Since the first days of paragliding cloth has always been a major issue, so it makes sense to stop and take a closer look at it. Sometimes manufacturers like to present the issue as very complicated, high-tech stuff, but actually it is simple and uncomplicated. This article is designed to deconstruct the myths and jargon that surrounds paragliding cloth. We'll start with the basics. It helps to know first that the cloth used by the industry is commonly known as paragliding ripstop material – usually nylon with a ripstop square pattern.

**WEIGHT AND STRENGTH**

The lighter the cloth, the lighter the wing. The general belief is that light is good and means less volume, less bulk, less weight and more passive safety. All paragliders are made from cloth made in a similar way. Basically, it is all woven from the same nylon filament (thread) – which is 50-denier filament of high-tensile nylon, known as nylon 6.6. (Denier is a unit of textile measurement, and denotes the weight of the filament for a fixed length – the lower the denier number, the lighter, thinner and weaker the thread.)

Paraglider cloth is made from cloth woven in a typical ripstop pattern, generally thought to prevent runs – small tears. However, this is not necessarily the case and there is no problem making gliders from plain weave cloth (it even has some advantages – see the Porosity Testing box).

In any case, the weight of the cloth will depend on how tight the weave is. You can build the cloth (which can be imagined as a net) very tightly, placing each filament side by side with the next filament, or make a loose net with big holes.

The industry reference is that good-quality cloth should have at least what is called 100T count, meaning you have 50 threads weft and 50 threads warp constructed tightly per square centimetre of cloth.

If you want to produce lighter cloth it’s easy: just reduce the count to a 40 x 40 thread construction per cm (usually referred to as ends and peaks) and you will have 20% lighter in no time.

You can go further and reduce the count even more, to 35 x 35 ends and peaks (some do). Obviously, the lower the count the lighter the cloth. It will also be cheaper to produce: less filament, faster to weave etc.

For the manufacturer this looks like the stairway to heaven: lighter cloth plus lower costs plus higher price tag on sale equals better profits.

But there is a downside to this: the cloth will also be weaker and ensuring it is not porous will be a more difficult task. As they say, there’s no such thing as a free lunch.

So, next time you buy a wing made from lighter cloth, be aware that its tensile strength and aging deterioration is in direct correlation to the thread count. Do not get confused by claims of ‘high tech’ this or that, or that it is lighter, but stronger and more expensive – it’s never true. (The exception is when cloth is made from even lower number denier: 20-denier nylon 6.6 has been developed recently, but it is not really used for mass-produced standard paragliding wings.)

**POROSITY AND COATING**

For cloth to be used for paragliding it must be airtight. By definition the woven net is a net (very tightly, placing each filament side by side and then again two coats of polyurethane polymer, one to each surface, and then again two coats of silicone, one on each surface to protect the polyurethane surface, providing the ultimate in paragliding cloth performance. They were known for the legendary durability of their cloth, but for a price and extra weight.

In conclusion, more coating and more layers means lower cloth porosity (more airtightness). But it will be more expensive to produce, heavier and thicker.

**ELASTICITY**

So far we have discussed two parameters of cloth – weight and air permeability. The third parameter is elasticity – the cloth’s elongation under load in different directions and its ability to recover to its original dimensions when a load is not applied.

Again, there are no magic tricks. It is like having a slice of bread: the more butter you spread, the tastier the sandwich. You can use whatever you want to coat – acrylic or polyurethane – but the final result depends on how much of it and how many times you spread it on the cloth.

The coating process is relatively simple. Coating polymer, which is a creamy thick residue, is applied to the face of the cloth. The thickness of the coated layer is monitored and manufacturers decide what thickness of polymer they wish to apply.

‘Sexy’ light cloth will have a very thin layer of coating. Polymer has a certain weight and cost, and again the less applied the lighter and thinner the cloth.

In practice the coating has to be applied so that the cloth will not recover back to its original shape. This is achieved by doubling and calendaring (a process where the cloth is folded in half and passed under rollers at high temperatures and pressures), coating and finishing will be quite similar.

Woven cloth before being finished (known as grey goods) will have quite low elasticity and good recovery parameters on both warp and weft (along and across the cloth). On the bias (the diagonal 45 degree direction to warp or weft), the cloth is not as stable. It is easy, if applying tension on bias, to change the dimensions of the cloth construction. Then, after the load is released, deformed cloth will not recover back to its original shape. The coating overcomes this problem.

The layer of coating material bonding the threads together creates a friction-like construction and could be imagined as a thin layer of ice frozen on netting. The ice will make the net rigid in all directions (including bias) as well as...
SO WHO’S RIGHT?
At first look it seems logical that rigid cloth must be better for the ribs, because whatever shape is designed, cut and sewn into the profile should remain the same. The problem is that all the different types of rigid cloth have quite bad recovery characteristics. They tend to quickly distort under excessive load and do not regain their original shape.

The process is accelerated when the cloth is crushed, crumbled, flattened and shaken, generating an endless number of little coating cracks. The result is the wing’s profile deviates from the designed profile.

Another argument against rigid cloth is that the designed rib profile is only defined where the rib is stitched between the panels. Any other cross-section in the wing will reveal a profile quite different to the projected profile – the result of inflated surfaces with a variable cross-section across the span. This means in any given cross-section across the wingspan there are different profiles or rib sections, and they definitely differ from the actual rib stitched in.

With stiff cloth, the designer only has control over the profile he stitches into the actual rib. The performance of the glider in general then comes down to trimming by the design team – a process of trial and error guided by experience.

So there you have it. A lot of work goes into making the cloth that makes a paraglider: take care of it and it will take care of you.

CLOTH FOR THE RIBS
Bearing all that in mind, it is generally accepted that medium-soft crunchy-feel cloth with a certain degree of elasticity and good recovery is the best material for your wing. The ribs however are a different matter and here opinion is divided.

One school of thought believes that the cloth for the ribs should be as rigid as possible – with no stretch whatsoever. Other manufacturers use the same cloth for ribs and external surfaces.

POROSITY TESTING
Check the porosity of your old glider the old-fashioned way – by squeezing moisture through the cloth by pressing a wet finger to the cloth surface – and you will notice that the moisture bubbles first on the cross-section of the thicker threads of ripstop construction while the rest of the surface is still airtight. This is because the thin layer of coating that the cloth has does not fully cover the thicker cross-section of ripstop junctions and these points give in first. This is why, over time, plain weave cloth with the same coating would probably give better porosity results for a longer time.

A CLOTH GLOSSARY

Acrylic: Synthetic coating applied to some paraglider cloths
Bias: The diagonal direction in fabric
Calendaring: A finishing process used on cloth where fabric is passed under rollers at high temperatures and pressures.
Cracking: Where the coating on a fabric cracks at the edges
Coating: A polymer coating applied to fabric to make it airtight
Denier: A unit of measurement – a single strand of silk is one denier
Elasticity: How far cloth stretches and how well it comes back to its original shape
Filament: A single thread
Grey Goods: Woven cloth before finishing
Nylon: Versatile commercial nylon known for its strength
Permeability: A measure of how airtight cloth is
Polyurethane: Synthetic coating applied to some paraglider cloth
Rib: The cloth between cells, commonly stiffer than the rest of the cloth in a paraglider
Ripstop: Lightweight nylon fabric with interwoven reinforcement threads in a crisscross pattern
Silicon: Synthetic coating applied to some paraglider cloth
Warp: Largethread in the fabric, through which the weft is woven
Weft: Horizontal thread in the fabric, that weaves through the warp
White breaks: White lines on the cloth that mark the cracked edges of coating