

Federal Aviation Administration

FAA / CAAs "Composite Meeting" - Composite Safety via Global Efforts -

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FAA / CAAs "Composite Meeting" - Composite Safety via Global Efforts -Outline

- Overview
- International Standards Organizations
 - Composite Material Handbook 17 (CMH-17)
 - SAE Committees e.g., Commercial Aircraft Composite Repair Committee
 - American Society for Testing Materials ASTM
- Industry/Regulatory Working Groups
- Workshops
- Joint Advanced Materials and Structures (JAMS) Center of Excellence
- Future CAA Interface



FAA / CAAs "Composite Meeting" - Overview -

- FAA Composite Initiatives work with industry, other government agencies, and academia to ensure safe and efficient deployment of composite technologies used in existing and future aircraft
 - Composite applications are expanding faster than the qualified workforce, industry standards, and regulatory guidance available
- Technical concerns driving Safety Management:
 - Composites are a non-standard technology
 - Limited shared databases, methods, and guidelines
 - Small companies have limited resources and certification experience
- Work with industry on the certification of composite applications provide a benchmark for future standards and regulatory guidance
 - International standards organizations, working groups and workshops are used for work with industry
- FAA focused research and educational ties with academia help fill knowledge gaps and provides safety awareness training



Organizations Making Progress in Composite Standardization



ITERNATIONAL

Some Existing Standards Databases Test Methods Engineering Guidelines Analysis Protocol Process Methods Training







Importance of Composite Materials Handbook 17, CMH-17 and Other Composite Standards Efforts

- Brings composite industry together with regulatory agencies and other government groups to determine the "best engineering practices"
- Consensus-driven/user acceptance helps ensure reliable engineering databases, methods and procedures for a workforce that is expanding with new applications
- Provides a forum on topical engineering concerns and new technology needs

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NDBOOK

What is the Composite Materials Handbook 17?



CMH-17 Mission

The Composite Materials Handbook organization creates, publishes and maintains proven, reliable engineering information and standards, subjected to thorough technical review, to support the development and use of composite materials and structures.

CMH-17 Vision

The Composite Materials Handbook will be the authoritative worldwide focal point for technical information on composite materials and structures.



Outline for Composite Material Handbook 17

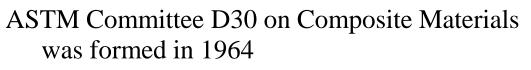
- Vol. 1 Polymer Matrix Composites: Guidelines for Characterization of Structural Materia Significant support from ASTM D-30
- Vol. 2 Polymer Matrix Composites: Material Properties Significant support from SAE P-17
- Vol. 3 Polymer Matrix Composites: Materials Usage, Design and Analysis
- Vol. 4 Metal Matrix Composites
- Vol. 5 Ceramic Matrix Composites
- Vol. 6 Structural Sandwich Composites (Initial Release)

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ERIALS HANDBOOK

ASTM Committee D-30





D30 has 6 technical subcommittees that maintain jurisdiction over the Committee's 60 standards (see Annual Book of ASTM Standards)

http://www.astm.org/COMMIT/COMMITTEE/D30.htm

D30.01 Editorial and Resource Standards D30.02 Research and Mechanics D30.02.04 TG on Interlaminar Fracture Analysis Benchmarking D30.02.05 Round Robin Planning D30.03 Constituent/Precursor Properties D30.04 Lamina and Laminate Test Methods D30.04.08 Specimen Preparation D30.05 Structural Test Methods D30.05.01 Civil and Marine D30.06 Interlaminar Properties D30.09 Sandwich Construction
D30.10 Composites for Civil Structures
D30.90 Executive
D30.91 Strategic Planning
D30.92 Awards
D30.93 Standards Coordination and Globalization Initiative
D30.94 Technical Specialists
D30.94.01 SCGI
D30.94.02 Glass Transition Temperature (Tg)
D30.94.03 Compression After Impact (CAI)
D30.94.04 Composites in Civil Engineering



SAE Commercial Aircraft Composite Repair Committee (CACRC)



- The CACRC is an airline maintenance committee, formed in 1991 as a combination of ATA, IATA and SAE committees, with a common charter
 – FAA played an important role in getting the organization started
- Mission: To reduce the cost of maintaining Composite Structures, through standardization of Materials, Techniques and Training
- Six active task groups to maintain existing documents and create new standards
 - Repair Technique
 - Analytical Design
 - Repair Materials

- Inspection
- Training
- Procedures
- SAE Contact: Sonal Khunti (skhunti@sae.org)



Industry/Regulatory Working Groups

- Assembled based on certification experiences and knowledge involving new composite applications
- Provide a basis for FAA/Industry Composite Workshops
- Provide an interface with experienced members of the industry to share experiences that advance efforts of standards organizations
- Example of an active composite working group Composite Transport Damage and Maintenance Working Group was started by FAA and EASA in 2005
 - ➢ Helped compile content for CMH-17, Revision G
 - Helped develop FAA safety awareness course content
 - Supported several FAA/Industry Composite Workshops
- Working Groups may become officially linked to an Aviation Advisory Rulemaking Committee (ARAC) for specific tasking e.g., ARAC for Transport Airplane Damage-Tolerance and Fatigue Evaluation



FAA/Industry Composite Workshops

- FAA/industry workshops helped benchmark composite industry practices for several technical areas
- Workshops were also used to review progress in composite policy, guidance and training initiatives
- Many composite presentations covered technical details not publically available before the workshop
- Workshop breakout sections were used to debate technical issues and help define FAA research
- 16 workshops were held between 2000 and 2011
- Wichita State University helped conduct and archive presentations and breakout sessions from several workshops on a website

Presentations, recaps and breakout session summaries at: http://www.niar.wichita.edu/niarworkshops/



List of FAA/Industry Workshops

- Composite Materials Control Workshop, 2002
 - Covered pre-impregnated composite material & process specifications (presentations on industry practices and draft FAA documents)
 https://www.niar.wichita.edu/niarworkshops/Workshops/CompositeMaterialsControlWorkshop2002/tabid/101/Default.aspx
- Composite Materials Control Workshop, 2003
 - Expanded discussions from 2002 workshop to include liquid resin molding (presentations on industry practices and draft FAA documents)
 https://www.niar.wichita.edu/niarworkshops/Workshops/CompositeMaterialsControlWorkshop2003/tabid/102/Default.aspx
- Bonded Structures Workshop I, June 2004 (Seattle, WA)
 - Bonded structures: design, M&P control, manufacturing and repair (presentations on industry practices as a basis for 2005 FAA policy)
 https://www.niar.wichita.edu/niarworkshops/Workshops/BondedStructuresWorkshopJune2004Seattle/tabid/104/Default.aspx
- Bonded Structures Workshop II, October 2004 (Sussex, UK)
 - Expanded discussions from 2004 US workshop for other participants (presentations on industry practices as a basis for 2005 FAA policy)

https://www.niar.wichita.edu/niarworkshops/Workshops/AdhesiveBondingWorkshopOctober2004Sussex/tabid/112/Default.aspx tabid/112/Default.aspx tabid/112/Default.



FAA Composite Damage Tolerance & Maintenance Workshops

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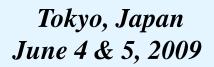
	Wednesday, July 19	Thursday, July 20	Friday, July 21
1 st Hour 2 nd Hour	-	Session 2* Substantiation of Structural Damage Tolerance	Session 6 <u>Technical Breakout Sessions</u> (*Separate working meetings covering technical subjects from Sessions 2 - 5)
Break (15 min.)	СМН17		
3 rd Hour	COMPOSITE MATERIALS HANDBOOK	Session 3* Structural	Session 7 Breakout Team Summary
4^{th} Hour		Test Protocol	Recap/Actions/Closure/Adjourn
Lunch (1 Hour)			
5 th Hour	FAA Initiatives Safety Management	Session 4*	
6 th Hour	Airbus/Boeing/EASA/FAA WG Maintenance Training Update	Substantiation of Maintenance Inspection & Repair Methods	A DOWNER THE THE
Break (15 min.)		e H	
7 th Hour	Session 1	Session 5*	
8 th Hour	Applications & Service Experiences	Damage/Defect Types and Inspection Technology	

Chicago II USA July 10-21 2006

Amsterdam, Netherlands May 9-11, 2007

<u></u>			
	Wednesday, May 9	Thursday, May 10	Friday, May 11
SAE. 1st Hour	Composite Repair Committee	Session 1 Applications & Field Experiences (continued) Service History of Composite Structure Service Dam age & Reliability of Repairs	Session 5* Field Inspection and Repair QC Test Standards & Inspector Qualifications Reliable NDI Technology Advances Material & Process Controls
Break (15 min.)			
3 rd Hour	Airbus and Boeing Perspectives on Safe Industry Practices	Session 2* Damage Tolerance Design Criteria & Objectives Structural Test Protocol	Session 6 Technical Breakout Sessions (*Separate working meetings covering technical subjects from Sessions 2 - 5)
4 th Hour	Airbus & Boeing (continued) SAE CACRC Active Task Group Reports		
Lunch (1 Hour			
5 th Hour	SAE CACRC Active Task Group Reports	Session 3* Damage in Sandwich Construction FluidIngression Growth Me charisms Analysis & Accelerated Tests	Session 7 Breakout Team Summary Recap/Actions/Closure/Adjourn
6 th Hour	FAA & EASA Initiatives		
Break (15 min.)			
7 th Hour	FAA & EASA Initiatives (conf.) Recent Progress/Safety Management	Session 4* Repair Design and Processes	110 Dorticinal
8 th Hour	Session 1 Applications & Field Experiences	Repair Limits Design Criteria & Process Guidelines Structural Substantiation	IIV Fai uvipa

Presentations, recaps and breakout session summaries at: http://www.niar.wichita.edu/niarworkshops/



HEPAIN	Thursday, June 4	Friday, June 5	
1 st Hour	FAA Initiatives Recent Progress/Safety Management	Session 4* Damage Tolerance & Maintenance	
2 nd Hour	EASA Initiatives Session 1: Applications & Field Experiences	Guidance Near- and Long-term Needs Design and Process Guidance Structural Substantiation = f(application criticality)	
Break (15 min.)			
3 rd Hour	Session 1: Applications & Field Experiences (continued) Service History of Critical Composite Structure	Session 5* CACRC Advances for the Future	
4 th Hour	Service Damage & Reliability of Repairs (all applications) Anticipated issues for expanding applications	Near and Long-term Initiatives Shared Databases and Methods Design & Process Guidelines = f(application criticality)	
Lunch (1 Hour)			
$5^{\rm th}$ Hour	Session 2* Damage Threats & Inspection Strategies	Session 6 Technical Breakout Sessions	
6 th Hour	Data for Damage Threat Assessments Test Standards & Inspector Qualifications Reliable Technology Advances for Inspection	(*Separate working meetings covering technical subjects from Sessions 2 - 5)	
Break (15 min.)			
7 th Hour	Session 3* Damage Tolerance & Repair Substantiation	Session 7 Breakout Team Summary	
8 th Hour	Design Criteria & Objectives Building Block Approaches (benefits & est. costs) Structural Test & Analysis Protocol	Recap/Actions/Closure/Adjourn	
	~120 Pai	rticinants	

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List of FAA/Industry Workshops, continued

• Composite Maintenance Training Workshop, 2005

- Review progress in FAA composite maintenance course development https://www.niar.wichita.edu/niarworkshops/Workshops/ChicagoWorkshop2005/tabid/100/Default.aspx

• Composite Damage Tolerance & Maintenance Workshop I, 2006

- Composite damage tolerance (design substantiation, structural test protocol) and maintenance (repair substantiation & inspection) industry practices [Chicago, IL]
 https://www.niar.wichita.edu/niarworkshops/Workshops/ChicagoWorkshop2006/tabid/99/Default.aspx
- Composite Damage Tolerance & Maintenance Workshop II 2007 (Amsterdam, Netherlands)
 - Expanded discussions on subjects from 2006 workshop by adding service experiences, sandwich damage and repair considerations [Amsterdam, 2007]
 https://www.niar.wichita.edu/niarworkshops/Workshops/CACRCMeetingWorkshopMay2007Amsterdam/tabid/110/Default.aspx
- Composite Damage Tolerance & Maintenance Workshop III 2009
 - Continued reviewing subjects from 2006 & 2007 workshops, summarized regulatory guidance development for related sections of AC 20-107B, and discussed future repair standards & training needs [Tokyo, 2009]



FAA Joint Advanced Materials and Structures (JAMS) Centers of Excellence

FAA JAMS Centers of Excellence to provide research and training in support of expanding composite applications



Wichita State University Northwestern University Purdue University Tuskegee University University of Delaware University of California at Los Angeles University of California at San Diego



University of Washington Edmonds Community College Oregon State University Washington State University University of Utah Florida International University



Future CAA Interface

- Foreign CAA will always be encouraged to support the industry interface, which is essential to FAA Composite initiatives
 - Some may have the experience to help lead specific composite initiatives
 - Others seek education/knowledge but want to review ongoing efforts to develop industry benchmarks in standards, guidelines, best practices and other reports to ensure they can follow the strategy/logic/documentation
- Working Groups consist of experienced industry technical experts to ensure safety is addressed and certification efficiency is achieved
- Once mature, the goal is to get regulatory guidance and industry standards, guidelines & best practices into educational materials, giving examples of industry acceptable means of compliance
- Without proactive involvement a significant safety concern will come from lack of trained resources and the application of unacceptable engineering, manufacturing & maintenance practices



Composite Safety & Certification Meeting - Composite Safety via Global Efforts -

- Thanks for Opportunity.
- Questions and/or Thoughts?
- Further Discussion.

