

Major Versus Minor Alterations

Know the difference

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Last month, we dipped our toes into the sea of controversy with an evaluation of the legalities of installing portables in the cockpit of certified aircraft. This month, we're going in headfirst with a discussion about major versus minor alterations and how to make some sense of the Federal Aviation Regulations (FARs) when it comes time to modify an aircraft.

Understanding the FARs is a lot like a treasure hunt: you start at one regulation, which inevitably references three other regulations. Those three regulations reference five more, and so on. In some cases, the FARs can even appear contradictory. So, the FAA also created guidance materials such as the Airworthiness Inspector's Handbook and, more recently, the Flight Standards Information Management System in an attempt to clarify some of the gray areas.

The complex regulations structure, coupled with various guidance materials and more than a few ambiguities, often results in different interpretations by the various flight standards district offices (FSDOs) around the country. What may be acceptable to one FSDO inspector may not be acceptable to another. Recently, the FAA has made a concerted effort to provide clear guidance materials to reduce these variations. It has come far from where it was 10 years ago, but there is still a long way to go.

Why Major Versus Minor?

It's important to determine if an alteration is major or minor because the approval and documentation require-

ments for major versus minor alterations are significantly different.

Minor alterations require only two things: data that is "acceptable" to the FAA and a logbook entry. Major alterations require FAA "approved data," recording of an FAA Form 337, and a logbook entry.

If the alteration is minor, the approval can be done by any certificated airframe and powerplant (A&P) mechanic.

However, if the alteration is deemed to be major, it requires an A&P mechanic with inspection authorization (IA) to sign the approval block on the Form 337 and submit it to the FAA.

It's important to mention here that it pays to check on the viability of the proposed alteration with your local FSDO before proceeding with the work. If there is any chance that the IA and the reviewing FSDO inspector will

disagree, you want to know this before investing money and time and, more importantly, cutting metal.

Acceptable Versus Approved Data

One of the most significant differences between major and minor alterations is the data required for approval. Minor alterations require data that is acceptable to the FAA. Acceptable data is data that the installer can refer to from FAA guidance materials, such as AC 43.13-1B, Acceptable Methods, Techniques and Practices. However, data from the manufacturer also can be used or even interpreted from. For example, let's say the aircraft manufacturer offered an option for a coat hook in the baggage compartment of the

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aircraft and you want to relocate it or add a second one. If the installer uses the same mounting methods to the same structure on the opposite side of the aircraft, it could logically be concluded that acceptable data was provided by the manufacturer when the original coat hook was designed. The point is that for any minor alteration, the installer should be able to demonstrate logical reasoning and a clear path from existing data to the work done.

Approved data for a major modification is much different. This is data that is explicitly approved by the FAA, a designated engineering representative (DER), or the aircraft manufacturer. No interpretation allowed.

Determining Major Versus Minor

It is the responsibility of the installer to determine whether an alteration is minor or major, based on the FAR guidelines. This makes choosing a good shop to do the alteration very important. There are a lot of excellent mechanics out there who understand the FARs, can help you navigate the process, and get your alteration done in a safe and legal manner. Unfortunately, there are also a few shops out there that follow the "No STC = No Alteration" philosophy. This approach has no basis in the FARs, so steer clear of anyone not willing to evaluate your proposed alteration on its own merits.

Good mechanics exercise the privileges under their FAA certificate. This means using their training, along with all applicable regulations and guidance materials from the FAA, to make sound decisions and safe alterations.

The primary regulatory guidance for determining a major versus a minor alteration can be found in 14 CFR 21.93 and 14 CFR Part 1.1:

21.93 Major & Minor Changes in Type Design A—"minor change" is one that has no appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product. All other changes are "major changes" (except as provided in paragraph (b) of this section).

14 CFR Part 1.1 – 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.

Sounds simple, right? Unfortunately it's not. First of all, there's the term "appreciably." What exactly is an "appreciable affect"? Is it 1 pound or 10 pounds? Then there are the other questions such as, what exactly does the FAA mean by something that affects weight, balance, structural strength, performance, etc.?

To get the answers, turn to the FAA guidance materials for its airworthiness inspectors. There have been many revisions to these guidelines over the years. However, the only guidance that specifically provides these critical definitions is ASI Handbook 8110.46. This document, 8110, has since been rescinded and replaced by newer guidelines. However, the FAA did not include these key definitions in the updates. According to Ric Peri, vice president of government and industry affairs for the Aircraft Electronics Association, the FAA still considers the 8110 definitions as a good point of reference.

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So, let's take something as simple as the line *no appreciable effect on the weight, balance...* from 21.93. According to 8110.46: *Typical alterations that may appreciably affect weight and balance include, but are not limited to:*

- Changes that increase the certificated maximum weight limits (increases in the maximum gross weight, maximum take-off, or landing weights).
- Changes in the certificated center of gravity range limits (for example decreasing the forward limit or increasing the aft limit).
- Changes that increase the operational limits (maximum speed limits such as V_{LE} , V_{LO} , V_{NE} ; minimum speed limitations such as stall speed; increases in service ceiling; and so forth).

You'll notice that the definition has absolutely nothing to do with adding a few pounds to the aircraft. It's all about changing the certified limits of the aircraft. So, just because the alteration adds 5 pounds to the aircraft does not mean it is a major alteration. However, if an alteration exceeds the certified maximum weight or balance limits, stop here because it is a major mod.

The definition of an appreciable effect to structural strength has a similar definition in 8110.46:

Typical alterations that may appreciably affect structural strength include:

- Changes to primary structures (structure that carries flight, ground, or pressure loads as defined in AC 25.571-1, *Damage Tolerance and Fatigue Evaluation of Structure*).
- Substituting an engine, propeller, rotor, or airframe primary structural materials (such as replacing a reciprocating engine with a turbine engine or increasing horsepower output by 10 percent or more).

Here the FAA is telling us that it is alterations to the primary structure of the aircraft that make an alteration a major

one. Unless you are modifying or attaching something to a primary structure, you are not having an appreciable effect on the structural strength of the aircraft.

There are similar definitions in 8110.46 for performance, powerplant operation, flight characteristics, or "other qualities affecting airworthiness." Read these definitions carefully in your evaluation of whether an alteration is major or minor.

Part 43 Guidelines

Part 43 Appendix A of the FARs specifically defines major

alterations to airframes, powerplants, propeller, and appliances. These regulations also shed some light on how the FAA wants us to determine major versus minor alterations. Fortunately, both 8110.46 and Part 43 Appendix A continue the same theme; major alterations are changes to the foundations of the aircraft certification. If you are changing how a system works, the basic structural integrity, or the certified operational characteristics of the aircraft, you are making a major alteration.

For example, let's consider an alteration to the aircraft's electrical system. Is adding a new circuit to the existing power bus a major alteration? Not unless it exceeds the basic capacity of the system. It's the system design that we're concerned with. Adding a backup alternator or a new electrical bus are both examples of major alterations.

Part 43 Appendix A asks: "Does the proposed alteration change the basic design of the fuel, oil, cooling, heating, cabin pressurization, electrical, hydraulic, deicing, or exhaust systems?" If it does, it's a major alteration.

Continuing Controversy

Because of this type of confusion, Aircraft Electronics Association has been working closely with the Small Airplane Directorate to better clarify the intent of the regulations concerning electrical system alterations. They have had numerous discussions with FAA leadership concerning what constitutes a major change to the electrical system of the aircraft. All parties agree that major changes are those that would affect the basic certification of the aircraft by the manufacturer. These include changes in power generation, distribution, and regulation. Expect to see new guidance materials from the FAA on this matter soon. *EAA*

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