THIS IS SAILCLOTH.

It's called ODL04 – One Design Laminate. It's 1.5 mil (that's 1½ thousandths of an inch) thick. Sandwiched between two pieces of monofilm are a layer of Technora Black and a layer of X-Ply set at a 22-degree angle. It weighs 2.2 ounces per square meter. It doesn't stretch until it's under 300 pounds of strain – and it doesn't tear until over 400. Is it the next supermaterial to be used to make windsurfing sails stronger, lighter and more durable? Although there are still some drawbacks – it lacks a "crisp" feel and has some stretch issues – designers like Bruce Peterson and David Ezzy have already started experimenting, with some promising results, Peterson used it to shed 1.5 pounds off the race sail he used to win the U.S. Nationals.

» **Extremely high tensile strength.**

» **No stretch.**

» **Unrivaled durability.**

» **UV resistance.**

» **Lightweight, space-age materials ...**

What will your sails look like next?

the Future (and a brief history) of Sailcloth

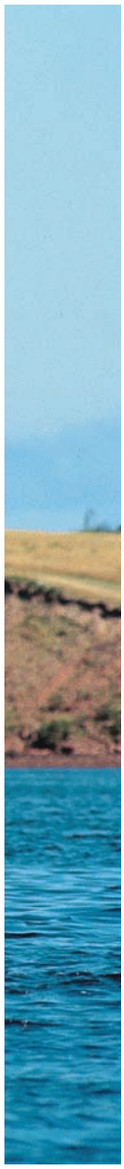
IT STARTED WITH DACRON. AND IT WAS GOOD.

Dacron is what sailmakers were using for sailboats in 1968, when Hoyle Schweitzer built the first Windsurfer, so that's what was used. The woven polyester blend made by DuPont worked — pretty well, in fact. It kept working for 12 years, with the basic design of the original Windsurfer sail changing very little as the sport grew. But the Dacron of that era had its disadvantages — it was soft and prone to stretching over time.

There are five major eras in sailcloth materials. "Sailcloth evolved because of the need to resist and control stretch," says Sailworks founder and designer Bruce Peterson. As windsurfing sails changed through the '80s, rig tension increased, which increased the required stretch resistance of the materials. Windsurfing sails are flexible wings, and controlling the rig tension is a huge part of sail development and design. This was (and is) the long-term driver of sailcloth development.

The first evolution in sailcloth was in the early 1980s and it addressed a problem that we're dealing with today — stretch (albeit it was on a relatively much larger level back then.) There were problems with Dacron sailcloth. It got heavier when wet – (much more of a problem with windsurfing sails than boat sails), and as with any woven cloth, as the yarns moved back and forth on top of each other,

» Monofilm ruled in the mid-'90s racing scene.



WHY DOES MONOFILM FEEL LIKE MONOFILM?

Tensile strength that comes from the film itself – it's dimensionally stable. You can use it in any direction and the stretch is the same.

it stretched. The first solution was to impregnate the polyester fibers with resin and then heat-set the weave, creating the fabric known as low-stretch Dacron or yarn-tempered Dacron. The resin-coating and heat-setting of the weave would help stabilize the yarns, although this solution was temporary — the sail would still blow out with extended use because as the resin began to break down, the sail would start to lose its shape. More modern low-stretch, yarn-tempered Dacrons are still being used today for batten pockets, race-sail mast sleeves and some Dacron wave-sail designs. In the late '70s, Peter Marr of North had the idea of laminating a 2-mil polyester film (monofilm) over the woven Dacron so the film would stabilize the cloth, but like the resin, it too deteriorated under the sun. This sailcloth is known as laminated Mylar, or just Mylar, and it's still used today for patches and reinforcing panels.

Monofilm, or straight polyester film in 4-, 5- and 7-mil thicknesses, was the next major era, and arguably the biggest step in the evolution of low-stretch sailcloth. Although first seen in 1983 in a sail made by F2, it didn't start to take hold until '85 or '86. Originally developed for the photo industry, monofilm soon began to take over as the material of choice for windsurfing sails. Its light weight, predictability and even stretch characteristics made it easier and cheaper to produce windsurfing sails that offered high performance on the slalom course, which dominated the windsurfing scene in the late '80s and early '90s. Of course, monofilm had drawbacks — it didn't have great tear strength, it deteriorated with exposure to UV rays and it was prone to scratching. The monofilm era flourished in the heyday of 1990s sail development — it was the main component of the vast majority of windsurfing sails well into the new millennium.

7 HUGE CHANGES IN SAIL DESIGN

1. **Fat-head sails** with short booms and higher clews altered the balance and handling of the original triangular form and allowed the use of smaller boards with smaller, more efficient sails.
2. **Vertical woven-fabric** luff panels with radial or horizontal body panels made it possible to make rigs with more tension and paved the way for film laminates in less loaded areas.
3. **Full-batten sails** were adapted from catamarans, creating stability and power.
4. **Higher-aspect sails** helped keep the draft in front of the sailor, making the rig easy to control.
5. **Head twist** lowered the center of effort by depowering the top of the sail – improving the control in high wind. It also improved the sail's efficiency by allowing it to handle a wider wind angle – like when you bear off the wind.
6. **Cams/camber inducers** defined foils into powerful, controllable forms that allowed greater and greater speed with larger sails.
7. **Low-profile batten** tension systems with easy adjustment got rid of flapping webbings and insufficient batten tension.

WE HAVE SEEN THE FUTURE. AND IT IS GOOD.

The next era in sailcloth is approaching — and we've dubbed it the "supermaterials" era. Simply put, sails are getting lighter and stronger with increasingly better stretch characteristics, more resistance to UV rays, and previously unsurpassed resistance to tearing and stretching. How so? We visited the Dimension-Polyant factory to find out. Nineteen years after the first X-Ply was used in a windsurfing sail, Dimension-Polyant's presence in the industry is inconspicuous but far-reaching — virtually every windsurfing sailmaker in the world (including companies with their own factories like Neil Pryde and Ezzy) uses Dimension-Polyant X-Ply, and virtually every windsurf sail incorporates X-Ply. The smallest pieces might be a clew or leech reinforcement, while some brands use X-Ply for the entire sail.

The DP factory is an impressive operation, cranking out over 2 million yards of sailcloth a year. Much of it goes to high-end yacht sails, but a significant portion goes to the windsurfing industry. Hale Walcoff, the sales manager for windsurfing materials, works closely with designers like Dave Ezzy, Bruce Peterson and others to specially develop material that suits their needs. Over the years, that has boiled down to a few key superlatives: lighter, more durable, less stretch.

In 30 years of making sailcloth, the R&D department at Dimension-Polyant has learned quite a bit — including a thing or two that might surprise you. For example, the thicker monofilm is, the more prone it is to cracking and tearing from UV damage. It has also learned how to inject UV inhibitors — and dye —into the adhesive that bonds two pieces of monofilm together, giving us the colored panels becoming more and more prevalent in modern sails. It now uses computer-driven hydraulic machines to test the stretch and tear levels of each particular product that it makes. A 6-inch piece of the material being tested is placed between two sets of calipers capable of exerting one ton of pulling force, while taking precise measurements of the force at which the material begins to stretch, then ultimately fail. Numbers like these are important to sailmakers. Some want a product that will stretch but not tear; others want virtually no stretch at all.

Of course, Dimension-Polyant isn't just studying current materials — it is imagining what we're going to use next. Walcoff thinks windsurfing might take a cue from the yachting world, which has begun to experiment with a product called D4 multi-panel, also known as membrane sails. Is it expensive? Yup. But it's pretty cool. Essentially, membrane sails are custom sails in which the yarn (aramid or a carbon fiber) is laid in a specific load pattern, and a patent-pending machine at the Dimension-Polyant factory assembles the panels using not stitches but high-tech glue. It's then delivered to the sailmaker to insert battens, patches and luff reinforcement. "It's already successful in small-boat competition," says Walcoff. "We think the next logical step in windsurfing is to try D4MP." Sails without stitches? If it works, we want it.

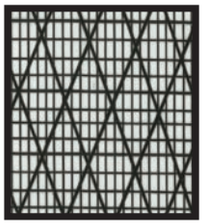
» Thanks to **DIMENSION-POLYANT** for a behind-the-scenes tour of its facility and help with this article.

WHY STRONGER MATERIALS COST MORE

▼ Colored Monofilm
Cost: Offers good performance, and it's treated with a UV-inhibitor adhesive. But it lacks the durability of X-Ply. Costs up to two times as much as untreated clear monofilm.

▼ X-Ply
Cost: This simple X-Ply offers more resistance to tears, and because it's a thinner monofilm, more resistance to UV. But it costs about two to three times as much per yard as traditional monofilm.

▼ Supermaterial
Cost: Offering greater UV resistance and the ultimate in durability, supermaterials are the most advanced materials being used. But they're not cheap – they cost three to six times as much as monofilm.



» Graham Ezzy puts some of the newest supermaterials through a test sesh at Ho'okipa.