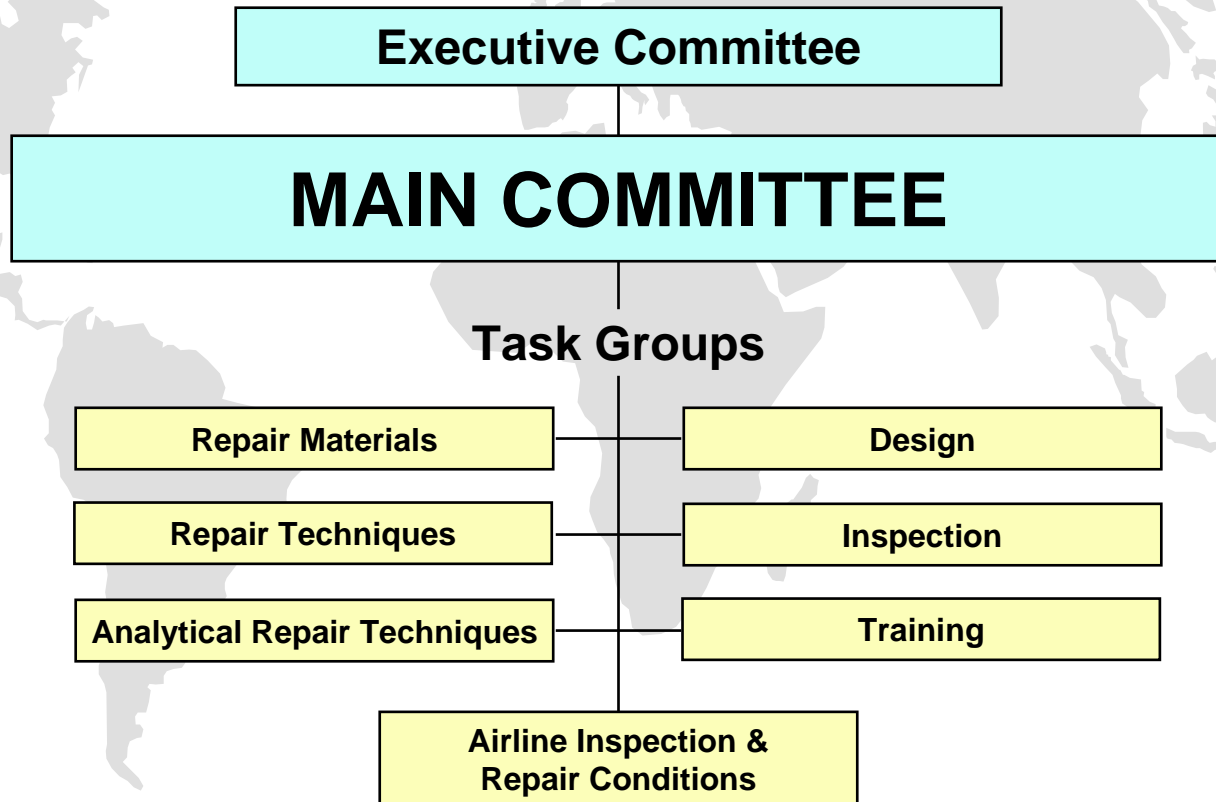
**SUPPLIER MEMBER:** Producers of the various materials and processes are an integral part of the AMS operation. Supplier members have no formal vote but can comment on documents.

**LIAISON MEMBER:** Liaisons relay information to and from parallel activities of other committees and organizations. Liaisons have no formal vote but can comment on documents.

**CONSULTANT MEMBER:** A person having specific technical knowledge. Consultants have no formal vote but can comment on documents.

**MAILING LIST:** A person that only receives the minutes, agendas, and announcements. Does not receive balloted documents.

# Structure of CACRC



# Task Group Summary

## x Repair Materials Task Group

Chairperson: David Walter – Boeing Materials & Technology

**Charter: To develop "Common Repair Material Specifications" and support the qualification process.**

## x Repair Techniques Task Group

Chairperson: Philip R. Griggs - GE Aircraft Engines

**Charter: To develop "Standardized Repair Techniques"**

## x Analytical Repair Techniques Task Group

Chairperson: William F. Cole – Aurora Flight Sciences Co.

**Charter: To develop a guide for commercial aircraft composite engineers, containing generally accepted stress analysis methods, used for the design and evaluation of composite repairs for approval submission.**

## Task Group Summary (cont.)

### x Design Task Group

Chairperson: Eric Chesmar – United Airlines

**Charter: Task 1: To improve composite design through operator feedback.**

**Task 2: To develop a “Maintenance Life Cycle Cost Model for Commercial Aircraft Composite”**

### x Inspection Task Group

Chairperson: John Hewitt - Airbus

**Charter: Task 1: To develop a “Standard Guideline for Composite inspection”.**

**Task 2: Steering Committee for “Composite Reference Standards” program at FAA and Sandia Labs.**

## Task Group Summary (cont.)

### x Training Task Group

Chairperson: Ralph Edwards – Northwest Airlines

**Charter: To develop guidelines for composite training.**

### x Airline Inspection& Repair Conditions Task Group

Chairperson: William F. Cole and John Player – United Airlines, Oksana Bardygula - FedEx

**Charter: Task 1: To define time, equipment, training and materials available for normal airline operation, so OEMs can design inspection and repair schemes for composite structure, with minimum impact.**

**Task 2: Prioritize Parts for enlarged Allowable Damage Limits and Repairable Damage Limits.**

# Progress Status

## Published documents

- ◆ 10 SAE / Aerospace Materials Specifications (AMS)
- ◆ 4 SAE / Aerospace Information Reports (AIR)
- ◆ 10 SAE / Aerospace Recommended Procedures (ARP)
- ◆ 1 SAE / Aerospace Engineering Report (AE)

**Documents have been implemented in OEM Manuals and Procedures!!  
(see document implementation status)**

**26** further documents in development or in revision cycle



## Document implementation status

Document sponsor	Document	Status	Implementation
T/G Repair Techniques	ARP 4916 Masking and Cleaning of Epoxy and Polyester Matrix Thermosetting Composite Materials.	issued 01.Mar.97	a) A.I. : Methods reflecting AI process included in SRM 51-77 b) Boeing : c) P&W : d) GE : implemented completely in Standard Practices Manual 70-46-01 e) BF Goodrich:
T/G Repair Techniques	ARP 4977 Drying of Thermosetting Composite Materials.	issued 01.Aug.96	a) A.I. : implemented b) Boeing : commitment to reference in SRM in near future c) P&W : implemented in Standard Practices Manual 70-46-02 d) GE : used as a resource in the answer of customer questions e) BF Goodrich:
T/G Repair Techniques	ARP 5256 Mixing Resins, Adhesives and Potting Compounds	issued 01.Mar.97	a) A.I. : Used in training course b) Boeing : c) P&W : implemented in 1997 d) GE : used as a resource in the answer of customer questions e) BF Goodrich:
T/G Repair Techniques	ARP 4991 Core Restoration of Thermosetting Composite Materials	issued 01.Dec.98	a) A.I. : existing technique in SRM 51-77 very close to ARP b) Boeing : c) P&W : implemented in 1998 d) GE : e) BF Goodrich:
T/G Repair Techniques	ARP 5143 Vacuum Bagging of Thermosetting Composite Repairs	issued 26.Jul.02	a) A.I. : Methods reflecting AI process included in SRM 51-77 b) Boeing : c) P&W : implemented in 1998 d) GE : implemented in Standard Practices Manual 70-46-03 e) BF Goodrich:

## Document implementation status

Document sponsor	Document	Status	Implementation
T/G Repair Techniques	ARP 5144 Heat Application for Thermosetting Resin Curing	issued 01.Mar.00	a) A.I. : implemented in SRM 51-77 (2000) b) Boeing : c) P&W : implemented in 1998 d) GE : ARP is referenced directly in SPM 70-46-02 and 70-46-03 e) BF Goodrich:
T/G Repair Techniques	ARP 5319 Impregnation of Dry Fabric and Ply Lay-Up	issued 19.Jul.02	a) A.I. : vertical bleeding implemented in SRM 51-77 (2000) b) Boeing : c) P&W : d) GE : e) BF Goodrich:
T/G Repair Techniques	AIR 5367 Machining	in Progress	a) A.I. : b) Boeing : c) P&W : d) GE : e) BF Goodrich:
T/G Repair Techniques	AIR 5431 Tooling	in Progress	a) A.I. : b) Boeing : c) P&W : d) GE : e) BF Goodrich:
T/G Repair Techniques	Repair design		a) A.I. : b) Boeing : c) P&W : d) GE : e) BF Goodrich:



## Document implementation status

Document sponsor	Document	Status	Implementation
T/G Training	AIR 4938 Composite and Bonded Structure Technician / Specialist: Training Doc.	issued 01.Sep.96	Flight Safety: uses as basis (100%) A.I.: Reduced content used, to match course length
T/G Training	AIR 5278 Composite and Bonded Structure Engineers: Training Doc.	issued 01.Mar.99	Flight Safety: uses as basis (100%) A.I.: Reduced content used, to match course length
T/G Training	AIR 5279 Composite and Bonded Structure Inspector: Training Doc.	issued 01.Mar.99	Flight Safety: uses as basis (100%) A.I.: Reduced content used, to match course length
T/G Training	AIR 4844 Composites and Metal Bonding Glossary	issued 01.Mar.97	a) A.I. : Internal use b) Boeing : c) P&W : d) GE : used as a resource in house e) BF Goodrich:
T/G Training	Composite Structures Awareness, Video	available	
T/G Training	Proper Handling of Composite Parts, Video	available	
T/G Airline Inspection & Repair Conditions	Structural Repair Manual Limitations in Commercial Airline Maintenance, Report	issued 30.Oct.98	
T/G Analytical Repair Techniques	AIR 5946 Design and Application of Composite Repairs for Thermosetting Composites	in Progress	

# **Other Successes for CACRC to date:**

**Forum to act as the source for industry to obtain airline input / feedback, such as :**

- ◆ **Comments on Advisory Circular Number 145-6 “Repair Station for Composite and Bonded Aircraft Structures”**
- ◆ **Sandia NDT Program Steering group.**
- ◆ **FAR Revisions**
- ◆ **Airline contacts for design reviews.**

# Summary

- x **Operator input remains absolute necessity.**
- x **CACRC proved to be effective to improve maintainability of composite structures.**
- x **CACRC proves to be worthwhile for operators, OEM's and material supplier.**
- x **CACRC is breaking new ground in industry cooperation.**

## Next meetings

### **North American Fall meeting:**

- × **October 18<sup>th</sup> to 21<sup>st</sup>, 2004, Manassas, VA, USA,  
Aurora Flight Sciences Co.**

### **European Spring meeting:**

- × **April/May 2005, Bremen, Germany  
Airbus**

Main committee detailed meeting information can be found on the SAE web page:  
[http://forums.sae.org/access/dispatch.cgi/TEAMSCACRC\\_pf](http://forums.sae.org/access/dispatch.cgi/TEAMSCACRC_pf)

# You are invited to join CACRC

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