

CACRC Repair Material Task Group

Repair Material Task Group

Status Report

***November
2007***

Wichita

CACRC Repair Material Task Group

Membership

Chairman:	Ana Rodriguez	Airbus
Members:	Paul Wittman	Middle River Aircraft Systems
	Larry Sullivan	Goodrich
	Marcos Maciel	Embraer
	David Walter	Boeing (Seattle)
	David Swartz	FAA
Consultant:		
	Gerard Bonnar	Boeing (Huntington Beach)
Participants (this meeting):		
	Paulo Mendes	Embraer
	Colin Hanna	Bombardier
	Trevor Shanks	Bombardier
	Pat Brooks	Hexcel

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- *Updated AMS 2980 (Carbon Fiber Fabric and Epoxy Resin Wet Lay-Up Repair Material) and PRI-QPL-AMS 2980 are published and are available in*

SAE web site: www.sae.org

PRI web site: www.eAuditNet.com

- *Some minor corrections found in Parts 1 and 3 and alternate test methods update in part 1 and part 2 are to be introduced.*
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- *Released AMS 2980 contains the following parts:*
 - *AMS 2980A Introduction*
 - *AMS 2980-1A General Requirements*
 - *AMS 2980-2A Qualification Test Program*
 - *AMS 2980-3A Purchasing Specification - Fabric*
 - *AMS 2980-4A Purchasing Specification - Resin*
 - *AMS 2980-5 Requirements to be Met by the Qualified Materials According to AMS 2980-1A and AMS 2980-2A*
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- *PRI-QPL-AMS 2980 lists the qualified material combination:*
 - *Resin EPOCAST 52 A/B (Huntsman)*
 - *Carbon fibre fabric, plain weave, 193 g/m²: G0904 D 1070 TCT (Hexcel Reinforcements)*
 - *Includes the APPENDIX to PRI-QPL-AMS-2980. It contains the requirements for batch release testing.*
 - *In September 2007 the FAA provided a database pedigree letter, which will be part of the total information package (supplier QTR, RMTG evaluation report, PRI QPL) stored at PRI.*
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U.S. Department
of Transportation

Federal Aviation
Administration

Aircraft Certification Service
ANM-115N
1601 Lind Ave., SW
Renton, WA 98057

ANM-115N:07-01
September 25, 2007

Mike Borgman, Chair, Commercial Aircraft Composite Repair Committee
8350 South Rock Road
Derby, KS 67037

Subject: FAA Acceptance of AMS2980 Qualification Data

Dear Mr. Borgman,

The purpose of this letter is to recognize the efforts of the Commercial Aircraft Composite Repair Committee, CACRC, in performing a ground breaking industry standard material qualification. The CACRC has developed Specification AMS 2980, for qualification and wet lay-up processing control of epoxy resin and carbon fiber-reinforced fabric materials under the Air Transport Association/International Air Transport Association/Society of Automotive Engineers, Inc. (ATA/LATA/SAE) CACRC-Repair Material Task Group. This specification, which has five parts and a qualified products list, has been used in generating base material qualification data and documenting the related requirements. The data generated to date is applicable to Epocast 52 A/B resin and G0904D1070TCT Hexcel Carbon Fiber Reinforcement fabric when processed in accordance with the processes described in AMS 2980 for these materials and the applicable SAE CACRC Accepted Repair Practices, ARPs.

We have reviewed the data found in report 2192-JRL-140901/Q077-1 Parts 1, 2 and 3, Revision none, dated May 14, 2002 "CACRC - Carbon Composite Repair Program, Tenax HTA 5131 200tex f3000 t0 & Vantico Epocast 52 A/B Resin, Tenax Fibers Qualification Program and Results for Commercial Aircraft Composite Repair Committee According AMS 2980", including Appendixes 18 dated April 21, 2005 and 19 dated November 30, 2005. We find that it is acceptable data when used in conjunction with the material processes and controls listed in the document and the CACRC ARPs and may be used as a portion of the data required to demonstrate compliance with 14 CFR parts 25.613, 23.613, 27.613 and 29.613. Additional product-specific detailed data is anticipated to substantiate all the appropriate regulatory requirements that must be met in structural repair of a given damage scenario for an aircraft component, which uses a composite material that is compatible with the repair materials and processes outlined in AMS 2980. We understand the appendixes 18 and 19 were created by the CACRC Repair Materials Task Group. If changes are made to these materials, they must be approved by the SAE Performance Review Institute (PRI) and the Repair Materials Task Group - Qualified Product Group, (QPG).

For background, this document is the culmination of many years of collaboration between the CACRC, its member companies, and the Federal Aviation Administration to develop

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standardized materials for use in the repair of commercial airplanes. The material tests performed were done in accordance with industry standard techniques and were done under the supervision of Airbus, Boeing and Goodrich. Prior to testing, and throughout the test program the Federal Aviation Administration has been involved, starting with FAA National Resource Specialist for Composites, Joe Soderquist, Composite Technical Specialist, David Swartz, and the Composite Chief Scientist, Larry Ilcewicz.

Regarding the procedures for use of this data as substantiation data for a specific application, we would like to offer the following points in existing policy:

1. It is expected that a repair design utilizing these materials will be substantiated separately by the approving organization. Once that certification has been accomplished and the new material is added to the structural repair manual, use of the material by an airline would follow existing processes like any other material.
2. Because of differences in processing that are likely to occur when these materials are used on a specific repair design, some equivalency testing/point design testing is expected to qualify these materials for specific repairs. Some guidance on equivalency testing can be found in a policy memorandum entitled "Material Qualification & Equivalency for Polymer Matrix Composite Material Systems" (PS-ACE100-2002-006, September, 2003).
3. The above referenced document does not contain the data reduction details needed to produce allowables for certification purposes. Existing accepted statistical methods or the methods described in the Composite Materials Handbook 17, CMH-17 (Formerly MIL-HDBK-17) may be used for this purpose.
4. Because the environmental conditions that specific repairs will be subjected to may differ from those that the qualification coupons were tested under, it may be necessary to conduct additional evaluations at other temperature and environmental conditions.

Our desire is to move away from individual data acceptance of specific material data sets like this in the future, and to rely on the industry standards development organization, such as SAE CACRC, the CMH-17, and SAE sub-committee P to create and maintain specifications and allowable data bases. Congratulations to the CACRC for the successful culmination of many years of work.

Sincerely,


Larry Ilcewicz
Chief Scientific and Technical Advisor, Composites


David Swartz
Senior Engineer, Anchorage Aircraft Certification Office, ACE 115N

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- *AMS 2950 (Adhesive paste for core restoration)*
- *2nd balloting process completed and specification approved. It went to the Aerospace Council for balloting in May 2007. Today's status unknown.*
- *AMS 2950 is one - part document:*
 - *AMS 2950 General Requirements and Qualification Test Program*

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- *Updating AMS 3970 (Carbon Fabric Repair Prepreg Material)*
 - *Initial CACRC Ballot was closed without quorum achieved (ten votes short). Management of additional votes performed by mass e-mailing. Additional votes achieved (Thank you!) Document will be forwarded to SAE for final formatting and submittal to the SAE Aerospace Council for balloting (November 2007).*
 - *AMS 3970B Introduction*
 - *AMS 3970-1B General Requirements*
 - *AMS 3970-2B Qualification Test Program*
 - *AMS 3970-3B Purchasing Specification for Carbon Prepreg*
 - *AMS 3970-4B Purchasing Specification for Film Adhesive*
 - *AMS 3970-5 Purchasing Specification for Non-Structural Glass Prepreg*
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- *Updating AMS 3970 (Carbon Fabric Repair Prepreg Material)*

- *The two remaining documents*

- *AMS 3970-6 Material Specification Carbon Fiber Reinforced Epoxy Prepreg for Repair*
- *IPS or Appendix 1 to PRI QPL to AMS 3970*

are in progress and will be finished when the qualifications are completed:

- *Carbon prepreg: the Hexcel Bridge Qualification + additional testing to address M20 solvent change*
 - *Adhesive film: the Henkel Qualification for Hysol EA 9695 .050 psf NW*
 - *Non-structural glass prepreg: the Hexcel Qualification*
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- *First materials qualification for AMS 3970 is in progress*
 - *Hexcel M20 carbon prepreg (Plain Weave, 193g/m², 40% resin content, HTA standard modulus fiber):*
 - *Previous data from Hexcel/DMS/RMS/AIMS were combined to define Part 6 requirements (in final review).*
 - *Details of the additional tests were set with the supplier. These tests results will be incorporated into the Part 6 requirements.*
 - *Re-qualification tests (solvent change) was proposed by the supplier and a counterproposal (some additional testing) was presented by the RMTG at the meeting in Cincinnati. Agreement was reached.*
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- *First materials qualification for AMS 3970 is in progress*
 - *Hexcel M20 carbon prepreg (Plain Weave, 193g/m², 40% resin content, HTA standard modulus fiber):*
 - *The manufacture process of the prepreg with the new solvent has been audited (Boeing and Airbus on behalf of the CACRC- QPG)*
 - *Panel and specimen manufacture is completed*
 - *DRY testing is completed*
 - *WET testing is 70% completed and the remaining 30% is still in conditioning and expected to be tested by January 2008*

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- *First materials qualification for AMS 3970 is in progress*
 - *Hexcel M20 glass prepreg (120 style) (non structural application):*
 - *Pre-existing database is to be analyzed and first proposal for part 6 requirements is to be made.*
 - *If the product is also affected by the solvent change, the supplier will propose re-qualification tests.*
 - *Completion is planned for third quarter 2008.*
 - *Henkel Hysol EA 9695 .050 psf NW (250 g/m²)*
 - *Pre-existing database has been analyzed and first proposal for part 6 requirements has been made (in final review).*
 - *QTR has been provided by Henkel and is being reviewed*
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- *First materials qualification for AMS 3970 is in progress*
 - *Both Hexcel and Henkel are committed to supply the materials in small kits that will be available on distributors*

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- *AMS XXXX (Glass Fabric Repair Prepreg Material – Structural application)*
 - *New AMS project submitted via the SAE website (no response to date)*
 - *First drafts provided for RMTG review*
 - *AMS XXXX Introduction*
 - *AMS XXXX-1 General Requirements*
 - *AMS XXXX-2 Qualification Test Program*
 - *AMS XXXX-3 Purchasing Specification for Glass Prepreg*
 - *AMS XXXX-4 Purchasing Specification for Film Adhesive (if needed)*

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● Performance Review Institute (PRI) Communications

– *Met with PRI at Manassas CACRC Meeting,*

– *Subsequent presentations with PRI*

- *November 2004:* *Outlined proposal with AMS2980
Became an official Qualified Product Group (QPG)*

- *May 2005:* *QPMC Meeting - Updated Status of Task Group*
- *November 2005:* *QPMC Meeting - Updated Status of Task Group*
- *May 2006:* *Approval of the PRI-QPL-AMS-2980*
- *June 2006:* *QPMC Meeting - Updated Status of Task Group*
- *December 2006:* *QPMC Meeting - Updated Status of Task Group*
- *May 2007:* *QPMC Meeting - Updated Status of Task Group*
- *November 2007:* *Next meeting*

QPMC: Qualified Product Management Council

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Future Actions:

- *Carry on with the qualification program for M20 and EA 9695 to have it completed in 2008:*
 - *Supplier Technical Support*
 - *Test Results Review*
 - *PRI Coordination*
 - *Finalize AMS 3970-6 and Appendix to PRI-QPL-AMS-3970 when qualification results (including the solvent change) are available.*
 - *Relocation of resin filming equipment is confirmed and re-qualification testing requirements are defined. Test plan and schedule to be provided by Hexcel*
 - *Possibility to combine this re-qualification with the implementation of a second source for the adhesive.*
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Future Actions:

- *AMS XXXX (Glass prepreg for structural application)*
 - *To pursue the AMS number from SAE*
 - *Candidate material: Hexcel 913 / 45% / 7781 (to be confirmed)*

 - *AMS 2960 (Glass wet lay up)*
 - *No candidates for qualification identified*
 - *Postponed as per Amsterdam Main Committee Meeting discussion*
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Future Actions:

- *New specification for a uni-weave or tape prepreg repair material to support reinforced tape and NCF designs to be prepared, as per Amsterdam Main Committee Meeting discussion*
 - *Revisit discussions with CMH-17 Data Review Committee to consider publishing the AMS 2980 Wet Lay-up materials database into the Handbook.*
 - *Update the M20 database (currently approved for publication into CMH-17 Volume II) to include normalization corrections and new data generated under the AMS 3970 qualification effort.*
 - *Explore the potential of working with NCAMP to support future qualification and second source database development to help facilitate improving time and possible funding to qualify material suppliers.*
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