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New level

## *Fly the finest fabric – Fly Kubicek Polyester*

### WHY YOU SHOULD CONSIDER CHANGING TO A POLYESTER BALLOON

There are two basic fabrics from which balloon envelopes are manufactured. The choice is either nylon or polyester. In Europe we are most familiar with nylon because it is the material that both Carrington and Luckenhaus make and these two companies provide the fabric for most of the European balloon manufacturers. American balloonists are more familiar with the choice between nylon and polyester because at least two American manufacturers use polyester.

Now that you can choose to fly a Kubicek envelope that is made from polyester it is time to look at the advantages and disadvantages of the two fabrics. In our opinion polyester is the better balloon fabric, but you must make up your own mind. Let's look at some basic facts.

#### FABRIC PROPERTIES

Nylon was first made in 1938 and its technical name is polyamide. Nylon absorbs energy well and it is elastic and extensible and has a high resistance to tearing under shock loads. Because of these excellent properties it is used extensively in the production of ropes, tyre cords and parachutes.

When European balloons were first manufactured, in England in the seventies, this fabric, probably because it was already used extensively for parachutes, was used for the production of the first balloons. Unfortunately nylon has a number of disadvantages, the greatest of which is that it is easily damaged by hydrolysis – it tends to absorb water, attract micro-organisms and, as a result, decay. This decay often continues even when the envelope is stored in its bag. Although modern coatings have reduced this susceptibility they have not removed it. To disguise the poorer properties of some of these fabrics you may be offered a heavier nylon fabric for the top of a nylon balloon.

Polyester was developed in 1941 and one of the best known brand names is Dacron. Polyester, when compared with nylon, has a higher UV resistance, higher reversible deformation and it is less susceptible to damage by micro-organisms. Polyester offers higher durability (life cycle), higher heat resistance, higher stability to UV radiation and other weather conditions. Although Polyester is an ideal fabric for balloon envelopes it is more difficult to dye and this has tended to deter most balloon manufacturers.



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## COATING

In addition to the chemical structure of the fibre the coatings applied to it and the way that the surface is finished will all effect the quality and the life of the fabric. Coatings can be used to fix the colours, to increase impermeability (air-tightness), to reduce microbiological action and to slow the decay of the fabric by reducing hydrolysis. The most frequently used coatings are polyurethane, acrylic and silicone. These coatings can be used individually or as a mixture on both nylon and polyester fabric. Coating thickness can be varied and a number of different coatings may be applied.

We are often asked why Kubicek is the only balloon manufacturer to use white demonstrators. The answer is simple; our fabric is coated and finished in a way designed to throw off dirt. Kubicek Polyester is designed to stay brighter for longer.

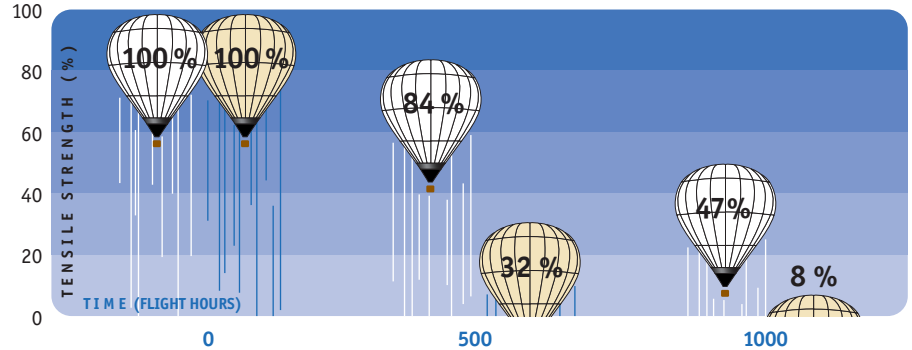
## HEAT DEGRADATION

Synthetic fabrics degrade gradually when they are exposed to heat. As an example of the difference between nylon and polyester, the Celanese Fibres company presented a comparison of fabric tensile strengths to the Industrial Fabric Association International. In this study it was shown that, after 500 hours of exposure to a continual 'dry temperature' of 149 °C, the fabric made from nylon had degraded to 32 % of its original strength, whereas the same fabric made from polyester retained 84 % of its initial strength. The same values measured over 1000 hours at the same temperature were even more dramatic: nylon was down to 8 % of its original strength whilst polyester had retained 47 % of the original strength.

**The durability (life cycle) of the polyester fabric is significantly higher than the life of a nylon fabric at comparable temperatures.**

Because polyester fabrics stand up well to high temperatures the manufacturers who uses this fabric have the option of asking for their balloons to be certified to fly at higher envelope temperatures than balloons made of nylon fabric. For example FireFly balloons are certified at to 149 °C against an 'European standard' of around 121 °C. This is a road that Kubicek has chosen not to take, preferring instead to certify its envelopes for 124 °C, closer to the temperatures adopted by European balloon manufacturers. By accepting this lower temperature the fabric will last longer.

149 °C DRY HOT CONDITION



## KUBICEK FABRIC

Since 1984 Kubicek has woven its own fabric. The looms that Kubicek own could produce either nylon or polyester fabric at similar costs, but the obvious choice was polyester. Kubicek's first fabric, called 'Urge' was used until 1997; it showed excellent laboratory results and lasted well. One of the oldest airworthiness envelope with 670 flight hours (autumn 2002) still flies in Vienna, Austria, pilot F-J. Rohrer. It's great feature and tolerance of overheating was shown when 'Flower Power' balloon had set an altitude record during which it had been flown at a fairly constant 200 °C and the fabric remain airworthy for many following years. In 1997 the weave density of the fabric was increased and the tensile strength increased to give yet longer life. This new fabric 'Kubicek Polyester' is expected to give even longer life than the excellent fabric that it replaces.

## BALLOON FABRICS – DATA COMPARISON

	KUBICEK POLYESTER	STANDARD BALLOON NYLON
weight (g/m <sup>2</sup> )	60	60–63
tensile strength	warp (N/5cm)	560
	weft (N/5cm)	540
		560–630
		510–620

We are often asked why we at Kubicek produce our own fabric. There are four simple reasons.

1. Kubicek can protect its own know how and maintain its own quality control.
2. In house production reduces dependence on suppliers.
3. New fabrics and coatings can be developed in house.
4. Kubicek cut out the middleman and pass the savings on to their customers.

Do not just take our word for it. Contact pilot Peter Flaggl in Stubenberg, Austria on [flaggl@aon.at](mailto:flaggl@aon.at) and ask his opinion of our fabric, as these words went to press the oldest of his six Kubicek balloons was passing 500 flight hours. Last strength fabric test on his Primagaz balloon BB60 (210000 cuft) shows that at 380 hrs (late 2002) the fabric retained 85 % of it's initial strength. Ask him how it's flying now !



## BASIC COMPARISON – TECHNICAL FABRICS

**PAD** – polyamide, commercial name e.g. Nylon, the most famous fibre producer e.g. Du Pont

**PES** – polyester, commercial name e.g. Dacron, the most famous fibre producer e.g. Hoechst Co.



### FIRST MADE

1938 | 1941



### ADVANTAGES

Higher loop strength, higher knot strength, higher abrasion resistance, higher deformation work (the fabric absorbs shock energy), easy to dye

Higher UV resistance, higher reversible deformation, higher resistance to degradation at higher temperatures.

### DISADVANTAGES

Hygroscopicity (wettability), the length changes by wetting, decreased strength caused by wetness, lower resistance to micro-organisms and chemical damage especially in acid conditions (acid rain, waste gases)

Rather difficult to dye + smaller choice of dyestuffs.

