PMA Standard

Material Changes in Paragliders

PMA standard specifying criteria for exchanging materials in the production of paragliders without negative impact on airworthiness and safety

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Content

1 Preface

This standard was developed by the experts of the Paragliding Manufacturers Association (PMA) in cooperation with independent experts; it is not a norm.

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The English version of this document shall be used as reference in case of differences between translations.

This standard can evolve according to new data and new designs of paragliders. Please refer to the latest version of this document.

1.1 Scope of application

This standard specifies criteria for exchanging one material for another in the manufacturing of a paraglider.

It only covers minor changes that have no impact on the safety of the paraglider - specifically, no negative impact on the paraglider's airworthiness according to relevant norms and safety standards, including EN 926-1 and EN 926-2.

This initial version only covers changes to the fabrics used in the manufacturing of the paraglider's canopy.

1.2 Start of application

The date of application of this standard is 16. December 2025.

1.3 Document history

The document versioning scheme is as follows: V Year.Month.Editorial

- Year.Month: Major changes between versions
- Editorial: Only editorial changes between versions

Date	Version	Changes / comments
11/12/2023	V 2023.12.0	First draft
Mar 2024 - Nov 2025	V 2024.03.1 - V 2025.11.1	Work-in-progress drafts
16/12/2025	V 2025.12.1	First official release

Table 1: Document history

2 Definitions

For the purpose of this standard, the following terms shall apply:

Paraglider
Ultralight glider without a rigid basic structure which is launched and landed by foot or on trike and in which the pilot (and, if applicable, a passenger) is suspended in a harness (or harnesses) connected to the wing. Also called glider.

Canopy
The wing part of the paraglider which is actually creating lift. Everything except the lines and the risers. Also called wing or sail.

Sail element
Either the upper sail, the lower sail, or the internal structure

> **Upper sail**
> Fabric area of the canopy between the leading edge and the trailing edge of the glider, attached to the top of the profile. Also called upper surface or top sail.
>
> **Lower sail**
> Fabric area of the canopy between the leading edge and the trailing edge of the glider, attached to the bottom of the profile. Also called lower surface.
>
> **Internal structure**
> Ribs, diagonals and straps
>
> > **Ribs**
> > Internal panel ensures the profile shape of the canopy, connecting the upper with the lower sail.
> >
> > **Diagonals and straps**
> > Internal panels spanning from one rib to another.

Suspension lines
Strings linking the risers to the sail, also simply called lines.

Riser
Textile element between the main lines and the suspension point on the harness (via a connecting element).

Fabric
Material used in the construction of a paraglider sail that is characterized by a single datasheet, such as Fabric_A or Fabric_B.

Fabric weight
Weight per unit area of a fabric, measured in grams per square meter (g/m^2 or GSM), also referred to as grammage.

Fabric quantity
Amount of fabric surface measured in square meters (m^2). Also referred to as fabric area.

Fabric proportion
Fabric quantity as a fraction of a glider's surface area. Also referred to as relative fabric quantity.

Layout pattern
Design or arrangement of cuts on upper and/or lower sail elements that define where different fabric colors and/or fabric materials are used.

Midpoint fabric weight (MFW)
Midpoint of the tolerance interval for the fabric weight as given in the fabric supplier's data sheet, measured in grams per square meter (g/m^2 or GSM).
For example,

- if a minimum and a maximum value are given in the data sheet, the midpoint fabric weight is calculated as the arithmetic mean of these two values,
- if a tolerance interval (absolute or relative) is given in the data sheet, the minimum and maximum value of this interval is to be determined, and the midpoint fabric weight is then calculated as the arithmetic mean of these two values.

Glider weight
Overall weight of a paraglider, including canopy, lines and risers.

Weighing environment
Atmospheric environment conditions with specific temperature and humidity levels to ensure accurate and consistent weight measurements.

Conditioning
Keeping an item to be measured in specified atmospheric environment conditions for a specified amount of time.

Manufacturer
Corporate entity that owns a specific glider's certification and commercially sells the glider.

3 Criteria for exchanging one fabric for another

Consider a paraglider *Model_1*:

- *Model_1* is certified according to EN 926-1 and EN 926-2
- *Fabric_A* is used in the lower sail, the upper sail, and/or the internal structure of the canopy of *Model_1*

In order to exchange the original *Fabric_A* with a replacement *Fabric_B* in *Model_1*, the following five criteria must be fulfilled:

- Criterion 1: Fabric weight
- Criterion 2: Established fabric
- Criterion 3: Fabric strength
- Criterion 4: Glider weight
- Criterion 5: Flight test

For the paraglider models referenced in the detailed specification of these criteria below, the following general rules apply:

- Model_1, Model_2, and Model_3 may be up to three different paraglider models
- Model_2 and Model_3 may be the same paraglider model

Note: Layout pattern changes are also covered by this standard, and must fulfill the same criteria.

3.1 Criterion 1: Fabric weight

Based on a comparison of the midpoint fabric weight for *Fabric_A* and *Fabric_B* as derived from the fabric suppliers' data sheets, the midpoint fabric weight of *Fabric_B* must be within the following ranges:

- For the internal structure of the canopy: The midpoint fabric weight of Fabric_B must be within -3.5 g/m^2 and +6 g/m^2 of the midpoint fabric weight of Fabric_A.
- For the lower sail: The midpoint fabric weight of Fabric_B must be within -6 g/m^2 and +3.5 g/m^2 of the midpoint fabric weight of Fabric_A.
- For the upper sail: The midpoint fabric weight of Fabric_B must be within -3.5 g/m^2 and +3.5 g/m^2 of the midpoint fabric weight of Fabric_A.

3.2 Criterion 2: Established fabric

There must be a paraglider model *Model_2* fulfilling the following criteria:

- *Fabric_B* is used in the canopy of *Model_2* in the area(s) considered for the material change (i.e., in the lower sail, the upper sail, and/or the internal structure, respectively), and
- *Model_2* is certified according to EN 926-1 and EN 926-2, and
- *Model_2* has been traded on the market for at least 24 months, and
- *Model_2* is being manufactured by the same manufacturer as *Model_1*.

3.3 Criterion 3: Fabric strength

There must be a paraglider model *Model_3* fulfilling the following criteria:

- *Fabric_B* is used in *Model_3*'s canopy in the same sail elements as *Fabric_A* in *Model_1* at an equal or larger proportion, and
- *Model_3* is certified according to EN 926-1 and EN 926-2, and
- The maximum allowed take-off-weight of *Model_3* according to EN 926-1 is larger or equal to the maximum allowed take-off-weight of *Model_1* according to EN 926-1, and
- *Model_3* is being manufactured by the same manufacturer as *Model_1*.

3.4 Criterion 4: Glider weight

The *calculated glider weight difference* between Model_1 with replacement Fabric_B and Model_1 with original Fabric_A must not be less than -4% and not be more than +3% of the *measured average overall glider weight* of Model_1 with original Fabric_A, where

- the *measured average overall glider weight* of Model_1 with original Fabric_A is determined by measuring the overall glider weight of a minimum of three production gliders after conditioning the gliders for at least 48 hours in a weighing environment of 20-35 °C ambient temperature and 40-80% relative humidity, and calculating the arithmetic mean of all measurements,
- the *calculated glider weight difference* between Model_1 with replacement Fabric_B and Model_1 with original Fabric_A is determined by calculating the difference between the respective midpoint fabric weights (MFW_B - MFW_A) as derived from the fabric suppliers' data sheets and multiplying this difference with the fabric quantity that is being replaced as derived from the glider manufacturer's construction plans.

Notes

- Model_1 with replacement Fabric_B must be of the same size and in the same configuration as Model_1 with original Fabric_A. There must be no other differences beyond the fabric change in question.
- One glider size - chosen by the manufacturer as the most representative for the model - must fulfill this criterion.

3.5 Criterion 5: Flight test

Paraglider Model_1 with replacement Fabric_B must be flight tested according to EN 926-2 requirements and test methods.

- One glider size - chosen by the manufacturer as the most representative for the model - must be flight tested at the upper limit and at the lower limit of its weight range.
- The flight test may be performed by the manufacturer or by someone commissioned by the manufacturer.
- Compared with Model_1 with original Fabric_A, the flight test of Model_1 with replacement Fabric_B must demonstrate the same or better safety characteristics; specifically, the overall EN classification must be the same or lower.

Flight test exemption: If in criterion 4 “glider weight” the *calculated glider weight difference* between Model_1 with replacement Fabric_B and Model_1 with original Fabric_A falls within -1.5% and +1.5% of the *measured average overall glider weight* of Model_1 with original Fabric_A, this flight test is not required.

4 Limitations

Material changes must not be applied recursively in the same area of the paraglider: For a certified paraglider *Model_1* for which the original *Material_A* has been replaced with a replacement *Material_B* according to criteria set forth in this standard, it is not permitted to subsequently replace *Material_B* with yet another replacement *Material_C* in the same area of the paraglider.

Material changes may be applied cumulatively in different areas of the paraglider: For a certified paraglider *Model_1,* changes may be made from an original *Material_A* to a replacement *Material_B* in one area of the paraglider and from another original *Material_A’* to another replacement *Material_B’* in a different area of the paraglider. This may be applied multiple times to collectively different areas of the paraglider.

Material changes must not be used to create a new paraglider model. Specifically, paraglider Model_1 with replacement Material_B must bear the same model name as Model_1 with original Material_A.

5 Documentation

Any and all changes of materials to a paraglider according to this standard must be documented. This documentation must include all detailed specifics about every change of materials, including details about:

- Paraglider model(s)
- Original material
- Replacement material
- Area of the paraglider in which the materials are exchanged
- Details how the criteria set forth in this standard are being met

This documentation must be

- signed by two representatives of the manufacturer, one of them the General Manager or CEO;
- archived and retained by the manufacturer for a minimum duration of seven years.