

FAA / CAAs "Composite Meeting"

- Bonded Repair Size Limits (BRSL) - Policy Statement

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FAA / CAAs "Composite Meeting" - BRSL Policy Statement -

- AVS Plan: Bonding Initiatives (Overview)
- BRSL Development Background
 - ^ Joint Efforts of Regulators & Industry
 - ^ Clearance Record Process (CRP)
 - ^ Public Commenting Process (PCP)
 - ^ FAA/EASA Coordination and Issuance
- BRSL Post Issuance Efforts
 - ^ PS/CM Harmonization & Proposed Revision
 - ^ Implementation Support & Further Plan
- BRSL PS / CM Coordination



Overview of AVS Composite Plan

- Based on safety management approach
- The Plans are linked to:
 - Best Industry Practices
- Certification and field experiences

Research

- Projected technology advances in aircraft structure

 Priority given to structural issues, related manufacturing procedures and maintenance practices coming from service experience and industry input.

Continued Operational Safety (COS)	Certification Efficiency (CE)	Workforce Education (WE)
COS A: Bonding Initiatives - Bonded Repair	CE A: Hybrid F&DT Substantiation	WE A: Composite Manufacturing Technology
- Bonding Quality Control	CE B: Advanced Composite Maintenance	WE B: Composite Structure Technology
- Sandwich Disbond Growth	CE C: Composite Structural Modifications	WE C: Composite Maintenance Technology
COS B: HEWABI	CE D: Composite Quality Assurance	Composite Basics
COS C: Failure Analysis of Composites Subjected to Fire	CE E: Bonded Structure Guidance	Composite DER
	CE F: General Composite Structure Guidance	
Support to future COS Initiatives Aging Composite Aircraft Teardown	Transport Crashworthiness	
	Lightning Protection	
	CMH-17 Revision H	

AVS Plan: Continued Operational Safety (COS) - Bonding Initiatives (BI) -

- Bonded Repair
 - BRSL Policy (FY 13-15)
 - Metal & Composite Bonding Best Practices
 - Repair Substantiation & M&P Control
 - Research Support

Bonding Quality Control

- Standards for Metal Bonding QC (FY 11-15)
- Standards for Composite Bonding QC (FY 13-)
- Research Support (e.g., Test Standards Development)

Sandwich Disbond Growth

- Document Best Practices
- Standards for Sandwich Disbond Crack Growth
- Research Support



AVS Plan: Certification Efficiency (CE) and Workforce Education (WE) Related to BI

- Composite Quality Control (CE)
 - Update AC 21-26 "Quality System for Manufacture of Composite Structures"
 - Update online job aid for audit & surveillance of composite repair facilities.
- Bonded Structures Guidance (CE)
 - Part 21 AC for Bonded Structure including Bonded Repair Best Practices
- Workforce Education (WE)
 - Composite Manufacturing Technology
 - Composite Structures Technology
 - Composite Maintenance Technology



Work Flow – Bonding Initiatives

Example of Working Plan Details

FY 2012 FY 2013 FY 2014 FY 2015 FY 2016 FY 2017 FY 2018 Revised Metal Wedge Crack Durability Test: Develop an update to the existing ASTM test standard and acceptance criteria for environmentally -driven crack growth and failure mode. Test Standards for Sandwich Disbond Crack Growth (Modes I, II, and III): Develop ASTM standards for composite sandwich disbond testing, including instructions for fracture toughness and growth measurements with environmental and aviation fluid exposures.. CMH-17 Design, Proof of Structure and Process Guidelines to Mitigate Safety Risks for Composite Sandwich Disbonding: Document best practices for M&P control, design, fabrication, inspection, repair and structural substantiation, with special considerations for the phenomena of sandwich panel disbonding in a service environment and controlling related aircraft safety (certification and continued airworthiness). CMH-17 Revision H: Document best practices for metal & composite bonding (incl. sandwich) as related to M&P control, design, fabrication, FAA/EASA/CAA/Industry Workshop inspection, repair and structural substantiation to support new AC. to review above Advances Part 21 AC for Bonded Structure: Build on industry guidelines, Needs to be expanded until informational reports, standards and AIR-100 policy to create comprehensive guidance supporting Part 23, 25, 27, 29, 33 and 35 bonding applications, considering new technology for Revision H is published modern aircraft (to be completed in FY20). Research Support to Sandwich Disbond Initiatives: Benchmark industry practices and field findings on the root cause of sandwich disbond growth, while standardizing analysis and test evaluation protocol.

Research Support to Bonded Structure Initiatives, Including Bonded Repair: Benchmark industry practices and identify potential safety problems to support the development of regulatory policy, guidance and training that mitigate risks. This research will also include inspection method and other maintenance technology evaluations.

Test Standards Research and Development: Perform research to support industry quality control and structural test standards development.



BRSL – Development Background

- Joint Effort of Regulators & Industry
 - Seattle Working Meeting (Apr/12)
 - Toulouse Working Meeting (Sep/12)
 - Washington DC Working Meeting (Jul/13)
- AIR-100 conducted internal review (Clearance Record Process) (May-Jul/14).

Comments Received:

- Composite CSTA [6/16/14]
- RCD (ASW-100) [6/25/14]
- SAD (ACE-100) [Jun/14]
- TAD (ANM-100) [Jun-Aug/14]



BRSL – Public Commenting Process

• AIR-130 conducted 30-day Public Commenting Process (9/10/14 - 10/10/14).

Comments Review/Disposition:

- Comments inputs may be categorized from four distinct sectors of industry –
 - OEMs (Manufacturers): Boeing, Airbus, Bombardier, Textron, Cirrus, Spirit
 - Airlines (Operators): AA, DAL, UA, UPS
 - MROs (Repair Stations): TAC, AQRD, ARR, NORDAM
 - Trade Organizations: ARSA, A4A

BRSL – Public Commenting Process (cont.)

Comments Review/Disposition (cont.):

- Nature of comments seems to reflect sector's perspectives where commenters situate.
- Team completed review/disposition.
- Team established final BRSL draft (11/14/14).

[Disposition files are maintained for record.]

FAA/EASA shared comments/dispositions for harmonization.



BRSL – Finalization and Issuance

- Harmonization of FAA PS and EASA CM started in 2013 and continues -
 - Policy sections for both documents are essentially identical.
 - Public commenting for both started at nearly the same time.
- FAA AIR-100 issued BRSL PS (11/24/14)
 - Wording mistake discovered in FAA policy section after issuance through communications with EASA.
 - FAA updated the BRSL Policy [PS-AIR-20-130-01]
- FAA continues harmonization support to EASA CM
 - FAA (Lester) & EASA (Simon) met in Cologne (Wk. of 2/16/15).
 - Final release of EASA CM (Date TBD).

BRSL – Summary [PS-AIR-20-130-01]

A. Summary

This policy reviews the regulatory basis and establishes the guidance in setting size limits for bonded repair to critical composite (monolithic and sandwich structures) and metallic structure. Bonded repair of critical structure must first be constrained to the sizes allowed by substantiating design data. This policy informs Aircraft Certification Office (ACO) engineers and designees that due to inspection limitations, bonded repair must be further limited to a maximum size whereby limit load residual strength can be demonstrated with a complete or partial failure of the bond within the repair or base structure arresting design features. This policy is not intended for minor repairs.

BRSL – Implementation & Further Plan

- Update FAA/AFS Order 8900.1 (*FAA Flight Standards Division Information Management System*) to outline bonded repair size limits (to be discussed by Rusty Jones)
- Further Plan Includes
 - ^ CACRC metal & composite best practices for bonded repair
 - ^ CMH-17 bonded repair structural substantiation guidelines
 - ^ NIAR/WSU and Heatcon research on bonded repair
 - CACRC round robin experiments
 - Industry views on critical in-process and post-process inspections
 - ^ DER short course for bonded repair
- Part 21 AC for Bonded Structures including Bonded Repair Best Practices (Culmination)

Composite Safety & Certification Meeting

- Bonded Repair Size Limits (BRSL) -

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