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## *The Practical Rigger*

# Rigger Resources: Repairs and Alterations

The FAA docs are pretty thick. Sometimes finding a specific topic can be difficult. This collection of passages refers to everything the FAA says about repairs and alterations within CFR 1 (Definitions), CFR 65 (section on parachute riggers); and Advisory Circular 105-2e on Parachute Operation They are quoted here with some formatting and emphasis for clarity.

Note: The FAA makes no distinction between major and minor *alterations* with reference to parachute rigging. The distinctions between major and minor repairs are made more clear in the AC.

Another important reference is the FAA's *Parachute Rigger's Handbook, Change 1*, where it specifies the repairman for many operations, including a table for what determines when a patch is a major or minor repair.

A passage on repairs is also included from the *Performance Designs Reserve Manual*.

### **§1.1 General definitions.**

*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.

*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 alteration* means **an alteration** (Rahlmo emphasis) other than a major alteration.

*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.

## **§65.129 Performance standards.**

No certificated parachute rigger may—

(a) Pack, maintain, or **alter** (Rahlmo emphasis) any parachute unless he is rated for that type;

(b) Pack a parachute that is not safe for emergency use;

(c) Pack a parachute that has not been thoroughly dried and aired;

(d) Alter a parachute in a manner that is not specifically authorized by the Administrator or the manufacturer;

(e) Pack, maintain, or alter a parachute in any manner that deviates from procedures approved by the Administrator or the manufacturer of the parachute

## **AC-105-2e.**

### **15. PARACHUTE REPAIRS.**

- a. Major Repair. A major repair, as defined in § 1.1, is a repair that, if improperly done, might appreciably affect airworthiness.
- b. Minor Repair. A minor repair is a repair other than a major repair.
- c. Major or Minor Repair Determination.

When there is a question about whether a particular repair is major or minor, follow the manufacturer's instructions. In the absence of the manufacturer's instructions, riggers should use the FAA's Parachute Rigger Handbook (FAA-H-8083-17) and Poynter's Parachute Manual Volume I and II as guides. If the procedure calls for a master rigger, it should be considered a major repair. If the procedure allows for a senior rigger, it should be considered a minor repair.

1) The same kind of repair may be classed as major or minor depending on size or proximity to key structural components. For example, a basic patch may be a minor repair if it is small and away from seams, but may be a major repair if it is large or adjacent to a seam.

(2) The same kind of repair may be classed as major or minor depending on whether it is done to an approved or unapproved component. For example, replacement of a suspension line on a reserve canopy is usually a major repair, while replacement of a suspension line on a main canopy is generally considered a minor repair (even if the identical technique is required for both replacements).

(3) If an operation results in an approved configuration, the operation is considered a repair. For example, if a parachute system is approved with and without an RSL, then removing or replacing RSL components is a repair that may be major or minor depending on whether, if improperly done, it might appreciably affect airworthiness. Similarly, resizing a harness, when the original design permits a range of sizes, is a repair when the resized harness remains within the permitted range.

(4) Only an appropriately rated master rigger or a manufacturer of approved parachute components may make major repairs. The manufacturer may designate certain repairs to be done only by the manufacturer or the manufacturer's designee.

### **16. PARACHUTE ALTERATIONS.**

a. Configuration. Alterations are changes to a parachute system configuration that the manufacturer or the manufacturer's supervising FAA Aircraft Certification Office (ACO) has not approved. Examples include removing a deployment device from a reserve canopy, adding harness fittings to permit attaching an additional canopy, using nonstandard repair materials or techniques, or installation of a specific make/model AAD when the manufacturer has not authorized such changes. Changes that result in an approved configuration are considered repairs (see paragraph 15).

b. Approval. An alteration to an approved parachute system must be done in accordance with approved manuals and specifications and only by those with specific authorization to perform that alteration. Specific approval is not needed for the method of altering a non-TSO'd AC 105-2E 12/4/13 Page 18 Par 16 main parachute canopy. A person seeking authorization to alter an approved parachute system should proceed as follows:

(1) A person qualified to alter a parachute (as listed below) should contact his or her local FAA FSDO inspector to discuss the proposed alteration. The applicant should be prepared to show the inspector the nature of the alteration by using a sample assembly, sketch, or drawing and be prepared to discuss the nature of the tests necessary for showing that the altered parachute meets all applicable requirements.

(2) The inspector will review the proposal with the applicant and a plan of action will be agreed upon.

(3) The applicant will then prepare an application, in the format of a letter, addressed to the local FSDO. Attach all pertinent data.

The data should include:

- A clear description of the alteration;
- Drawings, sketches, or photographs, if necessary;
- Information such as thread size, stitch, pattern, materials used, and location of altered components; and
- Some means of identifying the altered parachute (model and serial number).

(4) The FSDO aviation safety inspector (ASI) may send an alteration to the ACO for review if the ASI is not experienced in parachute alterations. When satisfied, the inspector will indicate approval by date stamping, signing, and placing the FSDO identification stamp on the letter of application.

(5) Only a certificated and appropriately rated master parachute rigger, a current manufacturer of approved parachute systems or components, or any other manufacturer the Administrator considers competent may perform alterations to approved parachutes.

# Parachute Rigger Handbook, Change 1

## Page 7-15

### Detailed Information on Square Canopy Repairs

Holes or snags smaller than the size of one ripstop box (1/8 inch, 3.2 mm) may remain unrepaired as long as no more than one hole exists within any 10-inch (25.4 cm) circle. A maximum of three such holes or snags per cell are allowed.

Ripstop tape is not authorized for use on parachutes. If the damage is enough to warrant a repair, a sewn repair must be performed. Darning is not a means of repairing any parachute currently in production.

Any hole or tear up to 10 inches (25.4 cm) in length may be repaired by a Senior Rigger as long as the closest area of the completed repair is at least 1 inch from the nearest seam and at least 5 inches from the nearest tape or line attachment. These are minor repairs. Any damage or hole larger than 10 inches (25.4 cm) may be repaired by a Master Rigger, in either direction or involving a seam or tape. This is a major repair.

Any damage that requires a repair of an area that is larger than 50 percent of the total area of a cell skin (upper or lower) requires cell skin replacement and should be returned to the manufacturer.

Master riggers may perform repairs that do not involve taking apart any bartacks on the canopy unless they have the correct bartack machine or equivalent. Special bartack patterns are used that are not normally found in the field. In addition, removal and replacement of these stitch patterns usually weakens the fabric to the point that it is necessary to replace or reinforce portions of the panels. This should also be considered in the repairs of load bearing and non load bearing ribs as most have these types of bartack stitches located at the ends.

Before performing a repair, contact with the canopy manufacturer is very important, as some of these repair standards and limitations may vary slightly.

## PD Reserve Owner's Manual

(page 26-27)

**Repairs are broken into three categories:**

**Minor repairs:** These may be done by a senior rigger or your country's equivalent.

**Major repairs:** These require a master rigger or your country's equivalent.

**Factory repairs:** These repairs may be performed only by the Performance Designs factory.

These include all repairs that are not specifically listed as minor or major repairs.

Small snags and holes smaller than 1/8 inch square (one ripstop box) located farther than 10 inches (25.4cm) from the closest line attachment may be left unrepaired as long as there are no

more than one in any 10- inch (25.4cm) circle. A maximum of three such snags per cell are allowed. Ripstop tape is not authorized for use on Performance Designs reserves. If the damage is enough to warrant a repair, a sewn repair must be done.

Any hole or tear up to 10 inches (25.4cm) in length may be repaired by a senior rigger as long as the closest area of the completed repair is at least 1 inch (2.54 cm) from the nearest seam and at least 5 inches (12.7 cm) from the nearest tape or line attachment. These are minor repairs. Any line, tape or webbing damage is a major repair. Lines may be replaced by a master rigger. However, it is recommended that these repairs be done at the factory.

Master riggers may perform repairs that do not involve taking apart any bar tacks on the canopy. Special bar tack patterns are used that are not normally found in the field. In addition, removal and replacement of these stitch patterns usually weakens the fabric to the point that it is necessary to replace portions of panels. The original templates are needed to complete this correctly.

All replacement materials and thread must come from the Performance Designs factory and:

- must have been purchased within 2 years
- have been stored properly
- show no signs of discoloration.

Under-strength thread and fabric is frequently found in the field. The only way to be sure your materials are up to Performance Designs standards is to purchase them directly from Performance Designs.