AEROSPACE INFORMATION REPORT

AIR5279™	REV. A

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Superseded by AIR4938, AIR6825, AIR7491

Composite and Bonded Structure Inspector: Training Document

RATIONALE

This content has been completely superseded by AIR4938, AIR6825, and AIR7491.

CANCELLATION NOTICE

This technical report has been declared “CANCELLED” as of October 2023 and has been superseded by AIR4938, AIR6825, and AIR7491. By this action, this document will remain listed in the respective index, if applicable. Cancelled technical reports are available from SAE.

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1. SCOPE:

This document provides recommendations concerning the minimum knowledge and skill guidelines for a composite and metal bond repair inspector.

Teaching levels have been assigned to this curriculum to define the knowledge, skills and abilities needed to inspect repairs. Minimum hours of instruction have been provided to ensure adequate lecture and laboratory coverage of all subject matter. These minimums may be exceeded, and may include an increase in the total number of training hours and/or increases in the teaching levels.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 U.S. Government Printing Office Publications:

Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

U.S. Code of Federal Registry 14, Part 147 (US FAA FAR) Scope

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3. STUDENT PREREQUISITES:

Student success will be in part based on the knowledge and skills possessed or developed in the following disciplines:

Basic technical mathematics
Fundamentals of engineering and technical drawings
General shop and hand tool usage
Use of precision measurement tools
Basic physics
Aircraft familiarization

The above listed disciplines are prerequisites, and may be learned prior to or in conjunction with the training outlined in this section. Evaluation of prior education can be accomplished by examination of school transcripts, or by review of the training received through aircraft apprenticeship, aircraft maintenance certification, or tests administered by the Approved Training Provider.

4. EXAMINATIONS:

Training Providers will be required to monitor student performance throughout the program. Students will be administered written exams in lecture classes and shall perform inspection tasks. The minimum passing grade for all tests shall be 70% and all grades shall be recorded in the individual's training records.

The final examination(s) will cover basic principles of composite and bonded metal repair inspection, including inspection tasks.

5. TEACHING LEVELS:

The following definitions of minimum teaching levels are derived from 14 CFR Part 147 and may be exceeded.

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5.1 Level 1:

Level 1 requires knowledge of general principles, but no practical application; no development of manipulative skill; and instruction by lecture, demonstration, and discussion. This teaching level generally refers to classroom discussion and does not require practical application. Teaching aids or instructional equipment may include charts, books, diagrams, or other visual teaching aids. If a training organization chooses to teach Level 1 courses incorporating actual components, the components do not have to be operational.

5.2 Level 2:

Level 2 requires knowledge of general principles and limited practical application; development of sufficient manipulative skill to perform basic operations; and instruction by lecture, demonstration, discussion, and limited practical application. This teaching level requires some hands-on manipulative skills and their accompanying actual or simulated components/equipment, but still may be taught primarily in the classroom environment.

5.3 Level 3:

Level 3 requires knowledge of general principles; performance of a high degree of practical application; development of sufficient manipulative skill to accomplish return to service; and instruction by lecture, demonstration, discussion, and a high degree of practical application. This teaching level requires hands-on skill, as well as sufficient and appropriate instructional aids to train the students to develop manipulative skills sufficient to simulate return to service mechanical skill. At this level, the teaching aids must be similar to or be the actual items of equipment on which the student is expected to develop required skill levels. A Level 3 subject cannot be taught solely by lecture in the classroom; the appropriate training aids and hands-on experience must be used.

NOTE: Numbers such as 2,3* indicate that the inspector needs training to a higher level only if he/she will be working with that particular equipment.

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6. CURRICULUM:

This curriculum describes the minimum subject matter to be taught by the Training Provider. Subjects may be combined, repeated or reinforced in any order which will effectively cover the scope of this curriculum.

TABLE 1 - Table of Contents

Subject	Section Number		Hours
Introduction	1.0		1
Material properties and characteristics	2.0		8
Material handling and storage	3.0		4
Original design criteria	4.0		4
Repair criteria	5.0		4
Safety and environment	6.0		1
Damage assessment and inspection techniques	7.0		12
Repair techniques	8.0		24
Source documents	9.0		8
Record keeping	10.0		4
Shop equipment and hand tools	11.0		4
Fastening systems	12.0		2
		Total hours	76

		Level	Hours
1.0	**INTRODUCTION**	(1)	[1]
	1.1 Definition of "Composites"		
	1.2 History		
	1.3 Evolution of Aircraft Structure		
	1.4 Advantages/Disadvantages		
	1.5 Applications		

		Level	Hours
2.0	**MATERIAL PROPERTIES and CHARACTERISTICS**		
	2.1 Fiber types and properties	(2)	[8]
	2.2 Size and finish		
	2.3 Fabric and tape		
	2.4 Resin and properties		
	2.5 Adhesive types		
	2.6 Compatibility		
	2.7 Core materials		
	2.8 Filler materials		
	2.9 Sealants, primers and finishes		
	2.10 Material substitution		

FIGURE 1

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2.11 Solvents
2.12 Test techniques

	Level	Hours
3.0 MATERIAL HANDLING AND STORAGE	(2)	[4]

3.1 Storage and environmental controls
3.2 Shelf life and out times
3.3 Shipping and receiving procedures
3.4 Re-certification of materials
3.5 Mixing and mix ratios
3.6 Control of repair environment
3.7 Pre-repair handling
3.8 Honeycomb storage
3.9 Kitting requirements

	Level	Hours
4.0 ORIGINAL DESIGN CRITERIA	(1)	[4]

4.1 Advantages and disadvantages
4.2 Fabrication techniques
4.3 Sandwich versus monolithic
4.4 Hygroscopic and thermal effects
4.5 Conductivity and radar transparency
4.6 Aerodynamic smoothness
4.7 Galvanic protection
4.8 Interior composites (part 25.853)
4.9 Primary, Principal Structure Element (PSE), and secondary structures
4.10 Lightning strike protection
4.11 RFI/EMI shielding
4.12 Damage tolerance and durability

	Level	Hours
5.0 REPAIR CRITERIA	(2)	[4]

5.1 Allowable damage limits
5.2 External bonded or bolted doublers
5.3 Scarfed repairs
5.4 Stepped repairs
5.5 Multiple repairs
5.6 Aerodynamic smoothness
5.7 Material selection
5.8 Repair classification
5.9 Repair method selection

	Level	Hours
6.0 SAFETY AND ENVIRONMENT	(2)	[1]

6.1 Respirable fibers and protection
6.2 Dust control
6.3 Precautions for exothermic reactions
6.4 Skin contact: fibers and resins
6.5 Hazardous waste disposal

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FIGURE 1 (Continued)

6.6 Material Safety Data Sheets (MSDS)
6.7 Hazardous fumes

		Level	Hours
7.0	**DAMAGE ASSESSMENT AND INSPECTION TECHNIQUES**		[12]
7.1	Visual inspection	(3)	
7.2	Tap testing	(3)	
7.3	Ultrasonic	(2,3*)	
7.4	Radiography	(2,3*)	
7.5	Bond testers	(2,3*)	
7.6	Eddy current	(2,3*)	
7.7	Paint thickness gauge	(2,3*)	
7.8	Moisture checker	(2,3*)	
7.9	Transmissivity testing	(1,3*)	
7.10	Laser shearography/ interferometry	(1,3*)	
7.11	Thermography	(1,3*)	
7.12	Verifilm	(3)	
7.13	Megaohm Meter (Megger)	(3)	

		Level	Hours
8.0	**REPAIR TECHNIQUES**		[24]
8.1	Surface preparation and damage removal	(3)	
8.2	Ply orientation identification	(3)	
8.3	Bolted repair: metal and precured composite	(2)	
8.4	Honeycomb core repair	(3)	
8.5	Line repair	(2)	
8.6	Wet lay-up repair	(3)	
8.7	Bonded metal repair	(2)	
8.8	Manufacturing test coupons	(2)	
8.9	Stepped repair	(2)	
8.10	Precured patch	(2)	
8.11	Surface restoration	(2)	
8.12	Prepreg repairs	(3)	
8.13	Fastener hole and edgeband repair	(2)	
8.14	Blind-side repair	(2)	
8.15	Hybrid repair	(2)	
8.16	Tapered or scarfed repair	(3)	
8.17	Solvent cleaning and surface preparation for bonding	(2)	
8.18	Trailing edge repair	(2)	
8.19	Cure pressures and temperatures	(2)	
8.20	Pre-repair drying	(2)	
8.21	Contamination removal	(2)	
8.22	Paint removal	(2)	
8.23	Post - repair inspection	(3)	
8.24	Uni-directional tape repairs	(2)	
8.25	Post repair finishing and sealing	(2)	
8.26	Vacuum bagging techniques	(3)	
8.27	Disbonding techniques	(2)	
8.28	Cual Plate	(3)	
8.29	Water break test	(3)	

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FIGURE 1 (Continued)