



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



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

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

CMH17

COMPOSITE MATERIALS HANDBOOK

Vol. 1 Polymer Matrix Composites: Guidelines for Characterization of Structural Materials
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)



ASTM Committee D-30



ASTM Committee D30 on Composite Materials
was formed in 1964

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 (T_g)

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>

FAA Composite Damage Tolerance & Maintenance Workshops

Chicago, IL, USA July 19-21, 2006

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

~150 Participants

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

Tokyo, Japan June 4 & 5, 2009



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

~120 Participants

Amsterdam, Netherlands May 9-11, 2007



	Wednesday, May 9	Thursday, May 10	Friday, May 11
1 st Hour	SAE Commercial Aircraft Composite Repair Committee Overview of Progress & Plans	Session 1 Applications & Field Experiences (continued) Service History of Composite Structure Service Damage & Reliability of Repairs	Session 5* Field Inspection and Repair QC Test Standards & Inspector Qualifications Reliable NDI Technology Advances Material & Process Controls
2 nd Hour			
Break (15 min.)	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)
3 rd Hour			
4 th Hour			
Lunch (1 Hour)	SAE CACRC Active Task Group Reports	Session 3* Damage in Sandwich Construction Fluid Ingression Growth Mechanisms Analysis & Accelerated Tests	Session 7 Breakout Team Summary Recap/Actions/Closure/Adjourn
5 th Hour			
6 th Hour	FAA & EASA Initiatives Recent Progress/Safety Management	Session 4* Repair Design and Processes Repair Limits Design Criteria & Process Guidelines Structural Substantiation	
7 th Hour			
8 th Hour	Session 1 Applications & Field Experiences		

~110 Participants



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]
<https://www.niar.wichita.edu/niarworkshops/Workshops/WorkshopCACRCMeetingJune2009Tokyo/tabid/114/Default.aspx>

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.**

