



News from the Hill

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Maintenance Terminology Matters

Anybody who has worked for any amount of time with the Federal Aviation Regulations knows the importance of properly characterizing one's activities under those rules. Whenever laws or regulations are involved, definitions matter a great deal, because how something is defined determines what rules apply. Questions on how to define an activity can arise frequently in the aviation industry. For example, does a given task constitute "maintenance" or not? Is a particular job a "repair" or an "alteration?" Is it "major" or "minor?" "Significant" or "non-significant?" The answers are sometimes difficult to pin down precisely. All too often, they come down to the personal interpretations of individual FAA inspectors.

This article will examine several terms that describe a significant portion of the work performed by maintenance providers such as repair stations, mechanics or manufacturers: repair, alteration, overhaul and rebuild, as well as the traditionally vexing difference between "major" and "minor" repairs and alterations. Perhaps surprisingly, the Federal Aviation Regulations do not provide formal definitions for any of these terms. The FAA has nevertheless published guidance and descriptions of these terms that amount to definitions, even where the agency prefers not to

use that word. It is critical to have some form of definition or other guidance to work with, since the label applied to a particular activity determines in many instances what sort of paperwork must be used to document the action and the type of approval that must be obtained before the affected item is considered airworthy.

Repair vs. Alteration

The definitions section of the Federal Aviation Regulations found at 14 C.F.R. section 1.1 offers the following definitions relating to repairs and alterations:

Major repair means a repair...

(1) That, if improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or

(2) That is not done according to accepted practices or cannot be done by elementary operations.

Minor repair means a repair other than a major repair.

Major alteration means an alteration not listed in the aircraft, aircraft engine, or propeller specifications...

(1) That might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or

(2) That is not done according to

accepted practices or cannot be done by elementary operations.

Minor alteration means an alteration other than a major alteration.

These definitions do not, however, shed much light on the fundamental question of what actually constitutes a "repair" or an "alteration." Despite the lack of formal regulatory definitions, the FAA has a firm understanding of what these terms mean and has published guidance for its employees and designees that provides a *de facto* definition. Order 8110.37C, *Designated Engineering Representative Handbook*, offers perhaps the clearest example. Paragraph 611 of that Order explains:

A repair is the restoration of a damaged airframe, powerplant, propeller, or appliance accomplished in such a manner and using material of such quality that its restored condition 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). The damage can be due to deterioration or to external causes.

An alteration is the modification of an aircraft from one sound state to another sound state; the aircraft meets the original airworthiness specifications and standards both before and after that modification.

While there is less confusion between these terms than exists between some of the others discussed below, situations nevertheless arise in which there is some question as to whether an action is a repair or an alteration. For example, a DER develops data for reinforcing the skin and airframe of an aircraft surrounding the spot where a hole has been cut to install a new antenna. Do these data support a repair (by restoring that section of the airframe to a condition at least equal to its original condition with regard to qualities affecting airworthiness) or an alteration (as part of the work supporting the installation of an antenna that was not there previously)? The key lies in properly defining the scope of the action in question (was the DER developing data only for the reinforcement of the airframe following the puncture, or for the installation of the antenna and other related items as well?) and applying the criteria above (restoration of a damaged article or modification from one sound state to another?).

Some DERs are limited in their privilege only to repairs or only to alterations so the definition of the work can be important. We have seen 8110-3 tags that described this work as repair and others describing this same work as alteration—it seems that the main difference was the personal interpretation of the FAA advisor. This is a good example of an area where there should be a firm understanding between the DER and his/her FAA advisor before the DER performs the work. Many DERs will have discussed this sort of work with the FAA in the past and will have an understanding of what the local FAA office expects.

If the local FAA office's interpretation inhibits your business, you may need to argue your case. Persuading the FAA that they have mischaracterized a transaction may be difficult,

especially in light of the fact that the FAA has previously admitted that the distinction between repair and alteration can be difficult to quantify in some cases. Reliance on FAA published advisory guidance on repairs and alterations can be a useful way to support your point about the proper characterization of a transaction.

Major vs. Minor

One thing that the definitions in 14 C.F.R. section 1.1 do make clear is that there is a distinction between "major" and "minor" repairs and alterations. This distinction is a key consideration in determining what sort of supporting data will be necessary to approve the given action.

As Order 8110.37C explains, major repairs and alterations require the development of technical substantiation data specific to the proposed repair or alteration. The data must be submitted to a FSDO for approval or, at the FSDO's request, to the ACO for engineering approval. Minor repairs and alterations do not require FAA engineering pre-approval of the underlying data. Nevertheless, there must be some identifiable technical rationale for the determination that a repair or alteration is minor, in order to substantiate the finding that the proposed action will have no appreciable effect on weight, balance, performance, powerplant operation, etc.

So when is a given repair or alteration "major" and when is it "minor?" Despite the concerted efforts of some of the best minds in the aviation industry, this fundamental question has defied precise definition for decades. The reason lies in the inescapable fact that there are so many variables at play that there can never be a hard and fast definition or a truly definitive list of actions that fall on one side or the other of that line (Appendix A to Part 43 classifies numerous activities as either major or minor, but the list is

not exhaustive). The best that the FAA has been able to achieve are guidelines focused on the end result—whether the action might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics or other qualities affecting airworthiness. Whether the effect of a given action is appreciable can be quantified in many cases, but there will always be some cases where the determination comes down to a judgment call.

The FAA has devoted considerable effort over the years to coming up with guidance to inform those judgment calls. In 1994, the Aviation Rulemaking Advisory Committee (ARAC) created a "Clarification of Major/Minor Repairs or Alterations Working Group." The Working Group examined how the distinction is addressed in Canadian and European regulations, and analyzed the history of the major/minor classification in U.S. regulations back to its inception in 1931. The group issued its final report and a proposed Advisory Circular (ultimately never adopted) in July 2001. One of the conclusions was that the fundamental ambiguity of the terms under the existing regulations was insurmountable. The Working Group put forward a number of recommendations, including regulatory changes designed to provide more objective guidance. After considerable debate and analysis, the Working Group proposed amending the definition of major repair in FAR section 1.1 to use the term "significantly affects" in place of "appreciably affects." The Working Group also proposed the addition of a FAR section 43.14—also never adopted—that would have allowed for an alternative approach to major/minor classification that is approved by the Administrator and based on the new section 1.1 definitions. The Working Group further

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proposed an extensive revision of Appendix A to Part 43, with items on the list presumed to be major in lieu of the use of an alternative methodology. Finally, they called for additional training and guidance materials for FAA inspectors and anyone else involved in performing maintenance.

The FAA has not adopted any of the working group's proposals, so we are left with the working group's conclusion: that the current regulations and guidance are simply inadequate to accurately determine whether a work activity 'on the fringes' is major or minor.

Thus, when all is said and done, the difference between major and minor still comes down to a judgment call in many cases. For that reason, many people prefer to err on the side of caution when performing alterations, applying for a field approval even where the alteration, in their opinion, is minor. There is no regulatory bar to this practice, although it can impose additional costs on a transaction. The FAA and the industry will continue to grapple with this distinction for some time to come.

Overhaul vs. Rebuild

Another question that sometimes causes confusion is the difference between an "overhaul" and a "rebuild." Neither of the terms is defined in 14 C.F.R. section 1.1, but the FAA has nevertheless described their meaning in 14 C.F.R. section 43.2. That section sets forth the conditions that must be met before the terms "overhauled" or "rebuilt" can be used in any required maintenance entry or form.

At first glance, the descriptions of the two activities are confusingly similar. The recordkeeping provision of 14 C.F.R. section 43.2(a) effectively defines an "overhaul" by stating:

"No person may describe in any required maintenance entry or form an aircraft, airframe, aircraft engine, propeller, appliance or component part as being overhauled unless—

(1) Using methods, techniques and practices acceptable to the Administrator, it has been disassembled, cleaned, inspected, repaired as necessary, and reassembled; and

(2) It has been tested in accordance with approved standards and technical data, or in accordance with current standards and technical data acceptable to the Administrator, which have been developed and documented by the holder of the type certificate, supplemental type certificate, or a material, part, process, or appliance approval under § 21.305 of this chapter."

Section 43.2(b) describes a "rebuild" by stating:

"No person may describe in any required maintenance entry or form an aircraft, airframe, aircraft engine, propeller, appliance, or component part as being rebuilt unless it has been disassembled, cleaned, inspected, repaired as necessary, reassembled, and tested to the same tolerances and limits as a new item, using either new parts or used parts that either conform to new part tolerances and limits or to approved oversized or undersized dimensions."

Both overhaul and rebuilding involve the same basic activities: disassembly, cleaning, inspection, repair as necessary, reassembly and testing. The real difference lies in who is authorized to perform the work.

Overhaul constitutes "maintenance" as defined in 14 C.F.R. section 1.1: "Maintenance means inspection, overhaul, repair, preservation and the replacement of parts, but excludes preventive maintenance." Consequently, any person or entity authorized to perform maintenance (and appropriately rated for the work) may perform an

overhaul. Section 43.3 lists the persons authorized to perform maintenance as:

- the holder of a mechanic certificate under Part 65;
- the holder of a repairman certificate under Part 65;
- a person working under the supervision of a holder of a mechanic or repairman certificate, subject to certain limitations;
- the holder of a repair station certificate under Part 145; or
- the holder of an air carrier operating certificate or operating certificate issued under Part 121 or Part 135

Rebuilding, on the other hand, represents a specific category all its own. It does not constitute maintenance, as a look at 14 C.F.R. section 1.1 will confirm. Only manufacturers are authorized to rebuild an item, and even then, Part 43 limits that activity to items actually produced by the manufacturer in question. Under 14 C.F.R. section 43.3(j), a manufacturer may:

(1) Rebuild or alter any aircraft, aircraft engine, propeller, or appliance manufactured by him under a type or production certificate; or

(2) Rebuild or alter any appliance or part of aircraft, aircraft engines, propellers, or appliances manufactured by him under a Technical Standard Order Authorization, an FAA-Parts Manufacturer Approval, or Product and Process Specification issued by the Administrator.

Unlike some of the conundrums the industry faces from day to day, the question of whether a particular action constitutes an overhaul or a rebuild is one that can be resolved relatively easily by a close reading of the regulations. Problems that arise are often attributable to the loose use of the language to mean something other than the regulations mean. A customer may ask a repair station to "rebuild" an item, when what they really are requesting constitutes an overhaul. If

the repair station personnel use the word “rebuild” when completing the maintenance record, however, trouble may ensue.

Make sure that you really do perform each of the steps in an overhaul or rebuild before using the term to describe your work in an approval for return to service. Companies have been sanctioned because they indicated that something was overhauled, but failed to complete one of the steps. For example, if a final test required by the overhaul manual was omitted because the proper testing equipment was unavailable, then the overhaul has not been completed.

Disassembly can serve as another sticking point in overhauls. The FAA has made it clear that disassembly only needs to be accomplished as far as practical. If an item cannot reasonably be disassembled, then it does not need to be disassembled (that is, the repair station does not need to break it in order to meet the disassembly element of an overhaul). This can be important if the repair station is asked to overhaul a circuit board, for example—it may be cleaned, inspected, repaired as necessary, and tested without pulling the circuits from the substrate!

Final testing instructions can also be a source of confusion, particularly when the overhaul manual does not include final inspection procedures. The FAA has made it clear that if the overhaul manual provides appropriate overhaul procedures, but no final testing provisions, then the manufacturer has thereby indicated that final inspections are unnecessary to the overhaul (this is an issue that is more common outside of the avionics realm).

Misuse of terminology can lead to a paperwork violation of the regulations even when the underlying work is perfectly acceptable. Careful use of terms will go a long way toward reducing confusion for inspectors and industry alike. □