



U.S. Department
of Transportation

Federal Aviation
Administration

Memorandum

Subject: **INFORMATION:** Guidance on Adhesive Approval for Use
in CAR/FAR Type Certificated Wooden Airplanes

Date:

FEB 05 2001

From: Manager, Standards Office
Small Airplane Directorate, ACE-110

To: SEE DISTRIBUTION

The Small Airplane Directorate (SAD) received an inquiry asking if any established procedure existed, for an aircraft mechanic to follow, to qualify an adhesive for use in the repair of wooden airplane structure. The Small Airplane Directorate researched this matter and presents its findings in this memorandum.

SUMMARY

Federal Specification MMM-A-181D and Military Specification MIL-A-22397 both describe a required series of tests that verify the chemical and mechanical properties of resorcinol. Resorcinol is the only known adhesive recommended and approved for use in the repair of wooden aircraft structure. The tests specified by the Federal and Military Specifications are intended to be performed in a laboratory environment, and are the only procedure a mechanic or any individual may follow to approve a resorcinol based adhesive.

While epoxy based adhesives have gained acceptance for use with composite aircraft, no known standards exists for their use in wooden aircraft structural repair. The Directorate will coordinate with industry to develop qualification and acceptance tests of epoxy based adhesives for this application. We will issue revised guidance and policy pending any advancement in this area.

DISCUSSION

Advisory Circular (AC) 43.13-1B, "Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair (9/8/98)," provides methods, practices, and criteria for the repair of civil aircraft. Specifically, as it relates to adhesives for use with wood products, Chapter 1, paragraph 1-4(a) states:

"Adhesives acceptable to the FAA can be identified in the following ways:

(1) *Refer to the aircraft maintenance or repair manual for specific instructions on acceptable adhesive selection for use on that type aircraft.*

(2) *Adhesives meeting the requirements of a Military Specification (Mil Spec), Aerospace Material Specification (AMS), or Technical Standard Order (TSO) for wooden aircraft structures are satisfactory providing they are found to be compatible with existing structural materials in the aircraft and the fabrication methods to be used in the repair."*

While Advisory Circular 43.13-1B provides information on the types of adhesives that may be used in wooden structure repair, it does not provide a process that a mechanic may follow to approve a previously non-certified adhesive for aeronautical repair. Thus, it becomes necessary for the Directorate to issue guidance on this subject.

Two essential documents specify the performance requirements and quality control procedures of adhesives for use on wooden structure. The first document, Federal Specification MMM-A-181D, "Adhesives, Phenol, Resorcinol, or Melamine Based," covers general-purpose adhesives, 2-part adhesives, and a 1-part adhesive, all suitable for wood assembly gluing. This Specification lists a detailed set of tests that a proposed adhesive must be subjected to before use. The intent of these tests is to verify the chemical and mechanical properties of the adhesive in question. Equally important is the need to ensure the tests are carefully controlled and reproducible. The second document, Military Specification MIL-A-22397, "Adhesive, Phenol and Resorcinol Resin Base (for Marine Service Use)" is consistent with the Federal Specification.

The inspection requirements as defined in MMM-A-181D and MIL-A-22397 are detailed and intended to be performed in a laboratory environment. The SAD guidance must not contradict the Government issued specifications. Therefore, the only procedures that one may follow to certify an adhesive for use in wooden structure are as described in the Federal Specification and the Military Specification. Only an inspection facility acceptable to the Government may perform the tests necessary to demonstrate the compliance of the product with the requirements listed in the Specification documents.

The Directorate did consider the possibility of allowing a mechanic to demonstrate the properties of an adhesive by performing a series of tests using double shear blocks made from the same materials as the aircraft. The adhesive in question would be used to bond the double shear blocks, and tested under a variety of loading and environmental conditions. If structural failures only occurred in the wood and not in the adhesive, the adhesive would be found acceptable. However, this concept was subsequently dismissed for the following reasons:

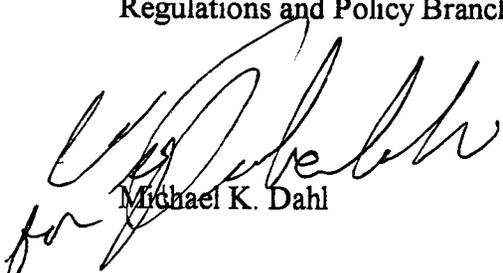
- The demonstration would have to be performed on every manufacturing lot of adhesive received by the mechanic.
- The adhesive manufacturer would not have initially subjected the adhesive to a complete set of qualification tests that ensure its reproducibility and suitability for the intended application.

- Any repair made using an adhesive approved in this manner would be in conflict with Chapter 1, paragraph 1-4 in AC 43.13-1B, which requires the use of an adhesive that satisfies a Military Specification, or other appropriate document.

We realize that MMM-A-181D and MIL-A-22397 are applicable to resorcinol adhesives only. We further realize that epoxy adhesives have gained acceptance in the use of composite built aircraft, and that mechanics would like to extend their use to repair of wooden structure. Unfortunately, elevated operating temperatures and humidity degrade the strength and durability of epoxy. In fact, there are no known epoxies that have been approved by the FAA for use in repair of wooden airplane structure.

To address this situation, the Directorate is coordinating with Mr. Larry Ilcewicz, National Resource Specialist for Advanced Composite Materials, on developing methods for approving the use of epoxy adhesives in the repair of wooden structure. These efforts will consider the initial detailed tests needed to qualify an adhesive for repair of wooden aircraft structure and acceptance testing needed to ensure subsequent material control. We will issue revised policy and guidance pending any advancement in this area. Until such time, the Small Airplane Directorate requires that wooden aircraft structural repair use only those adhesives that satisfy the criteria established in AC 43.13-1B.

If you have any questions or need additional information, please contact Mr. Pat Mullen, Regulations and Policy Branch, at 816-329-4128.



for Michael K. Dahl

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