



## Fabricating Parts to Facilitate Maintenance, What Does FAR 21.9 Really Mean?

*This article demonstrates all the interactions between various FARs, ACs, Orders and other documents.*

*It is excellent evidence that when you adopt one Part of a foreign regulatory system, you must also adopt all other provisions otherwise the intent of the adopted Part creates larger problems.*

The following is an excerpt from an Aviation Maintenance magazine article written by David Schober re the FAA MITCOM.

“A recent post I made on the Facebook “FAA Inspection Authorization and Inspectors” page stirred up a lot of unexpected controversy. The original post referred to a component fabricated in the course of maintenance, and how an FAA Aircraft Certification Office inspector threatened the person performing the maintenance with a violation unless he got a Field Approval for that maintenance task. What surprised me was the controversy that ensued covering several important points. The age-old Major/Minor controversy. What really constitutes Approved Data. The inconsistency between not only FAA Inspectors, but FSDO offices, and ACO offices in how they read the regulations. An idea that all parts require an FAA Form 8130-3. Finally, can an A&P fabricate parts for installation in the course of performing maintenance.

This article will focus on the last of those controversies. Can an A&P fabricate parts for a Type Certified Aircraft with a Standard Airworthiness Certificate, and what approval, or type of data would be required? To answer, unfortunately we need to first look at the Major/Minor controversy, to that end, who is responsible for the determination of Major/Minor? A review of the regulations does not give a direct answer, but once you read 43.9 and 43.13, it becomes clear that the **person performing that maintenance is the one that has to make that decision** as he is the one that must determine who can return the aircraft to service. It is not the FAA, it is not the aircraft owner, the sole responsibility for making a Major/Minor determination rests entirely on the person performing the maintenance function. That Major/Minor determination is what drives the type of Data that is required, who can actually return the aircraft to service, and finally what documents are required for that return to service. For simplicity in this discussion, we will assume the maintenance function is a Major Repair as that sets up the most stringent requirements. That Major/Minor determination can easily be made by referencing the flow chart in **AC43-210A Figure 4-1** along with the definition in Part 1.1 and Appendix A to Part 43. Given that we are assuming a Major Repair, **14 CFR 65.95(a)(1) identifies that Approved Data is required** for the repair, and that repair must be made in accordance with that Approved Data. Recognize also that in the Part 65 world, an FAA Form 337 would be required, and the return to service is done by the holder of an Inspection Authorization. Much of the information in this article only applies to Part 65 maintenance facilities. While operating under a Part 145 Repair Station, or an Air Carrier Certificate some information presented may not be applicable.

Now our happy A&P is about to undertake a maintenance task, and he discovers a broken or otherwise unserviceable part. Can our A&P make the replacement part? 14 CFR 43.13 (b) states “*Each person maintaining or altering, or performing preventive maintenance, shall do that work in such a manner and use materials of such a quality, that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original or properly altered condition (with regard to aerodynamic function, structural strength, resistance to vibration and deterioration, and other qualities affecting airworthiness).*”, so if we use parts of such quality that it will be at least equal to the original we satisfy that requirement. When we are finished, we want an “Airworthy” aircraft, and under the definition of “airworthy” in 14 CFR 3.5, that part needs to meet Type Design as well as being safe for flight. Given that, do we have sufficient data to make that determination? That is a value judgement given the complexity of the part and the aircraft. Can

it be reverse engineered from the existing unairworthy part? Do we have drawings or specifications that provide sufficient detail? Can we use existing publications from the FAA to fabricate the new part? All these are valid questions that we, as mechanics need to ask before embarking on the fabrication of parts for this aircraft.

Some examples of parts fabrication, fluid hoses. Sheet metal skin panels fabricated from raw aluminium sheet goods, Steel tubes to be welded into a steel tube fuselage, engine mount, or landing gear, flexible steel control cables, wood wing ribs, spars or compression struts, clear transparencies for side windows and sky lights. These are all examples of commonly fabricated items that may or may not be acceptable to fabricate locally. A hose assembly may have a pressure test requirement that you don't have the equipment to perform. A sheet metal skin may have a surface treatment that requires special processing, or has called outs for a manufacturers specification you aren't in possession of. The fuselage, engine mount, or landing gear may have heat treatment requirements you aren't equipped to comply with. There may be multiple reasons you may not be able to fabricate a part, but more frequently than not, these special requirements are not present.

If there are maintenance or structural repair manuals available for the aircraft in question, that is your first source of data. Aircraft manufactured prior to CAR 3 will have very limited, if any, maintenance information available. The primary source of maintenance and inspection data for these aircraft will be AC43.13-1B, all prior versions of AC43.13-1, and CAM 18. Recognize that with AC43.13-1, through the various revisions, critical information on inspection and repair was removed, yet if that information resides in an earlier version or CAM 18, and it is directly applicable to the repair, it is still valid information. The Signature page of AC 43.13-1B (and earlier versions) provides that it is acceptable data, and in certain cases it is APPROVED data. Recall we said that this was going to be Major Repair, so the data used in making the repair (fabricating the part) must be Approved Data.

The potential sources of Approved Data can be found in **Order 8300.16 Figure 4-1**. Our A&P needs to evaluate the Approved Data available and ensure that this data provides the ENTIRE data required to perform this repair (part fabrication). If it is, then no additional data approval is required. If the data doesn't cover the entire repair, then additional approval will be required. Go back to Order 8300.16 and AC 43-210A to find how to acquire additional approved data. Recognize that many aircraft manufacturers have gone out of business or are no longer supported. Your ability to secure Approved Data for these airplanes will be primarily DERs, DARs, and the FAA. AC23-27 provides additional information concerning material substitutions or part substitution. Use caution when making substitutions as your **repair may also become an alteration**, requiring further approved data.

Assuming we have all the data, and referring back to 14 CFR 43.13(b), our fabricated part must meet Type design and be "at least equal" to the original. It doesn't say it has to be EXACTLY, it says at least equal. In most instances, reverse engineering can provide alloy, thickness, type of hose, type of cable, size, shape, thickness, hole pattern, fitting ends, and all other features related to an item or part. Many times, processes can be determined through hardness testing, spark testing, NDT, or other inspection techniques. If there is no manufacturers maintenance or structural repair manual, AC 43.13-1B will be the go-to source. Given the limitations on the signature page, we have approved data for the fabrication of wood components, steel tube structures, sheet metal components, hoses, solid lines for fuel and hydraulic systems, control cables, and wiring. 14 CFR 21.9(a)(5) or (6) provide the legal authorization to actually fabricate parts for the purpose of repair. If we go to the original preamble of Part 21 in the Federal Register October 16, 2009, we find the following:

“In addition, the SBA’s Office of Advocacy asked the FAA to clarify and confirm that the existing ability of a repair shop to produce a part during maintenance activities remains in place. Since the NPRM proposed to remove that language, several repair stations asked us to clarify whether they will still be able to produce articles that will be consumed in the course of a repair without violating Sec. 21.9(a).

It is not our intent to preclude that activity. To address that concern and clarify our intent, we established an exception in Sec. 21.9(a)(6). This exception, which was not proposed in the NPRM, allows for the production of articles without benefit of a production approval when articles are fabricated by an appropriately rated certificate holder with a quality system and consumed in the repair or alteration of a product or article in accordance with part 43. Maintenance providers who do not have a quality system may continue to fabricate owner-produced articles for installation on type-certificated aircraft using the guidelines set forth in Policy Memorandum, Definition of “Owner Produced Part,” Section 21.303(b)(2), August 5, 1993.”

This clearly shows that the FAA’s intent with the changes from the old 21.303 to the new 21.9 was not to limit the ability of an A&P fabricating parts for the purpose of maintenance. Mind you that FAA has no clear definition of “quality system”. While that term shows up in Parts 145, 135, 121, and perhaps others, it does not mean that a shop that does not have a 145 Certificate can’t have a quality system. While controversial, I move that for a Major Repair, a quality system is inherent in the fact that the return to service on FAA Form 337 requires signatures for persons with two independent certificates, the first indicating conformity and the second provides an independent inspection leaving 21.9(b)(5) as the controlling regulation for parts fabrication. It really doesn’t matter since FAA provided both 21.9(b)(5) and (6) as methods for fabrication of parts consumed during maintenance.

**To summarize,**

1. Within the scope of the Federal Aviation Regulations, under 14 CFR 21.9, FAA clearly indicated that an A&P has the authority to fabricate parts either with a quality system under 21.9(b)(6), or 21.9(b)(5) without a quality system.
2. Any part fabricated in the process of performing maintenance still needs to conform to Type Design.
3. The installation of any part (purchased or fabricated) must follow the maintenance requirements of Part 43.
4. Part Fabrication, since it is considered maintenance, could be a Major Repair or a Minor Repair. Use the flow chart in AC 43-210A to help make that determination.
5. For minor repairs (part fabrication) only acceptable data is required. For Major Repairs (part fabrication) Approved Data is required. FAA Order 8300.16 has a listing of sources of approved data.
6. Parts fabricated under 21.9(b)(5) or (6) need to be consumed in the process of maintenance, they can’t be sold, or put on the shelf for future installation.
7. If additional Approved Data is required, you can enlist the support of a DER that has Major Repair and Major Alteration Authority within the functional area where your repair is, a DAR that has Field Approval Authority, or the FAA FSDO for a Field Approval. (Many FSDO offices will no longer support Field Approval requests)

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